COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss.	SUPERIOR COURT CIVIL ACTION NO.: 1984-CV-03333-BLS1
COMMONWEALTH OF MASSACHUSETTS,)
Plaintiff,)
) Service Via E-mail
V.)))
EXXON MOBIL CORPORATION,)
Defendant.)))

AFFIDAVIT OF JUSTIN ANDERSON

I, Justin Anderson, hereby depose and state under oath:

1. I am a partner with the law firm of Paul, Weiss, Rifkind, Wharton & Garrison LLP.

2. I submit this affidavit in support of Defendant Exxon Mobil Corporation's Special Motion to Dismiss the Amended Complaint Pursuant to G. L. c. 231, § 59H. My statements in this affidavit are based on personal knowledge, based on my experience or my consultation with others, or they are known to me in my capacity as counsel for Exxon Mobil Corporation ("ExxonMobil").

3. Attached to this affidavit as Exhibit 1 is a true and correct copy of a report by Seth Shulman, Union of Concerned Scientists and Climate, Accountability Institute, entitled *Establishing Accountability for Climate Change Damages: Lessons from Tobacco Control*, dated October 2012, which is available at http://www.climateaccountability.org/pdf/ Climate%20Accountability%20Rpt%20Oct12.pdf.

4. Attached to this affidavit as Exhibit 2 is a true and correct copy of an email from Kenny Bruno to Lee Wasserman, *et al.*, dated January 5, 2016, which is available at https://freebeacon.com/wp-content/uploads/2016/04/scan0003.pdf.

5. Attached to this affidavit as Exhibit 3 is a true and correct copy of an untitled draft agenda for a "January 8" meeting, which is available at https://freebeacon.com/wp-content/uploads/2016/04/Entire-January-meeting-agenda-at-RFF-1-1.pdf.

6. Attached to this affidavit as Exhibit 4 is a true and correct copy of a transcript of the "AGs United for Clean Power" press conference, held on March 29, 2016, which was prepared by counsel based on a video recording of the event. The video recording is available at http://www.ag.ny.gov/press-release/ag-schneiderman-former-vice-president-al-gore-and-coalition-attorneys-general-across, and the transcript is available at https://www.mass.gov/files/documents/2017/01/mx/mtd-opp-app.pdf.

7. Attached to this affidavit as Exhibit 5 is a true and correct copy of a *Daily Caller* article by Michael Bastasch entitled *Emails: Eco-Activists Plotted Oil Industry Lawsuits Long Before Anti-Exxon Stories Released*, dated May 16, 2016, which is available at https://dailycaller.com/2016/05/16/emails-eco-activists-plotted-oil-industry-lawsuits-before-anti-exxon-stories-released.

8. Attached to this affidavit as Exhibit 6 is a true and correct copy of an email from Lemuel Srolovic to Matthew Pawa, dated March 30, 2016, which is available at https://www.washingtonexaminer.com/ny-atty-general-sought-to-keep-lawyers-role-in-climate-change-push-secret.

9. Attached to this affidavit as Exhibit 7 is a true and correct copy of an e-mail from Michael Meade to Scot Kline and Wendy Morgan, dated March 18, 2016, which is available at https://eelegal.org/wp-content/uploads/2016/04/Development-of-Agenda.pdf.

10. Attached to this affidavit as Exhibit 8 is a true and correct copy of the Climate Change Coalition Common Interest Agreement, which is available at https://eelegal.org/wp-content/uploads/2016/08/Climate-Change-CIA.pdf.

11. Attached to this affidavit as Exhibit 9 is a true and correct copy of the Massachusetts Attorney General's Civil Investigative Demand to ExxonMobil, dated April 19, 2016, which is available at https://www.mass.gov/files/documents/2016/10/op/ma-exxon-cid-.pdf.

12. Attached to this affidavit as Exhibit 10 is a true and correct copy of the Tolling Agreement Between ExxonMobil Corporation and the Office of the Massachusetts Attorney General, executed on June 24, 2016, which is available at https://www.mass.gov/files/documents/2020/02/11/Notice%20of%20Removal.pdf.

13. Attached to this affidavit as Exhibit 11 is a true and correct copy of a press release by the Office of Attorney General Maura Healey, entitled AG Healey Sues Exxon for Deceiving Massachusetts Consumers and Investors, dated October 24, 2019, which is available at https://www.mass.gov/news/ag-healey-sues-exxon-for-deceiving-massachusetts-consumers-andinvestors.

14. Attached to this affidavit as Exhibit 12 is a true and correct copy of a transcript of an event hosted by the Council on Foreign Relations, entitled *CEO Speaker Series: A Conversation with Rex W. Tillerson*, dated June 27, 2012, which is available at https://www.cfr.org/event/ceo-speaker-series-conversation-rex-w-tillerson.

15. Attached to this affidavit as Exhibit 13 is a true and correct copy of a summary of an Exxon-European Commission meeting, which is available at https://influencemap.org/evoke/453949/file proxy.

16. Attached to this affidavit as Exhibit 14 is a true and correct copy of a transcript of a speech given by Lee Raymond to the World Petroleum Congress in Beijing, the People's

Republic of China, entitled *Energy—Key to Growth and a Better Environment for Asia-Pacific Nations*, dated October 13, 1997, which is available at http://www.climatefiles.com/exxonmobil/global-warming-who-is-right-1996.

17. Attached to this affidavit as Exhibit 15 is a true and correct copy of an advertorial entitled Display Ad 29 – No Title, dated January 22, 2004, which is available at https://www.ecowatch.com/exxon-advertised-against-climate-change-for-decades-after-top-executiv-1882096659.html.

18. Attached to this affidavit as Exhibit 16 is a true and correct copy of an ExxonMobil report, *Energy and Climate*, which is available at https://web.archive. org/web/20191230001423/http://cdn.exxonmobil.com/~/media/global/files/energy-and-environment/report---energy-and-climate.pdf.

19. Attached to this affidavit as Exhibit 17 is a true and correct copy of ExxonMobil's responses to the CDP Climate Change 2016 Information Request, which is available at https://www.exxonmobil.co.id/-/media/Indonesia/Files/Environmental-protection/2016-CDP-response.pdf.

20. Attached to this affidavit as Exhibit 18 is a true and correct copy of the ExxonMobil 2017 Sustainability Report Highlights report, which is available at https://corporate.exxonmobil.com/-/media/Global/Files/sustainability-report/publication/2017-Sustainability-Report.pdf.

21. Attached to this affidavit as Exhibit 19 is a true and correct copy of an ExxonMobil presentation, 2018 Outlook for Energy: A View to 2040, which is available at https://www.ief.org/_resources/files/events/ief-lecture-exxonmobils-2018-outlook-for-energy-a-view-to-2040/2018-outlook-for-energy.pdf.

22. Attached to this affidavit as Exhibit 20 is a true and correct copy of an ExxonMobil presentation, 2019 Outlook for Energy: A Perspective to 2040, which is available at https://corporate.exxonmobil.com/-/media/Global/Files/outlook-for-energy/2019-Outlook-for-Energy_v4.pdf.

23. Attached to this affidavit as Exhibit 21 is a true and correct copy of an ExxonMobil presentation, 2019 Energy & Carbon Summary, which is available at https://corporate.exxonmobil.com/-/media/Global/Files/energy-and-carbon-summary/2019-Energy-and-Carbon-Summary archive.pdf.

24. Attached to this affidavit as Exhibit 22 is a true and correct copy of an ExxonMobil presentation, 2020 Energy & Carbon Summary, which is available at https://corporate.exxonmobil.com/-/media/Global/Files/energy-and-carbon-summary/Energy-and-carbon-summary.pdf.

25. Attached to this affidavit as Exhibit 23 is a true and correct copy of the ExxonMobil 2015 Corporate Citizenship Report, which is available at https://corporate.exxonmobil.com/-/media/Global/Files/sustainability-report/publication/2015-ccr-full-digital.pdf.

26. Attached to this affidavit as Exhibit 24 is a true and correct copy of the ExxonMobil 2016 Corporate Citizenship Report, which is available at https://corporate.exxonmobil.com/-/media/Global/Files/sustainability-report/publication/2016-CCR-full-digital.pdf.

27. Attached to this affidavit as Exhibit 25 is a true and correct copy of an ExxonMobil presentation, entitled *2014 Outlook for Energy: A View to 2040*, which is available at https://www.slideshare.net/MarcellusDN/exxonmobils-2014-the-outlook-for-energy-a-view-to-2040.

28. Attached to this affidavit as Exhibit 26 is a true and correct copy of the ExxonMobil Energy and Carbon - Managing the Risks Report, which is available at

http://www.lawandenvironment.com/wp-content/uploads/sites/5/2014/04/Report-Energy-and-Carbon-Managing-the-Risks1.pdf.

29. Attached to this affidavit as Exhibit 27 is a true and correct copy of an *Energy in Depth* article by Menyae Christopher entitled *Report: Natural Gas Bans Will Disproportionately Impact Low Income Californians*, dated July 13, 2020, which is available at https://www.energyindepth.org/report-natural-gas-bans-will-disproportionately-impact-low-income-californians.

30. Attached to this affidavit as Exhibit 28 is a true and correct copy of an article from Mobil Oil, which was obtained on November 13, 2019 from https://mobiloil.com/en/article/ motorsports/nascar/nascar-race-to-green-initiative.

31. Attached to this affidavit as Exhibit 29 is a true and correct copy of a letter from Shamoil T. Shipchandler, Director, Fort Worth Regional Office, U.S. Securities and Exchange Commission to David R. Woodcock, Jones Day, dated August 2, 2018, which is available at https://dailycaller.com/wp-content/uploads/2018/08/letter-to-exxon-re-FW-04042-2018-08-02.pdf.

32. Attached to this affidavit as Exhibit 30 is a true and correct copy of the City of Cambridge City Solicitor Opinion on Gas Pump Labels Containing Information About Fossil Fuel Consumption, dated October 17, 2016, which is available at http://cambridgema.iqm2.com/Citizens/FileOpen.aspx?Type=4&ID=2613&MeetingID=1594.

33. Attached to this affidavit as Exhibit 31 is a true and correct copy of an email from Michael Meade to Scot Kline, dated March 22, 2016, which is available at https://eelegal.org/wp-content/uploads/2016/04/Master-VT-OAG-docs-of-note.pdf.

34. Attached to this affidavit as Exhibit 32 is a true and correct copy of an *Energy in Depth* article by Katie Brown entitled *Confirmed: Rockefellers Admit Funding Pay-to-Play Attack*

'Journalism' Against Exxon, dated December 2, 2016, which is available at https://www.energyindepth.org/confirmed-rockefellers-admit-funding-pay-to-play-attack-journalism-against-exxon.

35. Attached to this affidavit as Exhibit 33 is a true and correct copy of an order by the Honorable Ed Kinkeade, United States District Judge of the United States District Court for the Northern District of Texas, dated March 29, 2017, and entered in the case of *Exxon Mobil Corporation* v. *Schneiderman, et al.*, No. 4:16-CV-469-K (N.D. Tex.).

Signed under the penalties of perjury, this 30th day of July, 2020.

Justin Anderson (*pro hac vice*) janderson@paulweiss.com 2001 K Street, NW Washington, D.C. 20006-1047 (202) 223-7300 Fax: (202) 223-7420

CERTIFICATE OF SERVICE

I, Thomas C, Frongillo, counsel for Defendant Exxon Mobil Corporation, hereby certify that on July 30, 2020, J served a copy of the Affidavit of Justin Anderson and the accompanying exhibits on counsel of record by electronic service in accordance with the Joint Motion to Set Pleading Deadlines, allowed by the Court on April 14, 2020.

Thomas C. Frongillo Thomas C. Frongillo (BBO No. 180690

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Exhibit 1

Establishing Accountability for Climate Change Damages: Lessons from Tobacco Control

Summary of the Workshop on Climate Accountability, Public Opinion, and Legal Strategies

> Martin Johnson House Scripps Institution of Oceanography La Jolla, CA, June 14–15, 2012





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Report Author

This workshop summary was written by Seth Shulman, senior staff writer at the Union of Concerned Scientists.

Workshop Organizers

The workshop was conceived by Naomi Oreskes of the University of California–San Diego, Peter C. Frumhoff and Angela Ledford Anderson of the Union of Concerned Scientists, Richard Heede of the Climate Accountability Institute, and Lewis M. Branscomb of the John F. Kennedy School of Government at Harvard University and the Scripps Institution of Oceanography. Alison Kruger of the Union of Concerned Scientists coordinated workshop logistics.

Organizational affiliations are for identification purposes only. The opinions expressed in this report are the sole responsibility of the participants quoted.

Acknowledgments

This workshop was made possible by the V. Kann Rasmussen Foundation, the Mertz Gilmore Foundation, The Grantham Foundation for the Protection of the Environment, and the Martin Johnson House at the Scripps Institution of Oceanography. Without their generous support, this workshop would not have been possible.

The Union of Concerned Scientists is the leading science-based nonprofit working for a healthy environment and a safer world. More information about UCS is available on the UCS website at *www.ucsusa.org*.

The Climate Accountability Institute engages in research and education on anthropogenic climate change, dangerous interference with the climate system, and the contribution of fossil fuel producers' carbon production to atmospheric carbon dioxide content. This encompasses the science of climate change, the civil and human rights associated with a stable climate regime not threatened by climate-destabilizing emissions of greenhouse gases, and the risks, liabilities, and disclosure requirements regarding past and future emissions of greenhouse gases attributable to primary carbon producers.

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Preface

The workshop sought to compare the evolution of public attitudes and legal strategies related to tobacco control with those related to anthropogenic climate change.

or many years after scientists first concluded that smoking causes cancer, the tobacco companies continued to win court cases by arguing, among other things, that smokers assumed the risk of smoking and that no specific cancer deaths could be attributed to smoking. At some point, however, the tobacco companies began to lose legal cases against them even though the science had not substantively changed. Juries began to find the industry liable because tobacco companies had known their products were harmful while they publicly denied the evidence, targeted youth, and manipulated nicotine levels.

To explore how this transformation happened, and to assess its implications for people working to address climate change, the Union of Concerned Scientists and the Climate Accountability Institute brought together about two dozen leading scientists, lawyers and legal scholars, historians, social scientists, and public opinion experts for a June 14–15, 2012, workshop at the Scripps Institution of Oceanography in La Jolla, CA.

Specifically, the workshop sought to compare the evolution of public attitudes and legal strategies related to tobacco control with those related to anthropogenic climate change, fostering an exploratory, open-ended dialogue about whether we might use the lessons from tobacco-related education, laws, and litigation to address climate change. The workshop explored which changes now being observed (e.g., increasing extreme heat, sea level rise) can be most compellingly attributed to humancaused climate change, both scientifically and in the public mind. Participants also considered options for communicating this scientific attribution of climate impacts in ways that would maximize public understanding and produce the most effective mitigation and adaptation strategies.

The workshop explored the degree to which the prospects for climate mitigation might improve with public acceptance (including judges and juries) of the causal relationships between fossil fuel production, carbon emissions, and climate change. Participants debated the viability of diverse strategies, including the legal merits of targeting carbon producers (as opposed to carbon emitters) for U.S.-focused climate mitigation. And finally, the group sought to identify the most promising and mutually reinforcing intellectual, legal, and/or public strategies for moving forward. We are pleased to share the outcome of these preliminary workshop discussions. Among the many points captured in this report, we want to highlight the following:

- A key breakthrough in the public and legal case for tobacco control came when internal documents came to light showing the tobacco industry had knowingly misled the public. Similar documents may well exist in the vaults of the fossil fuel industry and their trade associations and front groups, and there are many possible approaches to unearthing them.
- Drawing upon the forthcoming "carbon majors" analysis by Richard Heede, it may be feasible and highly valuable to publicly attribute important changes in climate, such as sea level rise, to specific carbon producers. Public health advocates were effective in attributing the health impacts of smoking to major tobacco companies.
- While we currently lack a compelling public narrative about climate change in the United States, we may be close to coalescing around one. Furthermore, climate

Climate change may loom larger today in the public mind than tobacco did when public health advocates began winning policy victories.

change may loom larger today in the public mind than tobacco did when public health advocates began winning policy victories. Progress toward a stronger public narrative might be aided by use of a "dialogic approach" in which climate advocates work in partnership with the public. Such a narrative must be both scientifically robust and emotionally resonant to cut through the fossil fuel industry's successful efforts to sow uncertainty and confusion.

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Climate Accountability, Public Opinion, and Legal Strategies Workshop

Martin Johnson House, Scripps Institution of Oceanography, La Jolla, CA, June 14–15, 2012

1. Introduction

Tobacco companies realized they did not need to prove their products were safe. Rather, they had only to implement a calculated strategy to foster doubt about the science.

or decades after U.S. tobacco firms first became aware of strong scientific evidence linking smoking to cancer in the mid-1950s, the industry adopted a public relations strategy that knowingly sought to confuse people about the safety of its products. As we now know, tobacco industry lawyers long advised their clients that if they admitted to selling a hazardous product they would be vulnerable to potentially crippling liability claims. So, despite the scientific evidence, the industry developed and implemented a sophisticated disinformation campaign designed to deceive the public about the hazards of smoking and forestall governmental controls on tobacco consumption.

As time went on, a scientific consensus emerged about a multitude of serious dangers from smoking. On January 11, 1964, for instance, the U.S. government released the first report by the Surgeon General's Advisory Committee on Smoking and Health, which specifically warned the public about the link between smoking and lung cancer.¹ Nonetheless, the tobacco industry's disinformation campaign continued. As internal documents have long since revealed, the tobacco companies quickly realized they did not need to prove their products were safe. Rather, they had only to implement a calculated strategy to foster doubt about the science in the minds of the public. As one infamous internal memo from the Brown & Williamson company put it: "Doubt is our product, since it is the best means of competing with the 'body of fact' that exists in the minds of the general public."² The industry also managed to convince juries that smoking was a voluntary act, that the public was well informed of "potential risks," and that smokers therefore only had themselves to blame for whatever harm may have occurred.

It has become increasingly clear during the past decade or more that the fossil fuel industry has adopted much the same strategy: attempting to manufacture uncertainty about global warming even in the face of overwhelming scientific evidence that it is accelerating at an alarming rate and poses a myriad of public health and environmental dangers. Not only has the fossil fuel industry taken a page from the tobacco industry's playbook in its efforts to defeat action on climate change, it also shares with the tobacco industry a number of key players and a remarkably similar network of public relations firms and nonprofit "front groups" that have been actively sowing disinformation about global warming for years.³

At this pivotal moment for climate change, with international agreement all but stymied and governmental action in the United States largely stalled, the Union of Concerned Scientists and the Climate Accountability Institute sought to build a clearer understanding of the drivers of change that eventually proved effective against the tobacco industry. To be sure, lawyers played a huge role; scientific evidence played an important role as well. But notably, neither science nor legal strategies alone drove the changes in public understanding of the health dangers posed by smoking. Workshop participants were therefore asked to share their perspectives on a key question: given the power and resources of the tobacco industry, how were tobacco control efforts able to finally gain traction?

By gathering a distinguished and complementary group of experts, the Climate Accountability Workshop created the conditions for a well-informed discussion about the history of tobacco prevention as an example for those working on climate change: exploring how science in combination with the law, public advocacy, and possibly new technology can spur a seminal shift in public understanding and engagement on an issue of vital importance to the global community.

What follows is a summary of the workshop designed to highlight some of the major themes that emerged over the course of two days of structured dialogue. Because the discussion was often animated and wide-ranging, this report does not attempt to portray a comprehensive account of all the ideas presented, but rather the key findings that emerged.

When I talk to my students I always say, tobacco causes lung cancer, esophageal cancer, mouth cancer.... My question is: What is the "cancer" of climate change that we need to focus on?

—Naomi Oreskes

2. Lessons from Tobacco Control: Legal and Public Strategies

Both the tobacco industry and the fossil fuel industry have adopted a strategy of disseminating disinformation to manufacture uncertainty and forestall government action, and in so doing, have placed corporate interests above the public interest.

orkshop participants reviewed the history of tobacco control in the United States to identify lessons that might be applicable to action on global warming. The first important insight was that the history of tobacco control efforts stretches back much further than most people realize. The American Tobacco Company was broken up as a result of the Sherman Anti-Trust Act of 1890, and several U.S. states banned tobacco entirely between 1890 and 1920 in response to concerns that the powerful tobacco industry was paying off legislators. Those bans were all overturned after successful lobbying efforts by the industry, but a landmark 1900 legal case (Austin v. Tennessee) set an important precedent by upholding the legal right of states to ban tobacco.4

A second important insight was that the battle for tobacco control continues today, despite substantial gains over the past several decades. In a point made forcefully by Robert Proctor, a science historian who frequently serves as an expert witness in tobacco litigation, "Tobacco is not over." While the number of cigarettes smoked worldwide may no longer be growing, an estimated 6 trillion were still sold and smoked in 2012. More than 45 million Americans continue to smoke, some 8 million live with a serious illness caused by their smoking, and more than 400,000 die prematurely each year.⁵

A few principles emerged from the long fight for tobacco control. First, any legal strategies involving court cases require plaintiffs, a venue, and law firms willing to litigate-all of which present significant hurdles to overcome. Robert Proctor generalized about the history of tobacco-related litigation by noting that tobacco opponents typically won with simplicity but lost in the face of complexity. As he noted, it is worth remembering that, "The industry can win by making plaintiffs have to pass a thousand hurdles, any one of which can derail the whole effort." Second, public victories can occur even when the formal point is lost. In one effort that sought to stop tobacco research at Stanford University, for instance, no formal ban was enacted but the public outcry led the Philip Morris company to stop its external research programs anyway.⁶

The Importance of Documents in Tobacco Litigation

One of the most important lessons to emerge from the history of tobacco litigation is the

value of bringing internal industry documents to light. Roberta Walburn, a key litigator in the pathbreaking 1994 case *State of Minnesota and Blue Cross and Blue Shield of Minnesota v. Philip Morris et al.* [C1-94-8565], explained that her legal team, with strong backing from Minnesota Attorney General Hubert "Skip" Humphrey, made it a goal from the start of the lawsuit to use the process of legal discovery to gain access to Philip Morris's internal documents and make them part of the public domain. Walburn noted that Humphrey was mocked and scorned by many of his colleagues for this emphasis, but it proved critical to achieving the landmark settlement.

For the previous four decades, the tobacco industry had not lost a single legal case nor been forced to release most of its internal documents. But attorneys began to see the tremendous value of the industry's memos in an individual New Jersey smoker's case in the 1980s, and when a paralegal leaked some internal documents in the early 1990s. By making such documents a key part of the Minnesota litigation, the legal discovery process ultimately brought some 35 million pages of industry documents to light.⁷

Of course, the release of so many documents also presented immense challenges, requiring the legal team to pore over them one page at a time. The industry also went to great lengths to hide documents throughout the discovery process, listing them under different corporate entities, "laundering" scientific documents by passing them through attorneys in order to claim attorney-client privilege, and playing word games in order to claim they didn't have any documents on the topics sought by the plaintiffs. During pre-trial discovery in the Minnesota litigation, Walburn noted, Philip Morris was spending some \$1.2 million dollars every week in legal defense.

In the end, however, the documents proved crucial in helping to shift the focus of litigation away from a battle of the experts over the science of disease causation and toward an investigation of the industry's conduct. As Roberta Walburn explained, their legal team was able to say to the judge and jury, "You don't have to believe us or our experts; just look at the companies' own words." The strategy of prying documents from the industry also proved effective because once a lawsuit begins, litigants are required by law to retain evidence. The very first order issued by the judge in the Minnesota case was a document preservation order, which meant that the company could be held in contempt of court if it failed to comply. Companies are also required to preserve any documents they think might be pertinent to possible future litigation.

Today, the documents that have emerged from tobacco litigation have been collected in a single searchable, online repository: the so-called Legacy Tobacco Document Library (available at *legacy.library.ucsf.edu*) currently contains a collection of some 80 million pages. Stanton Glantz, a professor of cardiology at the University of California–San Francisco who directs the project, noted the importance of the decision to create an integrated collection accessible to all. One advantage of such a collection, he said, is that it becomes a magnet for more documents from disparate sources.

Because the Legacy Collection's software and infrastructure is already in place, Glantz suggested it could be a possible home for a parallel collection of documents from the fossil fuel industry pertaining to climate change. He stressed the need to think carefully about which companies and which trade groups might have documents that could be especially useful. And he underscored the point that bringing documents to light must be established as an objective independent of the litigation, or else the most valuable documents are not likely be made public.

Documents Helped Establish a Conspiracy

The release of documents from the tobacco industry became front-page news in the 1990s. The headlines did not tout the fact that tobacco causes lung cancer, which had already been widely reported; instead, they focused on the tobacco industry's lies to the public, its efforts to target children in its marketing campaigns, and its manipulation of the amount of nicotine in cigarettes to exploit their addictive properties.⁸ Many of these facts had not come to the public's attention until the industry's internal documents came to light.

Most importantly, the release of these documents meant that charges of conspiracy or racketeering could become a crucial component of tobacco litigation. Formerly secret documents revealed that the heads of tobacco companies had colluded on a disinformation strategy as early as 1953.⁹

Sharon Eubanks noted the importance of documents in a racketeering case against the tobacco industry she prosecuted during the Clinton administration. That case, U.S.A v. Philip Morris, Inc., was filed after President Clinton directed his attorney general to attempt to recover from the tobacco industry the costs of treating smokers under Medicare. The Justice Department brought the case under the Racketeer Influenced and Corrupt Organizations (RICO) statute that was originally enacted to combat organized crime.

The U.S. District Court for the District of Columbia found Philip Morris and other tobacco companies charged in the case guilty of violating RICO by fraudulently covering up the health risks associated with smoking and by marketing their products to children. The court imposed most of the requested remedies, and rejected the defendants' argument that their statements were protected by the First Amendment, holding that the amendment does not protect "knowingly fraudulent" statements. The tobacco companies appealed the ruling but a three-judge panel of the U.S. Court of Appeals for the District of Columbia unanimously upheld the decision in 2009.

Lessons for the Climate Community

One theme to emerge from this review of tobacco litigation was the similarity between the tobacco industry's disinformation campaign and the fossil fuel industry's current efforts to sow confusion about climate change. As one participant put it, "The tobacco fight is now the climate fight." Both industries have adopted a strategy of disseminating disinformation to manufacture uncertainty and forestall governmental action, and in so doing, have placed corporate interests above the public interest. Several workshop participants presented detailed evidence of the close ties between the two industries in terms of personnel, nonprofit "front groups," and funders.

Given these close connections, many participants suggested that incriminating documents may exist that demonstrate collusion among the major fossil fuel companies, trade associations, and other industry-sponsored groups. Such documents could demonstrate companies' knowledge, for instance, that the use of their products damages human health and well-being by contributing to "dangerous anthropogenic interference with the climate system."¹⁰

Finally, participants agreed that most questions regarding how the courts might rule on climate change cases remain unanswered. Most participants also agreed that pursuing a legal strategy against the fossil fuel industry would present a number of different obstacles and opportunities compared with those faced by litigants in the tobacco cases. As Roberta Walburn noted, however, both efforts do share an important public interest imperative: "People have been harmed and there should be justice," she said. "If you want to right a wrong you have to be bold."

3. Climate Legal Strategies: Options and Prospects

Tobacco started with a small box of documents. We used that to wedge open a large pattern of discovery. . . . It looks like where you are with climate is as good as it was with tobacco—probably even better. I think this is a very exciting possibility.

—Stanton Glantz

wide variety of potential legal strategies were discussed at the workshop. Participants agreed that a variety of different approaches could prove successful in spurring action and engaging the public on global warming, with suggestions ranging from lawsuits brought under public nuisance laws (the grounds for almost all current environmental statutes) to libel claims against firms and front groups that malign the reputations of climate scientists.

Several participants warned of the potential polarizing effect of lawsuits. While it is never an easy decision to bring a lawsuit, they noted, litigants must understand that if they pursue such a course they should expect a protracted and expensive fight that requires careful planning. Among the issues discussed were the importance of seeking documents in the discovery process as well as the need to choose plaintiffs, defendants, and legal remedies wisely. Another issue of concern was the potential for a polarizing lawsuit to slow the broad cultural shift in public perception (see section 5).

Strategies to Win Access to Internal Documents

Having attested to the importance of seeking internal documents in the legal discovery phase of tobacco cases, lawyers at the workshop emphasized that there are many effective avenues for gaining access to such documents.

First, lawsuits are not the only way to win the release of documents. As one participant noted, congressional hearings can yield documents. In the case of tobacco, for instance, the infamous "Doubt is our product" document came out after being subpoenaed by Congress.¹¹ State attorneys general can also subpoena documents, raising the possibility that a single sympathetic state attorney general might have substantial success in bringing key internal documents to light. In addition, lawyers at the workshop noted that even grand juries convened by a district attorney could result in significant document discovery.

Jasper Teulings, general counsel for Greenpeace International, emphasized that the release of incriminating internal documents from the fossil fuel industry would not only be relevant to American policy but could have widespread international implications.

Importance of Choosing Plaintiffs, Defendants, and Legal Remedies

Matt Pawa, a leading litigator on climaterelated issues, discussed his current case, *Kivalina v. ExxonMobil Corporation, et al.*, now pending on appeal. The lawsuit, brought under public nuisance law, seeks monetary damages from the energy industry for the destruction of the native village of Kivalina, AK, by coastal flooding due to anthropogenic climate change. Damages have been estimated by the U.S. Army Corps of Engineers and the U.S. Government Accountability Office between \$95 million and \$400 million.

The suit was dismissed by a U.S. district court in 2009 on the grounds that regulating global warming emissions is a political rather than a legal issue that needs to be resolved by Congress and the executive branch rather than the courts. An appeal was filed with the Ninth Circuit Court of Appeals in November 2009, but was rejected in September 2012. The plaintiffs have yet to determine whether to take further legal action, either by calling for an *en banc* review of the appeal verdict or by re-filing the case in state court.

Pawa noted that in representing Kivalina, he chose a plaintiff whose stake in the case is patently evident, as is the harm that has come to the village. Because those facts remain largely beyond dispute, it puts the focus of the case squarely on attributing the damage to the defendants. Pawa has used the principle of "joint and several" liability, which (in his words) holds that, "If two guys are outside a bar and the plaintiff gets beaten up and only one technically does it but both of them collude in the activity, they can both be held responsible." Because Exxon and the other corporate defendants in the Kivalina case are indisputably large emitters of heat-trapping gases, Pawa said he will argue that they "are basically like the two guys outside that bar." To help with his argument of causation, Pawa will also argue that Exxon and the other defendants distorted the truth. He said that litigation not only allows him to pursue a remedy for some of those most vulnerable to the effects of climate change, but also serves as "a potentially powerful means to change corporate behavior."

Jasper Teulings recounted the unusual and controversial case in which Greenpeace International helped representatives from Micronesia—an island nation threatened by rising sea levels-request a transboundary environmental impact assessment (TEIA) in the Czech Republic, hoping to prevent the Czech government from granting a 30-year permit extension for a coal-fired power plant. That action, he said, led to a national debate about global warming in a country led by a climate skeptic, and the Czech environment minister ultimately resigned as a result. The case also drew the attention of the international media, including the Wall Street Journal, Economist, and Financial Times.¹²

Participants weighed the merits of legal strategies that target major carbon *emitters*, such as utilities, versus those that target carbon *producers*, such as coal, oil, and natural gas companies. In some cases, several lawyers at the workshop noted, emitters are better targets for litigation because it is easy to establish their responsibility for adding substantial amounts of carbon to the atmosphere. In other cases, however, plaintiffs might succeed in cases against the producers who unearthed the carbon in the first place.

In lawsuits targeting carbon producers, lawyers at the workshop agreed, plaintiffs need

to make evidence of a conspiracy a prominent part of their case. Richard Ayres, an experienced environmental attorney, suggested that the RICO Act, which had been used effectively against the tobacco industry, could similarly be used to bring a lawsuit against carbon producers. As Ayres noted, the RICO statute requires that a claimant establish the existence of a "criminal enterprise," and at least two acts of racketeering (with at least one having occurred within the past four years). It is not even clear, he added, whether plaintiffs need to show they were actually harmed by the defendant's actions. As Ayres put it, "RICO is not easy. It is certainly not a sure win. But such an action would effectively change the subject to the campaign of deception practiced by the coal, gas, and oil companies."

The issue of requesting an appropriate legal remedy was also discussed. As one of the workshop's lawyers said, "As we think about litigation, we need to consider: what does our carbon system look like with climate stabilization? It has to be something positive. Only then can we figure out what strategies we need to pursue." As important as this broad vision of a legal remedy is, this participant also emphasized the advantage of asking courts to do things they are already comfortable doing, noting that, "Even if your ultimate goal might be to shut down a company, you still might be wise to start out by asking for compensation for injured parties."

Other Potential Legal Strategies False advertising claims

Naomi Oreskes, a historian of science at the University of California-San Diego, brought up the example of the Western Fuels Association, an industry-sponsored front group that has run ads containing demonstrably false information. Oreskes noted that she has some of the public relations memos from the group and asked whether a false advertising claim could be brought in such a case. Lawyers at the workshop said that public relations documents could probably be used as evidence in such a case but they cautioned that courts view claims designed to influence consumer behavior differently than they do those designed to influence legislative policy.

Some lawyers at the workshop did note that historical false advertising claims could be deemed relevant, especially if plaintiffs can show that the conduct has continued. In tobacco litigation, for example, plaintiffs have successfully gone back as far as four decades for evidence by establishing the existence of a continuing pattern by the tobacco industry.

Joe Mendelson, director of climate policy at the National Wildlife Federation, suggested that such a strategy might be employed to take on the coal industry's advertising campaign, which has targeted swing states whose attorneys general are unlikely to call out the ads' distortions. Such a legal case, Mendelson explained, might achieve a victory in terms of public education and engagement.

Libel suits

Lawyers at the workshop noted that libel lawsuits can be an effective response to the fossil fuel industry's attempts to discredit or silence atmospheric scientists. Pennsylvania State University's Michael Mann, for instance, has worked with a lawyer to threaten libel lawsuits for some of the things written about him in the media, and has already won one such case in Canada. Matt Pawa explained that libel cases merely require the claimant to establish falsity, recklessness, and harm. "What could be more harmful than impugning the integrity of a scientist's reputation?" Pawa asked. Roberta Walburn noted that libel suits can also serve to obtain documents that might shed light on industry tactics.

Atmospheric trust litigation

Mary Christina Wood, professor of law at the University of Oregon, discussed her involvement with so-called atmospheric trust litigation, a legal strategy she pioneered that is now unfolding in all 50 states. The goal of the litigation—to force massive reforestation and soil carbon sequestration that would return the planet to a sustainable level of atmospheric carbon dioxide (350 parts per million)—is grounded in the internationally recognized principle known as the Public Trust Doctrine, first enunciated by the Roman Emperor Justinian.

Under this doctrine, a state or third-party corporation can be held liable for stealing from or damaging a resource—in this case, the atmosphere—that is held as a public trust. The beneficiaries in the case are citizens—both current and future—who claim that the defendants (the state or federal government or thirdparty corporations) have a duty to protect and not damage that resource, which they oversee or for which they bear some responsibility.

Wood noted that this legal action has several promising features: it is being brought by children, can highlight local impacts of climate change because it is being brought in every state, and is flexible enough to be brought against states, tribes, the federal government, or corporations. Wood said that while the atmospheric trust lawsuits are just starting, some 22 amicus briefs (in which law professors from around the country argue that the approach is legally viable) have already been filed.

Disagreement about the Risks of Litigation

Despite widespread endorsement by workshop participants of the potential value in pursuing legal strategies against the fossil fuel industry, some of the lawyers present expressed concern about the risks entailed should these cases be lost. As one participant put it, "We have very powerful laws and we need to think strategically about them so they won't be diminished by the establishment of a legal precedent or by drawing the attention of hostile legislators who might seek to undermine them."

Others, such as Sharon Eubanks, took issue with this perspective. "If you have a statute, you should use it," she said. "We had the case where people said, 'What if you screw up RICO?' But no matter what the outcome, litigation can offer an opportunity to inform the public." Stanton Glantz concurred with this assessment. As he put it, "I can't think of any tobacco litigation that backfired; I can't think of a single case where litigation resulted in bad law being made."

4. Attribution of Impacts and Damages: Scientific and Legal Aspects

Why should taxpayers pay for adaptation to climate change? That is a sound bite that I don't hear used. Why should taxpayers bear the risk? Perhaps that question alone can help shift public perception.

-Myles Allen

everal sessions at the workshop addressed a variety of vexing issues concerning the extent to which localized environmental impacts can be accurately attributed to global warming and how, in turn, global warming impacts might be attributed to specific carbon emitters or producers. Many challenges are involved in these kinds of linkages, from getting the science right to communicating it effectively.

Myles Allen, a climate scientist at Oxford University, suggested that while it is laudable to single out the 400 Kivalina villagers, all 7 billion inhabitants of the planet are victims of climate change. He noted, for instance, that while the United Nations Framework Convention on Climate Change makes an inventory of global warming emissions, it does not issue an inventory of who is being affected. As he put it, "Why should taxpayers pay for adaptation to climate change? That is a sound bite that I don't hear used. Why should taxpayers bear the risk? Perhaps that question alone can help shift public perception."

Allen also noted that the scientific community has frequently been guilty of talking about the climate of the twenty-second century rather than what's happening now. As a result, he said, people too often tend to perceive climate change as a problem for our grandchildren.

Challenges of Attributing Environmental Effects to Anthropogenic Climate Change

Several of the climate scientists at the meeting addressed the scientific challenges involved in attributing specific environmental effects to anthropogenic climate change. For example, global warming, natural variability, population exposure, and population vulnerability are all factors in the disasters that make headlines. Myles Allen noted that while scientists can accurately speak about increases in average global temperature, such large-scale temperature measurements are difficult to link to specific individuals.

Claudia Tebaldi, a climate scientist at Climate Central, emphasized the problem of confounding factors: "If you want to have statistically significant results about what has already happened [on the health impacts of climate change]," she said, "we are far from being able to say anything definitive because the signal is so often overwhelmed by noise."

Given that nearly all consequences have multiple causes, Tebaldi reviewed the difficulties entailed in efforts at so-called singlestep attribution (in which a single variable is added or removed from a model), multi-step attribution (in which two or more attribution linkages are drawn), and associative patterns of attribution (in which linkages are mapped over time in order to detect possible patterns). She noted that the authors of the 2007 Intergovernmental Panel on Climate Change report were relatively comfortable attributing certain environmental phenomena to climate change: changes in snow/ice/frozen ground; increased runoff and anticipated snowmelt in spring; warmer water temperatures and changes in salinity, oxygen levels, and ocean acidification. But she added that it is still hard to say anything statistically significant about some key areas of concern.

Climate scientist Mike MacCracken expressed more optimism about the ability of scientists to identify patterns of changes. The traditional view, he explained, is that one cannot attribute a single weather event to humaninduced climate change, but climate change reflects a difference in the frequency and intensity of weather events from the past that is how the term is defined. So, as the distribution of weather events changes, we are seeing an increasing likelihood of what were once very rare events, but are likely to become much more frequent.

Myles Allen agreed that scientists could be far more confident about a group of events rather than a single event, but noted, "Then you are talking again about climate [as opposed to weather]. We can say with confidence how the risks are changing. Absolutely. And some harms can be caused by change in risk. But we are still talking about probabilities." As an example, Allen cited work Absolutely crucial is real progress on regional and local consequences of climate change. We have general notions that the Southwest will be drier. But once the science is able to say with confidence what will happen in the states of Colorado and Arizona, then the people who live there will want to pressure their representatives to fix their problem. Then political people will be much more responsive to the issue. That will be real progress in the next few years.

-Lew Branscomb

by Stefan Rahmstorf and Dim Coumou, who found an 80 percent probability that the July 2010 heat record would not have occurred without global warming.¹³

Others agreed that many different types of aggregate findings can be useful. Paul Slovic, for instance, cited the example of the book *At War with the Weather* by Howard Kunreuther. In studying economic losses from natural disasters, Kunreuther found an exponential increase in losses incurred over the last 10 or 20 years.¹⁴ Again, multiple factors need to be teased apart, such as the growth in population exposed to natural disasters, increased infrastructure replacement costs, natural variability, and the influence of climate change.¹⁵

Mike MacCracken suggested that issues related to the science itself are distinct from how findings should be communicated to the public. "The challenge," he said, "is finding an effective lexicon that scientists are comfortable with." Along these lines, one participant suggested that it could be helpful to communicate findings framed as a discussion. For example, a farmer could ask a question saying, "I'm concerned because I'm seeing this [particular local weather]." The scientist can comfortably respond: "You're right to be concerned because we are seeing this, this, and this [aggregate effect or strong probability of anthropogenic warming]."

Lew Branscomb, a physicist, governmental policy expert, and one of the meeting's organizers, suggested that the evolution of climate science is an important issue. As he put it, "Absolutely crucial is real progress on regional and local consequences of climate change. We have general notions that the Southwest will be drier. But once the science is able to say with confidence what will happen in the states of Colorado and Arizona, then the people who live there will want to pressure their representatives to fix their problem. Then political people will be much more responsive to the issue. That will be real progress in the next few years."

Determining Appropriate Standards of Evidence

A discussion arose at the workshop about the appropriate standard of evidence required when attributing specific environmental phenomena to global warming and establishing the culpability of carbon emitters and producers. Naomi Oreskes noted the important differences among standards of evidence in science, in law, and in public perception.

As she explained, "When we take these things to the public, I think we often make a category error. We take a standard of evidence applied internally to science and use it externally. That's part of why it is so hard to communicate to the public." Oreskes pointed out that the "95 percent proof rule" widely accepted among scientists might not be appropriate in this application. That standard of proof, she said, "is not the Eleventh Commandment. There is nothing in nature that taught us that 95 percent is needed. That is a social convention. Statistics are often used when we don't understand the mechanisms of causation. But what if we do know what the mechanisms are? For instance, if we know how a bullet kills a human, we don't need statistics to prove that bullets can kill."

Oreskes went on to note that scientific knowledge in the field of climate science is very robust—more robust than in many other fields such as plate tectonics or relativity. This observation led her to wonder why climate scientists have been so reticent about communicating their results, and to postulate that in accepting such a high standard of proof, "The scientific community has been influenced by push-back from industry."

Stanton Glantz drew a comparison to his work with the Centers for Disease Control establishing a link between smoking and breast cancer. "I fought CDC on the links between smoking and breast cancer," he recalled. "There were 17 studies. How could you make a statement that there was no link? The epidemiologists focus on statistics but we already knew about the biology of breast cancer and damage to DNA and links to tobacco. My argument was that you needed to look at a whole body of evidence.... We compared the breast cancer evidence, which is stronger than the original lung cancer evidence, and that got accepted and became the default position. But the fact is, not everyone who smokes gets cancer."

For climate change, Glantz said, all the pieces fit together and they represent a consistent body of evidence. He added that criminal trials use the standard of "beyond a reasonable doubt." But as he put it, "Scientists have been making the 'reasonable doubt' standard higher and higher."

Some of the scientists at the workshop, however, took issue with the idea that they

ought to apply different standards of proof to their work. Claudia Tebaldi, for instance, responded, "As a scientist I need to have two different standards? I don't see that. I am not convinced that I should lower my standards of skepticism when I talk to the public. As a scientist I give you the probability. It is not my job to change my paper if the consequences are so bad. That is the job of a policy maker working with my results."

Mary Christina Wood reminded the group that the medical profession is adept at juggling two very different standards: the standard of proof and the standard of care, and suggested that climate scientists might be able to do something similar. Dick Ayres agreed, emphasizing that, "Too high a standard of proof increases the burden on those who seek to protect public health."

Myles Allen noted that a key problem always comes back to the issue of doubt. "If you grab a scientist off the street and ask whether we *could* have had this weather event without global warming, they will likely say yes, it could have been possible. So the reality is that there will always be a scientist available to fill that role in the court of law." The vexing thing, Allen said, is "trying to make clear to the public that there are two uncertainties. We can be very certain about what is happening and yet very uncertain about what is going to happen tomorrow or next year."

Attributing Environmental Damage to Carbon Producers

Richard Heede, co-founder and director of the Climate Accountability Institute, presented a preview of a research project several years in the making, in which he has been quantifying the annual and cumulative global warming emissions attributable to each of the world's major carbon producers. By closely reviewing annual reports and other public sources of information from the energy sector, Heede is working to derive the proportion of the planet's atmospheric carbon load that is traceable to the fossil fuels produced and marketed by each of these companies annually from 1864 to 2010. The work deducts for carbon sequestered in non-energy products such as petrochemicals, lubricants, and road oil, and quantifies annual and cumulative emissions to the atmosphere attributable to each company. The research is still awaiting peer review before it can be finalized and publicized.

Most of the workshop's participants responded positively to Heede's research. Matt Pawa thought the information could prove quite useful in helping to establish joint and several liability in tort cases, but he cautioned that, in practice, a judge would likely hesitate to exert joint and several liability against a carbon-producing company if the lion's share of carbon dioxide in the atmosphere could *not* be attributed to that company specifically. Nevertheless, he said this kind of accounting would no doubt inspire more litigation that could have a powerful effect in beginning to change corporate behavior.

Other participants reacted positively to other aspects of Heede's research. Angela Anderson, director of the climate and energy program at the Union of Concerned Scientists, noted for instance that it could potentially be useful as part of a coordinated campaign to identify key climate "wrongdoers." Mary Christina Wood agreed, saying the preliminary data resonated strongly with her, making her feel like "Polluters did this and they need to clean this up." Other participants noted that it could be helpful in the international realm by changing the narrative that currently holds nations solely responsible for the carbon emitted by parties within their own borders. Finding the specific companies responsible for emissions, they said, cuts a notably different way.

One concern raised was that some in the "American middle" might perceive it as unfair to go after a company that didn't know carbon dioxide was harmful for much of the extended period Heede reviewed. To get a sense of this, some suggested reaching out to someone like public opinion specialist Tony Leiserowitz who could undertake polling to see how such research might be received by different segments of the public.

Robert Proctor suggested that the most effective public communication about the research would use the simplest formulation possible. One effective strategy in the fight against tobacco, he observed, was equating a year's production of cigarettes in a particular factory to a number of deaths. Anti-tobacco activists determined that there was one smoking-related death for every one million cigarettes produced. As Proctor explained, given that the industry made roughly one cent in profit per cigarette, that meant a company such as Philip Morris made \$10,000 in profit for every death its products caused. Proctor suggested a similar strategy could be adapted to link the largest corporate carbon producers to specific climate impacts. If numbers could be generated for how many deaths per year were caused by each degree rise in global temperature, for instance, a similar case could be made against a particular company that produced or emitted a known percentage of the carbon load contributing to global warming.

Picking up on this notion, Naomi Oreskes suggested that some portion of sea level rise could be attributed to the emissions caused by a single carbon-producing company. In essence, she suggested, "You might be able to say, 'Here's Exxon's contribution to what's happening to Key West or Venice.'" Myles Allen agreed in principle but said the calculations required, while not complicated, were easy to get wrong.

Whether or not the attribution would hold up in court, Stanton Glantz expressed some enthusiasm about such a strategy, based on his experience with tobacco litigation. As he put it, "I would be surprised if the industry chose to attack the calculation that one foot of flooding in Key West could be attributed to ExxonMobil. They will not want to argue that you are wrong and they are really only responsible for one half-foot. That is not an argument they want to have." For similar reasons, he said, tobacco companies have never challenged death estimates, noting, "Their PR people tell them not to do that, focusing instead on more general denial and other tactics."

Evidence of Collusion and Prospects for Constructive Engagement

Participants at the workshop also discussed one other aspect of attribution: the close connections among climate change deniers, the fossil fuel industry, and even the tobacco companies. John Mashey, a computer scientist and entrepreneur who has meticulously analyzed climate change deniers, presented a brief overview of some of his research, which traces funding, personnel, and messaging connections between roughly 600 individuals and 100 organizations in the climate change denial camp.¹⁶ Mashey noted that looking closely at the relationships between these parties-via documents, meetings, e-mails, and other sources-can help clarify the extent of collusion involved in sowing confusion on the issue. Mashev cited, for instance, memos that have surfaced from a 1998 "climate denial" plan involving most of the major oil companies (under the auspices of the American Petroleum Institute) that set the

stage for much of the disinformation of the past 10 years.¹⁷

A number of participants ultimately agreed that the various linkages and attribution data could help build a broad public narrative along the following lines:

- We have a serious problem (as shown by the science)
- We know the people responsible are the same ones responsible for a campaign of confusion
- There are solutions, but we can't get to them because of the confusion these companies have funded

Finally, there was some fundamental disagreement over the potential for engagement with the fossil fuel industry. Richard Heede expressed optimism, saying, "I would love to envision constructive engagement with industry. That would mean convincing them to participate in a plan that 'could make life worth living for future generations.'"

Some veterans of the tobacco control campaign voiced skepticism, however. Stanton Glantz recalled two instances in which activists sought engagement with the industry. In one, the National Cancer Institute met with tobacco companies to try to persuade them to make less dangerous cigarettes. "The tobacco companies used it as an opportunity to undertake intelligence gathering about health groups and it was a disaster," he recalled. Glantz did note a fundamental difference between tobacco and climate change, however: while tobacco companies offer no useful product, he explained, "The fact is we do need some form of energy. Unless other alternative energy firms replace the current carbon producers, which seems unlikely, at some point there will likely have to be some kind of positive engagement. Less clear, however, is how best to create a political environment for that engagement to work."

5. Public Opinion and Climate Accountability

The watershed moment was the congressional hearing when the tobacco companies lied and the public knew it. If that had occurred earlier, the public might not have so clearly recognized that the executives were lying. My question is: What do we know about how public opinion changed over time?

-Peter Frumhoff

hroughout several sessions, workshop participants discussed and debated the role of public opinion in both tobacco and climate accountability. It was widely agreed that, in the case of tobacco control, a turning point in public perception came at the 1994 "Waxman hearings" on the regulation of tobacco products.¹⁸ On this highly publicized occasion, a broad swath of the populace became aware that the heads of the major tobacco companies had lied to Congress and the American public. Naomi Oreskes said tobacco litigation helped make this public narrative possible.

Participants grappled with the question of how climate advocates might create a similar narrative for global warming. While there was a good deal of debate about exactly what such a narrative should be, there was widespread agreement that the public is unlikely to be spurred into action to combat global warming on the basis of scientific evidence alone. Furthermore, climate change science is so complex that skeptics within the scientific community can create doubts in the public mind without any assistance from the fossil fuel industry or other climate change deniers.

The Importance of Creating a Public Narrative

Jim Hoggan, a public relations expert and cofounder of DeSmogBlog.com, explained the problem this way: "The public debate about climate change is choked with a smog of misinformation. Denial and bitter adversarial rhetoric are turning the public away from the issue. Communicating into such high levels of public mistrust and disinterest is tricky. We need to do some research into a new narrative." Hoggan emphasized the importance of linking the industry's "unjust misinformation" back to an overall narrative about sustainability, rather than getting mired in issues of whose fault climate change is and who should do what to ameliorate the situation. Noting the fact that there is broad and deep support for clean energy, Hoggan suggested the following narrative: "Coal, oil, and gas companies are engaging in a fraudulent attempt to stop the development of clean energy."

Many participants agreed about the importance of framing a compelling public narrative. Dick Ayres added that the simple act of naming an issue or campaign can be important as well. After acid rain legislation passed in 1990, he recalled, an industry lobbyist told him, "You won this fight 10 years ago when you chose to use the words 'acid rain.'"

Paul Slovic, a psychologist and expert on risk perception, cited his colleague Daniel Kahneman's book *Thinking, Fast and Slow*, which has shown that people often tend to make snap judgments rather than stopping to analyze.¹⁹ Though a degree of slow thinking is necessary to comprehend climate change, he said, people instead tend to go with their quick first impressions.

Having reviewed two boxes of documents obtained from tobacco marketers by the Justice Department for its RICO case against the tobacco companies, Slovic became convinced that the industry was decades ahead of academic psychologists in understanding the interplay of emotion and reason in decision making. The sophistication of the cigarette makers' approach showed, he said, in the effectiveness with which they used images of beautiful people doing exciting things, or words like "natural" and "light" that conveyed health (in response to mounting evidence of smoking's link to lung cancer).

Slovic emphasized that there are huge differences between tobacco and climate risks. "Every hazard is unique, with its own personality, so to speak," he said. "Does it pose a risk to future generations? Does it evoke feelings of dread? Those differences can make an impact on strategy." The feeling of dread, specifically, was an important feature in people's perception of tobacco risks, since they equated smoking with lung cancer. Here is one possibility for a public narrative: "Coal, oil, and gas companies are engaging in a fraudulent attempt to stop the development of clean energy."

—Jim Hoggan

This differs from "doom-and-gloom" discussions about climate change, which can tend to turn people off rather than instilling dread. The difference is that climate change risks seem diffuse-distant in both time and location. The situation is even more complicated, Slovic added, by the fact that when people receive a benefit from an activity, they are more inclined to think the risk that activity carries is low. If they receive little benefit, they tend to think the risk is higher. As he explained, "The activities that contribute to climate change are highly beneficial to us. We love them; we are addicted to them." That, he said, makes the problem of communicating the dangers of climate change all the more difficult.

Reaching People "Where They Live"

Several participants emphasized the phenomenon of cultural cognition, including work on the subject by Dan Kahan at Yale Law School.²⁰ Cultural cognition research suggests that we all carry around with us a vision of a just social order for the world in which we live. Kahan's work identifies a major division between those who tend toward a worldview based on structure and hierarchy, and those who tend toward a worldview based on egalitarianism. Another axis is individualism versus communitarianism (i.e., whether a higher value is placed on the welfare of the individual or the group). In Kahan's conception, all of us have a blend of such attributes. Attitudes on climate change are highly correlated with these views. As a result, it is difficult to change people's views on the issue because, when they receive information, they tend to spin it to reflect their favored worldview. In light of this research, several participants expressed concern that a revelation about documents from oil companies might not work to change many minds, given the power of such pre-existing worldviews.

Brenda Ekwurzel, a climate scientist at the Union of Concerned Scientists (UCS). recounted her organization's experience with this variable, explaining that UCS, as a science-based organization, contends with an "information fire hose" when it comes to climate change. As she put it, "We love data. We scientists tend to focus on the frontal lobe and we need communications folks to remind us that there are other parts of our brain too." She said she always wants to begin a discussion by saying, "Let's talk about climate change." But that, it turns out, is not necessarily the best starting point—she has learned that it's better to start with: "Let's talk about what you care about most." The answer is likely to be family, friends, livelihood, health, and recreation.

Ekwurzel highlighted polling data that have shown some 77 percent of people in Kahan's egalitarian/communitarian sector believe experts agree about climate change,

Every hazard is unique, with its own personality, so to speak. Does it pose a risk to future generations? Does it evoke feelings of dread? Those differences can make an impact on strategy.

—Paul Slovic

while 80 percent of those in the hierarchical/ individualist camp believe experts disagree about climate change. To overcome that barrier, UCS staff responsible for communicating about climate change began experimenting, in one case addressing an issue of great concern to a very specific constituency: the correlation between August high school football practices in Texas and an increase in heat stroke among the student athletes.

This effort, launched to coincide with the first week of football practice in Texas and Oklahoma, proved remarkably successful, Ekwurzel said, drawing local media attention in a region the organization rarely reached. It also encouraged commentary from a different set of voices than those who normally talk about global-warming-related issues, such as medical professionals. It may have been a coincidence, Ekwurzel admitted, but within six weeks of this campaign the state of Texas decided to scale back high school football practices in the summer—and the message about the consequences of warmer summers in the region reached a largely untapped audience for UCS.²¹

Identifying Wrongdoers

Participants at the workshop also discussed the benefits and risks associated with identifying wrongdoers as part of a public narrative. Some participants, such as Paul Slovic, argued that this could prove an effective strategy. Slovic cited research by Roy Baumeister and Brad Bushman suggesting that, when it comes to messages, "bad is stronger than good"—a finding that helps explain the tendency toward negative advertising in political campaigning.²² Claudia Tebaldi said she believed "there is a big difference between convincing people there is a problem and mobilizing them. To mobilize, people often need to be outraged."

On the other hand, several of the public opinion experts cautioned that "argument tends to trigger counter-argument." By contrast, they pointed out, emotional messages don't tend to trigger counter-emotions. "Abuse breeds abuse," explained Dan Yankelovich, cofounder of Public Agenda, a nonpartisan group devoted to public opinion research and citizen education. "In this case, you have industry being abusive. But you do not want to demonize the industry. The objective ought to be to have the public take this issue so seriously that people change their behavior and pressure industry to alter their current practices. In the end, we want industry to be more receptive to this pressure, not less."

For this reason and others, several participants expressed reservations about implementing an overly litigious strategy at this political moment. Perhaps the strongest proponent of this view was Yankelovich, who explained, "I am concerned about so much emphasis on legal strategies. The point of departure is a confused, conflicted, inattentive public. Are legal strategies the most effective strategies? I believe they are important after the public agrees how to feel about an issue. Then you can sew it up legally." In the face of a confused, conflicted, and inattentive public, legal strategies can be a double-edged sword, he continued: "The more adversarial the discourse, the more minds are going to be closed." In response to a comment by Richard Ayres, however, Yankelovich agreed that a legal strategy focused on the industry's disinformation campaign could help advance public opinion on global warming, as it did in the case of tobacco.

Jim Hoggan advised, "It's like that old adage that says, 'Never get into a fight with a pig in public. The pig likes it. You both get dirty. And, after a while, people can't tell the difference.'" I am concerned about so much emphasis on legal strategies. The point of departure is a confused, conflicted, inattentive public. Are legal strategies the most effective strategies? I believe they are important after the public agrees how to feel about an issue. Then you can sew it up legally. Legal strategies themselves are a double-edged sword. The more adversarial the discourse, the more minds are going to be closed.

-Daniel Yankelovich

Dan Yankelovich also described his theory of the "public learning curve," which holds that public opinion moves through three recognizable phases on issues like smoking or climate change. The first is the "consciousness-raising" phase, during which the media can help dramatically to draw attention to an issue. This is followed by the "working-through" phase, during which things bog down as the public struggles over how to adapt to painful, difficult change. Yankelovich noted a paucity of institutions that can help the public work through this phase, which is frequently marked by the kind of denial and wishful thinking recognizable today in public opinion about climate change. He argued that only when the public begins to move into the third phase of "thoughtful public judgment" can legal strategies prove most effective and ultimately produce laws and regulations.

As he explained, "My sense is we are not there yet on climate change. The media has not been a help. The opposition has been successful in throwing sand in the works. People are just beginning to enter the open-minded stage. We are not decades away but I don't have enough empirical data. My sense is that it may take about three to five more years."

The Prospects for a "Dialogic" Approach and Positive Vision

Given the fact that the climate advocacy community has not yet coalesced around a compelling public narrative, Dan Yankelovich suggested that the topic could be a good candidate for engaging in a relatively new public opinion technique known as the "dialogic method," in which representative groups holding different views on a subject meet over the course of a day or more to develop a narrative in an iterative fashion. The benefit of this method, he said, is that climate advocates could essentially work in partnership with the public "by having them help shape a narrative that is compelling."

Yankelovich argued that the narrative must convey deep emotion to cut through the apathy and uncertainty prevalent in public opinion on the issue today, which has made it easier for the fossil fuel industry to sow confusion. In considering these emotional components of the narrative, he noted that anger is likely to be one of the major candidates but there may be others as well, adding that, "The notion of a custodial responsibility and concern also has deep resonance." Finding the right public narrative, Yankelovich suggested, could help accelerate public opinion through the second phase of the curve within the next five years. In one interesting example of mobilizing public opinion on an issue, Mary Christina Wood drew the group's attention to the "victory speakers" campaign in World War II. When the U.S. government was contemplating entering the war, the threat of Nazi Germany seemed too far away to many Americans, who were reluctant to change their lives to mobilize for war. In response, the government orchestrated a campaign in which some 100,000 speakers, including Wood's mother and grandmother, made five speeches each day about the need for U.S. involvement.²³ Wood suggested that the campaign helped mobilize the American people remarkably quickly.

Finally, several participants voiced strong support for the need to create a positive vision as part of the public narrative about climate change. As Naomi Oreskes put it, citing Ted Nordhaus and Michael Schellenberger's article "The Death of Environmentalism," ²⁴ "Martin Luther King did not say, 'I have a nightmare'! King looked at a nightmare but he painted a positive vision. Abolitionists did not say, 'We have to collapse the economy of the South,' even if that is what happened. No one wants to hear you are a bad person or that the way you live is bad." Lew Branscomb concurred, noting that, "There has got to be a future people think is worth struggling for."

6. Conclusion

There was widespread agreement among workshop participants that multiple, complementary strategies will be needed moving forward.

orkshop participants unanimously agreed that the sessions yielded a productive and well-timed interdisciplinary dialogue. Participants from the scientific and legal communities seemed especially appreciative for the opportunity to engage so intensively with experts outside their usual professional circles. The only potential gaps identified by attendees were a lack of participants from the insurance industry and a lack of emphasis on the biotic effects of climate change.

Participants made commitments to continue the discussion and collaborate on a number of the efforts discussed at the meeting. In particular, several participants agreed to work together on some of the attribution work already under way, including efforts to help publicize attribution findings in a way that will be easy for the general public to understand, and build an advocacy component around those findings. Others proposed an informal subgroup to pursue Dan Yankelovich's suggestion of using the dialogic method in conjunction with public relations specialists to help develop an effective public narrative.

Participants also made commitments to try to coordinate future efforts, continue discussing strategies for gaining access to internal documents from the fossil fuel industry and its affiliated climate denial network, and to help build an accessible repository for those documents that are obtained.

Points of Agreement

There was widespread agreement among workshop participants that multiple, complementary strategies will be needed moving forward. For instance, in terms of what the "cancer" analog for global warming might be, participants generally accepted the proposition put forth by Angela Anderson that the answer might differ by region, with sea level rise instilling the most concern on the coasts, and extreme heat proving most compelling in the Midwest. Participants also agreed that it is better to focus on consequences of climate change happening now rather than on those projected for the distant future. Brenda Ekwurzel's anecdote about the public's engagement on the issue of high school football was offered as an example of the power that highlighting such immediate consequences can have.

Equally important was the nearly unanimous agreement on the importance of legal actions, both in wresting potentially useful internal documents from the fossil fuel industry and, more broadly, in maintaining pressure on the industry that could eventually lead to its support for legislative and regulatory responses to global warming. Some participants stated that pressure from the courts offers the best
current hope for gaining the energy industry's cooperation in converting to renewable energy.

Dan Yankelovich expressed a widely held sentiment when he noted what he called "a process of convergence" over the course of the workshop, in which participants with different expertise gradually incorporated broader perspectives on the problem at hand. "I know I found the tobacco example and the range of possible legal strategies very instructive," he said.

Unresolved Issues

Perhaps the largest unresolved issues from the workshop were some disagreement over how adversarial in tone efforts targeting the fossil fuel industry should be, and the extent to which outrage can mobilize the public.

On the latter point, one participant noted, "Outrage is hugely important to generate. Language that holds carbon producers accountable should be an important part of the narrative we create." But a number of participants expressed reservations about any plans that "demonized" the fossil fuel industry.

Myles Allen, for instance, worried that too adversarial a tone "could hand a victory to the 'merchants of doubt." He explained that because the fossil fuel industry's disinformation has effectively muted a large portion of the electorate, "Our focus ought to be to bring as many of these people back to the table and motivate them to act. We need to somehow promote a debate among different parts of the legislature to get this happening."

Lew Branscomb agreed that efforts should not seek to demonize the fossil fuel industry, noting that, "There are a lot of companies in the oil and auto business, and some of the companies will come forward on the good side. We all need their cooperation. My notion is to try to find people in the industry producing It is possible to see glimmers of an emerging consensus on a strategy that incorporates legal action with a narrative that creates public outrage.

carbon who will come around." To accomplish this, he suggested a strategy that emphasizes facts and doesn't impugn motives.

Brenda Ekwurzel lent some historical support to such a view by citing Adam Hochschild's book Bury the Chains, about the long campaign to end slavery. Hochschild noted, she said, that one of the most influential pamphlets published in the abolitionists' fight offered a dispassionate accounting of facts and details about the slave trade gathered from witnesses who had participated in it. This publication had no trace of the moral finger-wagging that had marked virtually all prior pamphlets. Instead, the facts-especially a famous diagram of a slave ship—carried the day and became widely accepted. Women in the United Kingdom, for instance, soon started serving tea using only sugar that had been certified as not having come from the slave trade.²⁵ "Maybe," Ekwurzel suggested, "we need an analogous effort to offer certified energy sources from suppliers who do not spread disinformation."

Mike MacCracken supported the need to "win the middle." As he noted, "We have had an international consensus of scientists agreeing to key facts since 1990."

Angela Anderson said she hoped UCS could contribute meaningfully to the public's "working-through" stage of the process outlined by Dan Yankelovich. She noted that local climate adaptation stories offer a way to sidestep the controversy, but acknowledged that it is still an open question whether this strategy helps people work through the issue and ultimately accept climate science as fact. "This is our theory," she said, "But we don't have the research yet to prove this." Anderson added that many people expect UCS, as a science-based organization, to correct misinformation about climate science. "I don't want to abdicate that responsibility," she said, "and I wrestle with this, wondering what is the most effective order in which to do things and the right tone?" While many questions like these remain unresolved, the workshop made an important contribution to the quest for answers. And it is possible to see glimmers of an emerging consensus on a strategy that incorporates legal action (for document procurement and accountability) with a narrative that creates public outrage—not to demonize industry, but to illuminate the collusion and fraudulent activities that prevent us from building the sustainable future we need and our children deserve.

Endnotes

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Appendix A: Workshop Agenda

Climate Accountability, Public Opinion, and Legal Strategies

Martin Johnson House, Scripps Institution of Oceanography, La Jolla, CA June 14–15, 2012

Workshop Goals

- Compare the evolution of public attitudes and legal strategies for tobacco control and anthropogenic climate change. Can we use the lessons from tobacco education, laws, and litigation to address climate change?
- Explore which impacts can be most compellingly attributed to climate change, both scientifically and in the public mind, and consider options for communicating the scientific understanding of attribution in ways most useful to inform both public understanding and mitigation strategies.
- Explore the degree to which public (including judge and jury) acceptance of the causal relationships of climate impacts to fossil fuel production and/or emissions would increase the prospects for an effective strategy for U.S.-focused climate mitigation.
- Consider the viability of diverse strategies, including the legal merits of targeting carbon producers—as opposed to carbon emitters—for U.S.-focused climate mitigation.
- Identify promising legal and other options and scope out the development of mutually reinforcing intellectual, legal, and/or public strategies to further them.

June 14, 2012

7:45 a.m.	Meet in La Jolla Shores Hotel lobby for shuttle to workshop venue
8:00 a.m.	Coffee, light breakfast
8:30 a.m.	Welcome and charge to participants
9:00 a.m.	Session 1. The Lay of the Land: Key Issues and Concepts
	Five presentations @ five minutes each, with limit of one image/visual aid; followed by moderated discussion
	Proctor: A brief history of the tobacco wars: epidemiology, "doubt is our product," litigation and other strategies
	Allen: Climate science and attribution
	Heede: Attribution of emissions to carbon producers
	Pawa: The legal landscape: fundamentals of law, climate change, damages, plaintiffs, and defendants
	Slovic: Public opinion and risk perception on tobacco and climate
10:30 a.m.	Break
11:00 a.m.	Session 2. Lessons From Tobacco Control: Legal and Public Strategies
	Three presentations @ seven minutes each, with limit of one image/visual aid; followed by moderated discussion
	Sharon Eubanks, Stanton Glantz, Robert Proctor, Roberta Walburn: Litigation, media strategies, coordination with grassroots efforts, etc.
	Key issue: What lessons can we draw from the history of public and legal strategies for controlling tobacco that might be applicable to address climate change?
12:30 p.m.	Lunch
1:30 p.m.	Session 3. Attribution of Impacts and Associated Damages to Carbon and Climate Change: State of the Science and Expert Judgment
	Two presentations @ less than 10 minutes each; followed by moderated discussion
	On science: Myles Allen and Claudia Tebaldi
	Lead discussant: Mike MacCracken
	Key issue: What impacts can be most compellingly attributed to carbon and climate change?
3:00 p.m.	Break
3:15 p.m.	Session 4. Climate Legal Strategies: Options and Prospects
	Three presentations @ seven minutes each; followed by moderated discussion
	Presenters: Matt Pawa, Mims Wood, Richard Ayres
	Key issues: What potential options for U.Sfocused climate litigation appear most promising? To what extent would greater public (including judge and jury) acceptance of the causal relationships of climate impacts to fossil fuel production and/or emissions enhance the prospects for success?

5:00 p.m.	Wrap up
	Shuttle service will be provided for the return trip to the hotel
6:30 p.m.	Drinks and dinner at the home of Lew and Connie Branscomb
	Shuttle will be provided from La Jolla Shores Hotel

June 15, 2012		
7:45 a.m.	Meet in La Jolla Shores Hotel lobby for shuttle to workshop venue	
8:00 a.m.	Coffee, light breakfast	
8:30 a.m.	Session 5. Attribution of Emissions to Carbon Producers	
	Presentation @ 10 minutes; followed by moderated discussion	
	Heede: Carbon majors analysis	
	Lead discussant: Matt Pawa	
	Key issue: Can new analyses increase the prospect for holding major carbon producers legally and publicly accountable?	
9:30 a.m.	Session 6. Innovative Strategies for Climate Accountability	
	One to two presentations @ seven minutes each; followed by moderated discussion	
	Jim Hoggan, John Mashey	
	Key issues: What potential options for U.Sfocused climate litigation appear most promising? To what extent would greater public (including judge and jury) acceptance of the causal relationships of climate impacts to fossil fuel production and/or emissions enhance the prospects for success? What types of non-litigation public pressure might enhance their prospects for success?	
11:00 a.m.	Break	
11:15 a.m.	Session 7. Public Opinion and Climate Accountability	
	Moderated discussion drawing from key perspectives in public opinion	
	Speakers: Dan Yankelovich, Paul Slovic, Brenda Ekwurzel	
	Key issues: What is the role of public opinion in climate accountability?	
12:45 p.m.	Lunch	
2:00 p.m.	Session 8. Discussion, outcomes, next steps	
4:00 p.m.	Wrap up	
	Shuttle service will be provided for the return trip to the hotel	
7:30 p.m.	Drinks and dinner at La Jolla Shores Hotel restaurant	

Appendix B: Participants

Climate Accountability, Public Opinion, and Legal Strategies Workshop

June 14-15, 2012

Workshop Organizers

Naomi Oreskes

Professor of History and Science Studies, University of California–San Diego Adjunct Professor of Geosciences, Scripps Institution of Oceanography

Peter C. Frumhoff Director of Science and Policy, Union of Concerned Scientists Cambridge, MA

Richard (Rick) Heede Principal, Climate Mitigation Services Co-Founder and Director, Climate Accountability Institute Snowmass, CO

Lewis M. Branscomb Aetna Professor of Public Policy and Corporate Management (emeritus), John F. Kennedy School of Government, Harvard University

Angela Ledford Anderson Director, Climate and Energy Program, Union of Concerned Scientists Washington, DC

Workshop Participants

Myles Allen Professor of Geosystem Science, School of Geography & the Environment, University of Oxford Environmental Change Institute, Oxford University Centre for the Environment

Richard (Dick) E. Ayres Attorney, The Ayres Law Group Washington, DC

Brenda Ekwurzel *Climate Scientist and Assistant Director of Climate Research and Analysis, Union of Concerned Scientists Washington, DC*

Sharon Y. Eubanks Advocates for Justice, Chartered PC Senior Counsel, Sanford Wittels & Heisler, LLP Washington, DC

Stanton A. Glantz Professor of Medicine, University of California–San Francisco University of California Center for Tobacco Control Research & Education James (Jim) Hoggan President, Hoggan & Associates Vancouver, BC

Michael (Mike) MacCracken Chief Scientist for Climate Change Programs, Climate Institute Washington, DC

John Mashey Techviser Portola Valley, CA

Joseph (Joe) Mendelson III Director of Policy, Climate and Energy Program, National Wildlife Federation Washington, DC

Matt Pawa President, Pawa Law Group, PC Founder, The Global Warming Legal Action Project Newton Centre, MA

Robert N. Proctor Professor of the History of Science, Stanford University

Paul Slovic Founder and President, Decision Research Eugene, OR Claudia Tebaldi Research Scientist, Climate Central Boulder, CO

Jasper Teulings General Counsel/Advocaat, Greenpeace International Amsterdam

Roberta Walburn Attorney Minneapolis, MN

Mary Christina Wood Philip H. Knight Professor and Faculty Director, Environmental and Natural Resources Law Program, University of Oregon School of Law

Daniel (Dan) Yankelovich Chair and Co-Founder, Public Agenda San Diego, CA

Rapporteur

Seth Shulman Senior Staff Writer, Union of Concerned Scientists Cambridge, MA



Pictured (L to R): Stanton Glantz, Richard Heede, Roberta Walburn (obscured), James Hoggan, Sharon Eubanks, Peter Frumhoff, Richard Ayres (obscured), Angela Anderson, Mary Christina Wood, Lewis Branscomb, Claudia Tebaldi, Brenda Ekwurzel, Naomi Oreskes, Robert Proctor (obscured), Joseph Mendelson, Seth Shulman, John Mashey (obscured), Myles Allen, Alison Kruger, Michael MacCracken. Not pictured: Matt Pawa, Paul Slovic, Jasper Teulings, Daniel Yankelovich.



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Exhibit 2

From: Kenny Bruno <kenny.bruno@verizon.net> Date: Tue, Jan 5, 2016 at 4:42 PM Subject: Exxon meeting DRAFT Agenda and logistics To: Lee Wasserman <lwasserman@rffund.org>, Bill McKibben

bill.mckibben@gmail.com>, Jamie Henn <jamie@350.org>, Rob Weissman <rweissman@citizen.org>, Bill Lipton <blipton@workingfamilies.org>, Dan Cantor <dcantor@workingfamilies.org>, John Passacantando <j.passacantando@gmail.com>, Kert Davies <kertmail@gmail.com>, won@ef.org, SEubanks@bordaslaw.com, ikrarup@vkrf.org, mp@pawalaw.com, bcampbell@clf.org, Stephen Kretzmann <<u>steve@priceofoil.org</u>>, Carroll Muffett <<u>cmuffett@ciel.org</u>>, Naomi Ages <naomi.ages@greenpeace.org>

Dear All,

If you are receiving this message then we believe you are attending the meeting this coming Friday Jan 8 regarding Exxon. The meeting will take place at: **Rockefeller Family Fund** 475 Riverside Dr entrance on Claremont @ 120th St. in Upper Manhattan, 1 Train to 116th St. from Penn Station Please confirm whether you are attending in person (preferred, of course!) or remotely. If remotely see instructions below. Here is a DRAFT Agenda, your suggestions are welcome.

DRAFT Agenda

Exxon: Revelations & Opportunities Friday January 8 11 AM - 3 PM 475 Riverside Dr @ 120th ST Manhattan 10:45: Arrival and Coffee 11:00 – 11:15 Introductions and purpose of the meeting (Lee) 11:15-12:00 - Goals of an Exxon campaign What are our common goals? Examples include:

- To establish in public's mind that Exxon is a corrupt institution that has pushed humanity (and all creation) toward climate chaos and grave harm.
- To delegitimize them as a political actor
- To force officials to disassociate themselves from Exxon, their money, and their historic opposition to climate progress, for example by refusing campaign donations, refusing to take meetings, calling for a price on
- To call into question climate advantages of fracking, compared to coal.
- To drive divestment from Exxon.
- To drive Exxon & climate into center of 2016 election cycle. 0

Exhibit 3

Dear All,

If you are receiving this message then we believe you are attending the meeting this coming Friday Jan 8 regarding Exxon. The meeting will take place at: Rockefeller Family Fund 475 Riverside Dr entrance on Claremont @ 120th St. in Upper Manhattan, 1 Train to 116th St. from Penn Station Please confirm whether you are attending in person (preferred, of course!) or remotely. If remotely see instructions below. Here is a DRAFT Agenda, your suggestions are welcome.

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- To delegitimize them as a political actor
 - To force officials to disassociate themselves from Exxon, their money, and their historic opposition to climate progress, for example by refusing campaign donations, refusing to take meetings, calling for a price on carbon, etc.
 - To call into question climate advantages of fracking, compared to coal.
 - To drive divestment from Exxon.
 - To drive Exxon & climate into center of 2016 election cycle.

Other goals?

12:00 - 1:00 Legal Status and prospects

What are the main avenues for legal actions & related campaigns?

-AGs

- -DOJ
- -Torts
- -International

-Other

Which of these has the best prospects for successful action? For getting discovery? For creating scandal? Shortest time line? Do we know which offices may already be considering action and how we can best engage to convince them to proceed?

1:00 - 1:30 LUNCH

1:30 - 2:00 Coordination

Does this group want to establish a rapid response and coordination structure to react to new research, revelations and legal developments as they happen? A higher level of coordination with a war room, joint social media, and

coordinated organizing and media pushes?

Who else should be asked to participate?

Do we need a single facilitator or small group unit?

2:00 – 3:00 Other considerations and next steps

-To what extent do we focus on Exxon and to what extent other oil companies?
- How to include (or not) industry associations, scientists and front groups?
-What is best way to follow up with you about how your organization wants to

and can engage in this campaign?

-What are the next steps?

3:00 Adjourn

Exhibit 4

AG Schneiderman: Thank you, good morning. I'm New York's Attorney General, Eric Schneiderman. I thank you for joining us here today for what we believe and hope will mark a significant milestone in our collective efforts to deal with the problem of climate change and put our heads together and put our offices together to try and take the most coordinated approach yet undertaken by states to deal with this most pressing issue of our time. I want to thank my coconvener of the conference, Vermont Attorney General, William Sorrell, who has been helping in joining us here and been instrumental in making today's events possible, and my fellow attorneys general for making the trip to New York for this announcement. Many of them had been working for years on different aspects of this problem to try and preserve our planet and reduce the carbon emissions that threaten all of the people we represent. And I'm very proud to be here today with Attorney General George Jepsen of Connecticut, Attorney General Brian Frosh of Maryland, Attorney General Maura Healey of Massachusetts, Attorney General Mark Herring of Virginia, and Attorney General Claude Walker of the U.S. Virgin Islands.

> We also have staff representing other attorneys general from across the country, including: Attorney General Kamala Harris of California, Matt Denn of Delaware, Karl Racine of the District of Columbia, Lisa Madigan of Illinois, Tom Miller of Iowa, Janet Mills of Maine, Lori Swanson of Minnesota, Hector Balderas of New Mexico, Ellen Rosenblum of Oregon, Peter Kilmartin of Rhode Island and Bob Ferguson of Washington.

> And finally, I want to extend my severe thanks to Vice President Al Gore for joining us. It has been almost ten years since he galvanized the world's attention on climate change with his documentary *An Inconvenient Truth*.

> And, I think it's fair to say that no one in American public life either during or beyond their time in elective office has done more to elevate the debate about climate change or to expand global awareness about the urgency of the need for collective action on

^{*} The following transcript of the AGs United For Clean Power Press Conference, held on March 29, 2016, was prepared by counsel based on a video recording of the event, which is available at http://www.ag.ny.gov/press-release/ag-schneiderman-former-vice-president-al-gore-and-coalitionattorneys-general-across.

climate change than Vice President Gore. So it's truly an honor to have you here with us today.

So we've gathered here today for a conference - the first of its kind conference of attorneys general dedicated to coming up with creative ways to enforce laws being flouted by the fossil fuel industry and their allies in their short-sighted efforts to put profits above the interests of the American people and the integrity of our financial markets. This conference reflects our commitment to work together in what is really an unprecedented multi-state effort in the area of climate change. Now, we have worked together on many matters before and I am pleased to announce that many of the folks represented here were on the Amicus Brief we submitted to the United States Supreme Court in the Friedrichs v. California Teachers Association case. We just got the ruling that there was a four-four split so that the American labor movement survives to fight another day. And thanks, thanks to all for that effort and collaboration. It shows what we can do if we work together. And today we are here spending a day to ensure that this most important issue facing all of us, the future of our planet, is addressed by a collective of states working as creatively, collaboratively and aggressively as possible.

The group here was really formed when some of us came together to defend the EPA's Clean Power Plan, the new rules on greenhouse gases. And today also marks the day that our coalition is filing our brief in the Court of Appeals for the District of Columbia. In that important matter we were defending the EPA's rules. There is a coalition of other states on the other side trying to strike down the rules, but the group that started out in that matter together was 18 states and the District of Columbia. We call ourselves The Green 19, but now that Attorney General Walker of the Virgin Islands has joined us our rhyme scheme is blown. We can't be called The Green 19, so now we're The Green 20. We'll come up with a better name at some point.

But, ladies and gentlemen, we are here for a very simple reason. We have heard the scientists. We know what's happening to the planet. There is no dispute but there is confusion, and confusion sowed by those with an interest in profiting from the confusion and creating misperceptions in the eyes of the American public that really need to be cleared up. The U.S. Defense Department, no radical agency, recently called climate change an urgent and

growing threat to our national security. We know that last month, February, was the furthest above normal for any month in history since 1880 when they started keeping meteorological records. The facts are evident. This is not a problem ten years or twenty years in the future. [There are] people in New York who saw what happened with the additional storm surge with Super Storm Sandy. We know the water level in New York Harbor is almost a foot higher than it was. The New York State Department of Environmental Conservation, not some radical agency, predicts that if we continue at this pace, we'll have another 1.5 feet of water in New York Harbor. It'll go up by that much in 2050. So today, in the face of the gridlock in Washington, we are assembling a group of state actors to send the message that we are prepared to step into this breach. And one thing we hope all reasonable people can agree on is that every fossil fuel company has a responsibility to be honest with its investors and with the public about the financial and market risks posed by climate change. These are cornerstones of our securities and consumer protection laws.

My office reached a settlement last year based on the enforcement of New York securities laws with Peabody Energy. And they agreed to rewrite their financials because they had been misleading investors and the public about the threat to their own business plan and about the fact that they had very detailed analysis telling them how the price of coal would be going down in the face of actions taken by governments around the world. But they were hiding it from their investors. So they agreed to revise all of their filings with the SEC. And the same week we announced that, we announced that we had served a subpoena on ExxonMobil pursuing that and other theories relating to consumer and securities fraud. So we know, because of what's already out there in the public, that there are companies using the best climate science. They are using the best climate models so that when they spend shareholder dollars to raise their oil rigs, which they are doing, they know how fast the sea level is rising. Then they are drilling in places in the Arctic where they couldn't drill 20 years ago because of the ice sheets. They know how fast the ice sheets are receding. And yet they have told the public for years that there were no "competent models," was the specific term used by an Exxon executive not so long ago, no competent models to project climate patterns, including those in the Arctic. And we know that they paid millions of dollars to support organizations that put out propaganda denying that we can predict or measure the effects of

fossil fuel on our climate, or even denying that climate change was happening.

There have been those who have raised the question: aren't you interfering with people's First Amendment rights? The First Amendment, ladies and gentlemen, does not give you the right to commit fraud. And we are law enforcement officers, all of us do work, every attorney general does work on fraud cases. And we are pursuing this as we would any other fraud matter. You have to tell the truth. You can't make misrepresentations of the kinds we've seen here.

And the scope of the problem we're facing, the size of the corporate entities and their alliances and trade associations and other groups is massive and it requires a multi-state effort. So I am very honored that my colleagues are here today assembling with us. We know that in Washington there are good people who want to do the right thing on climate change but everyone from President Obama on down is under a relentless assault from well-funded, highly aggressive and morally vacant forces that are trying to block every step by the federal government to take meaningful action. So today, we're sending a message that, at least some of us – actually a lot of us – in state government are prepared to step into this battle with an unprecedented level of commitment and coordination.

And I now want to turn it over to my great colleague, the coconvener of this conference, Vermont Attorney General William Sorrell.

AG Sorrell: I am pleased that the small state of Vermont joins with the big state of New York and are working together to make this gathering today a reality. Truth is that states, large and small, have critical roles to play in addressing environmental quality issues. General Schneiderman has mentioned our filing today in the D.C. Circuit on the Clean Power Plan case. Going back some time, many of the states represented here joined with the federal government suing American Electric Power Company, the company operating several coal-fired electric plants in the Midwest and largely responsible for our acid rain and other air quality issues in the eastern part of the United States, ultimately resulting in what I believe to date is the largest settlement in an environmental case in our country's history. With help from a number of these states, we successfully litigated Vermont's adoption of the so-called California standard

for auto emissions in federal court in Vermont, now the standard in the country. And right down to the present day, virtually all of the states represented today are involved in looking at the alleged actions by Volkswagen and the issues relating to emissions from tens of thousands of their diesel automobiles.

But today we're talking about climate change which I don't think there's any doubt, at least in our ranks, is the environmental issue of our times. And in order for us to effectively address this issue, it's going to take literally millions of decisions and actions by countries, by states, by communities and by individuals. And, just very briefly, Vermont is stepping up and doing its part. Our legislature has set goals of 75% reduction – looking from a 1990 base line – a 75% reduction in greenhouse gas emissions by 2050. Similarly, our electric utilities have a goal of 75% use of renewable energy sources by 2032. So, we've been doing our part. Our presence here today is to pledge to continue to do our part. I'm mindful of the fact that I'm between you and the real rock star on this issue, and so I'm going to turn it back to General Schneiderman to introduce the next speaker.

AG Schneiderman: Thank you. Thank you. I'm not really a rock star.

[Laughter]

Thank you Bill. It's always a pleasure to have someone here from a state whose U.S. senator is from Brooklyn.

[Laughter]

And doing pretty well for himself. So, Vice President Gore has a very busy schedule. He has been traveling internationally, raising the alarm but also training climate change activists. He rearranged his schedule so he could be here with us to day to meet with my colleagues and I. And there is no one who has done more for this cause, and it is a great pleasure to have him standing shoulder to shoulder with us as we embark on this new round in what we hope will be the beginning of the end of our addiction to fossil fuel and our degradation of the planet. Vice President Al Gore.

VP Gore: Thank you very much, Eric. Thank you. Thank you very much.

[Applause]

Thank you very much, Attorney General Schneiderman. It really and truly is an honor for me to join you and your colleagues here, Bill Sorrell of Vermont, Maura Healey of Massachusetts, Brian Frosh of Maryland, Mark Herring of Virginia, George Jepsen of [Connecticut] and Claude Walker from the U.S. Virgin Islands, and the ten (let's see 1, 2, 3, 4, 5) how many other – ten other states . . . eleven other state attorneys general offices that were represented in the meetings that took place earlier, prior to this press conference.

I really believe that years from now this convening by Attorney General Eric Schneiderman and his colleagues here today may well be looked back upon as a real turning point in the effort to hold to account those commercial interests that have been – according to the best available evidence – deceiving the American people, communicating in a fraudulent way, both about the reality of the climate crisis and the dangers it poses to all of us. And committing fraud in their communications about the viability of renewable energy and efficiency and energy storage that together are posing this great competitive challenge to the long reliance on carbon-based fuels. So, I congratulate you, Attorney General, and all of you, and to those attorneys general who were so impressively represented in the meetings here. This is really, really important.

I am a fan of what President Obama has been doing, particularly in his second term on the climate crisis. But it's important to recognize that in the federal system, the Congress has been sharply constraining the ability of the executive branch to fully perform its obligations under the Constitution to protect the American people against the kind of fraud that the evidence suggests is being committed by several of the fossil fuel companies, electric utilities, burning coal, and the like. So what these attorneys general are doing is exceptionally important. I remember very well – and I'm not going to dwell on this analogy - but I remember very well from my days in the House and Senate and the White House the long struggle against the fraudulent activities of the tobacco companies trying to keep Americans addicted to the deadly habit of smoking cigarettes and committing fraud to try to constantly hook each new generation of children to replenish their stock of customers who were dying off from smoking-related diseases. And it was a combined effort of the executive branch, and I'm proud that the Clinton-Gore administration played a role in that, but it was a combined effort in which the state attorneys general

played the crucial role in securing an historic victory for public health. From the time the tobacco companies were first found out, as evidenced by the historic attorney generals' report of 1964, it took 40 years for them to be held to account under the law. We do not have 40 years to continue suffering the consequences of the fraud allegedly being committed by the fossil fuel companies where climate change is concerned.

In brief, there are only three questions left to be answered about the climate crisis. The first one is: Must we change, do we really have to change? We rely on fossil fuels for more than 80% of all the energy our world uses. In burning it we've reduced poverty and raised standards of living and built this elaborate global civilization, and it looks like it'll be hard to change. So naturally, people wonder: Do we really have to change? The scientific community has been all but unanimous for a long time now. But now mother nature and the laws of physics – harder to ignore than scientists – are making it abundantly clear that we have to change. We're putting 110 million tons of man-made heat trapping global warming pollution into the thin shell of atmosphere surrounding our planet every day, as if it's an open sewer. And the cumulative amount of that man-made global warming pollution now traps as much extra heat energy in the earth's system as would be released by 400,000 Hiroshima-class atomic bombs exploding every 24 hours on the surface of our planet.

It's a big planet, but that's a lot of energy. And it is the reason why temperatures are breaking records almost every year now. 2015 was the hottest year measured since instruments had been used to measure temperature. 2014 was the second hottest. 14 of the 15 hottest have been in the last 15 years. As the Attorney General mentioned, February continues the trend by breaking all previous records - the hottest in 1,632 months ever measured. Last December 29th, the same unnatural global warming fuel storm system that created record floods in the Midwest went on up to the Arctic and on December 29th, smack in the middle of the polar winter night at the North Pole, temperatures were driven up 50 degrees above the freezing point. So the North Pole started thawing in the middle of the winter night. Yesterday the announcement came that it's the smallest winter extent of ice ever measured in the Arctic.

Ninety-three percent of the extra heat goes into the oceans of the world, and that has consequences. When Super Storm Sandy headed across the Atlantic toward this city, it crossed areas of the Atlantic that were nine degrees Fahrenheit warmer than normal and that's what made that storm so devastating. The sea level had already come up because of the ice melting, principally off Greenland and Antarctica. And as the Attorney General mentioned, that's a process now accelerating. But these ocean-based storms are breaking records now. I just came from the Philippines where Super Typhoon Haiyon created 4 million homeless people when it crossed much warmer waters of the Pacific. By the way, it was a long plane flight to get here and I happened to get, just before we took off, the 200-page brief that you all filed in support of the Clean Power Plan. Really excellent work. Footnotes took up a lot of those 200 pages so I'm not claiming to [have] read all 200 of them.

The same extra heat in the oceans is disrupting the water cycle. We all learned in school that the water vapor comes off the oceans and falls as rain or snow over the land and then rushes back to the That natural life-giving process is being massively ocean. disrupted because the warmer oceans put a lot more water vapor up there. And when storm conditions present themselves they, these storms will reach out thousands of kilometers to funnel all that extra humidity and water vapor into these massive record-breaking downpours. And occasionally it creates a snowpocalypse or snowmaggedon but most often, record-breaking floods. We've had seven once-in-a-thousand-year floods in the last ten years in the U.S. Just last week in Louisiana and Arkansas, two feet of rain in four days coming again with what they call the Maya Express off the oceans. And the same extra heat that's creating these record-breaking floods also pull the soil moisture out of the land and create these longer and deeper droughts all around the world on every continent.

Every night on the news now it's like a nature hike through the Book of Revelation. And we're seeing tropical diseases moving to higher latitudes – the Zika virus. Of course the transportation revolution has a lot to do with the spread of Zika and Dengue Fever and Chikungunya and diseases I've never heard of when I was growing up and maybe, probably most of you never did either. But now, they're moving and taking root in the United States. Puerto Rico is part of the United States, by the way – not a state,

but part of our nation. Fifty percent of the people in Puerto Rico are estimated to get the Zika virus this year. By next year, eighty percent. When people who are part of the U.S. territory, when women are advised not to get pregnant, that's something new that ought to capture our attention. And in large areas of Central America and South America, women are advised now not to get pregnant for two years until they try to get this brand new viral disease under control.

The list of the consequences continues, and I'm not going to go through it all, but the answer to that first question: "Do we have to change?" is clearly now to any reasonable thinking person: "yes, we have to change." Now the second question is: "Can we change?" And for quite a few years, I will confess to you that, when I answered that question yes, it was based on the projections of scientists and technologists who said, just wait. We're seeing these exponential curves just begin, solar is going to win, wind power is going to get way cheaper, batteries are going to have their day, we're going to see much better efficiency. Well now we're seeing these exponential curves really shoot up dramatically. Almost 75% of all the new investment in the U.S. in new generating capacity last year was in solar and wind - more than half worldwide. We're seeing coal companies go bankrupt on a regular basis now. Australia is the biggest coal exporter in the world. They've just, just the analysis there, they're not going to build any more coal plants because solar and wind are so cheap. And we're seeing this happen all around the world. But, there is an effort in the U.S. to slow this down and to bring it to a halt because part of the group that, again according to the best available evidence, has been committing fraud in trying to convince people that the climate crisis is not real, are now trying to convince people that renewable energy is not a viable option. And, worse than that, they're using their combined political and lobbying efforts to put taxes on solar panels and jigger with the laws to require that installers have to know the serial number of every single part that they're using to put on a rooftop of somebody's house, and a whole series of other phony requirements, unneeded requirements, that are simply for the purpose of trying to slow down this renewable revolution. In the opinion of many who have looked at this pattern of misbehavior and what certainly looks like fraud, they are violating the law. If the Congress would actually work our democracy's been hacked, and that's another story, not the subject of this press conference - but if the Congress really would

allow the executive branch of the federal government to work, then maybe this would be taken care of at the federal level. But these brave men and women, who are the attorneys general of the states represented in this historic coalition, are doing their job and – just as many of them did in the tobacco example – they are now giving us real hope that the answer to that third question: "Will we change?" is going to be "yes." Because those who are using unfair and illegal means to try to prevent the change are likely now, finally, at long last, to be held to account. And that will remove the last barriers to allow the American people to move forward and to redeem the promise of our president and our country in the historic meeting in Paris last December where the United States led the global coalition to form the first global agreement that is truly comprehensive. If the United States were to falter and stop leading the way, then there would be no other leader for the global effort to solve this crisis. By taking the action these attorneys general are taking today, it is the best, most hopeful step I can remember in a long time – that we will make the changes that are necessary.

So, I'll conclude my part in this by, once again, saying congratulations to these public servants for the historic step they are taking today. And on behalf of many people, who I think would say it's alright for me to speak for them, I'd like to say thank you.

- AG Schneiderman: Thank you very much, and now my other colleagues are going to say a few words. For whatever reason, I've gotten into the habit, since we always seem to do this, we do this in alphabetical order by state, which I learned when I first became an AG but I guess we'll stick with it. Connecticut Attorney General George Jepsen who was our partner in the *Friedrichs* case and stood with me when we announced that we were filing in that case. We've done a lot of good work together. Attorney General Jepsen.
- AG Jepsen: I'd like to thank Eric and Bill for their leadership on this important issue and in convening this conference and to recognize the man who has done more to make global warming an international issue than anybody on the entire planet – Vice President Al Gore. In the backdrop, in the backdrop of a very dysfunctional Congress, state attorneys general, frequently on a bipartisan, basis have shown that we can stand up and take action where others have not. The Vice President referenced the tobacco litigation, which was before my time but hugely important in setting the tone and the structures by

which we do work together. Since becoming attorney general in 2011, we've taken on the big banks and their mortgage servicing issues, a \$25 billion settlement. We've taken on Wall Street's Standard & Poor's for mislabeling mortgage-backed securities – as a 20-state coalition – mislabeling mortgage-backed securities as AAA when in fact they were junk. Working together on data privacy issues, and now it's time that we stand up once again and take on what is the most important issue of our generation. We owe it to our children, our children's children, to step up and do the right thing, to work together and I'm committed to it. Thank you.

- AG Schneiderman: Thank you. And now a relatively new colleague but someone who has brought incredible energy to this fight and who we look forward to working with on this and other matters for a long time to come. Maryland Attorney General Brian Frosh.
- AG Frosh: Well, first thank you again to General Schneiderman and General Sorrell for putting together this group and it's an honor to be with you, Mr. Vice President. Thank you so much for your leadership. I'm afraid we may have reached that point in the press conference where everything that needs to be said has been said, but everyone who needs to say it hasn't said it yet.

[Laughter]

So, I will try to be brief. Climate change is an existential threat to everybody on the planet. Maryland is exceptionally vulnerable to The Chesapeake Bay bisects our state. It defines us it. geographically, culturally, historically. We have as much tidal shoreline as states as large as California. We have islands in the Chesapeake Bay that are disappearing. We have our capital, Annapolis, which is also the nuisance flood capital of the United It's under water way, way, way too often. States. It's extraordinarily important that we address the problem of climate change. I'm grateful to General Sorrell and General Schneiderman for putting together this coalition of the willing. I'm proud to be a part of it in addressing and supporting the President's Clean Power Plan. What we want from ExxonMobil and Peabody and ALEC is very simple. We want them to tell the truth. We want them to tell the truth so that we can get down to the business of stopping climate change and of healing the world. I think that as attorneys general, as the Vice President said, we have a unique ability to help bring that about and I'm very glad to be part of it.

- AG Schneiderman: Thank you. And, another great colleague, who has done extraordinary work before and since becoming attorney general working with our office on incredibly important civil rights issues, financial fraud issues, Massachusetts Attorney General Maura Healey.
- AG Healey: Thank you very much General Schneiderman. Thank you General Schneiderman and General Sorrell for your leadership on this issue. It's an honor for me to be able to stand here today with you, with our colleagues and certainly with the Vice President who, today, I think, put most eloquently just how important this is, this commitment that we make. Thank you for your leadership. Thank you for your continuing education. Thank you for your inspiration and your affirmation.

You know, as attorneys general, we have a lot on our plates: addressing the epidemics of opiate abuse, gun violence, protecting the economic security and well-being of families across this country; all of these issues are so important. But make no mistake about it, in my view, there's nothing we need to worry about more than climate change. It's incredibly serious when you think about the human and the economic consequences and indeed the fact that this threatens the very existence of our planet. Nothing is more important. Not only must we act, we have a moral obligation to act. That is why we are here today.

The science – we do believe in science; we're lawyers, we believe in facts, we believe in information, and as was said, this is about facts and information and transparency. We know from the science and we know from experience the very real consequences of our failure to address this issue. Climate change is and has been for many years a matter of extreme urgency, but, unfortunately, it is only recently that this problem has begun to be met with equally urgent action. Part of the problem has been one of public perception, and it appears, certainly, that certain companies, certain industries, may not have told the whole story, leading many to doubt whether climate change is real and to misunderstand and misapprehend the catastrophic nature of its impacts. Fossil fuel companies that deceived investors and consumers about the dangers of climate change should be, must be, held accountable. That's why I, too, have joined in investigating the practices of ExxonMobil. We can all see today the troubling disconnect between what Exxon knew, what industry folks knew, and what

the company and industry chose to share with investors and with the American public.

We are here before you, all committed to combating climate change and to holding accountable those who have misled the public. The states represented here today have long been working hard to sound the alarm, to put smart policies in place, to speed our transition to a clean energy future, and to stop power plants from emitting millions of tons of dangerous global warming pollution into our air. I will tell you, in Massachusetts that's been a very good thing. Our economy has grown while we've reduced greenhouse gas emissions and boosted clean power and efficiency. We're home to a state with an \$11 billion clean energy industry that employs nearly 100,000 people. Last year clean energy accounted for 15% of New England's power production. Our energy efficiency programs have delivered \$12.5 billion in benefits since 2008 and are expected to provide another \$8 billion over the next three years. For the past five years, Massachusetts has also been ranked number one in the country for energy efficiency. So we know what's possible. We know what progress looks like. But none of us can do it alone. That's why we're here today. We have much work to do, but when we act and we act together, we know we can accomplish much. By quick, aggressive action, educating the public, holding accountable those who have needed to be held accountable for far too long, I know we will do what we need to do to address climate change and to work for a better future. So, I thank AG Schneiderman for gathering us here today and for my fellow attorneys general in their continued effort in this important fight. Thank you.

- AG Schneiderman: Thank you. And now another great colleague who speaks as eloquently as anyone I've heard about what's happening to his state, and a true hero of standing up in a place where maybe it's not quite as politically easy as it is to do it in Manhattan but someone who is a true aggressive progressive and a great attorney general, Mark Herring from Virginia.
- AG Herring: Thank you, Eric. Good afternoon. In Virginia, climate change isn't some theoretical issue. It's real and we are already dealing with its consequences. Hampton Roads, which is a coastal region in Virginia, is our second most populated region, our second biggest economy and the country's second most vulnerable area as sea levels rise. The area has the tenth most valuable assets in the

world threatened by sea level rise. In the last 85 years the relative sea level in Hampton Roads has risen 14 inches – that's well over a foot – in just the last century.

Some projections say that we can expect an additional two to five feet of relative sea level rise by the end of this century – and that would literally change the face of our state. It would cripple our economy and it could threaten our national security as Norfolk Naval, the world's largest naval base, is impacted. Nuisance flooding that has increased in frequency will become the norm. They call it blue sky flooding. Storm surges from tropical systems will threaten more homes, businesses and residents. And even away from the coast, Virginians are expected to feel the impact of climate change as severe weather becomes more dangerous and frequent. Just a few weeks ago, we had a highly unusual February outbreak of tornadoes in the Commonwealth that was very damaging and unfortunately deadly.

Farming and forestry is our number one industry in Virginia. It's a \$70 billion industry in Virginia that supports around 400,000 jobs and it's going to get more difficult and expensive. And, the Commonwealth of Virginia local governments and the navy are already spending millions to build more resilient infrastructure, with millions and millions more on the horizon. To replace just one pier at Norfolk Naval is about \$35 to \$40 million, and there are 14 piers, so that would be around a half billion right there.

As a Commonwealth and a nation, we can't put our heads in the sand. We must act and that is what today is about. I am proud to have Virginia included in this first of its kind coalition which recognizes the reality and the pressing threat of man-made climate change and sea level rise. This group is already standing together to defend the Clean Power Plan – an ambitious and achievable plan - to enjoy the health, economic and environmental benefits of cleaner air and cleaner energy. But there may be other opportunities and that's why I have come all the way from I am looking forward to exploring ideas and Virginia. opportunities, to partner and collaborate, if there are enforcement actions we need to be taking, if there are legal cases we need to be involved in, if there are statutory or regulatory barriers to growing our clean energy sectors and, ultimately, I want to work together with my colleagues here and back in Virginia to help combat climate change and to shape a more sustainable future.

And for any folks who would say the climate change is some sort of made-up global conspiracy, that we're wasting our time, then come to Hampton Roads. Come to Norfolk and take a look for yourselves. Mayor Fraim would love to have you.

- AG Schneiderman: Thank you. And our closer, another great colleague who has traveled far but comes with tremendous energy to this cause and is an inspiration to us all, U.S. Virgin Islands Attorney General Claude Walker.
- AG Walker: Thank you. Thank you, General Schneiderman, Vice President Gore. One of my heroes, I must say. Thank you. I've come far to New York to be a part of this because in the Virgin Islands and Puerto Rico, we experience the effects of global warming. We see an increase in coral bleaching, we have seaweeds, proliferation of seaweeds in the water, all due to global warming. We have tourism as our main industry, and one of the concerns that we have is that tourists will begin to see this as an issue and not visit our shores. But also, residents of the Virgin Islands are starting to make decisions about whether to live in the Virgin Islands - people who have lived there for generations, their families have lived there for generations. We have a hurricane season that starts in June and it goes until November. And it's incredibly destructive to have to go through hurricanes, tropical storms annually. So people make a decision: Do I want to put up with this, with the power lines coming down, buildings being toppled, having to rebuild annually? The strengths of the storms have increased over the Tropical storms now transform into hurricanes. When vears. initially they were viewed as tropical storms but as they get close to the land, the strength increases. So we're starting to see people make decisions about whether to stay in a particular place, whether to move to higher ground – which is what some have said – as you experience flooding, as you experience these strong storms. So we have a strong stake in this, in making sure that we address this issue.

We have launched an investigation into a company that we believe must provide us with information about what they knew about climate change and when they knew it. And we'll make our decision about what action to take. But, to us, it's not an environmental issue as much as it is about survival, as Vice President Gore has stated. We try as attorneys general to build a community, a safe community for all. But what good is that if

annually everything is destroyed and people begin to say: Why am I living here?

So we're here today to support this cause and we'll continue. It could be David and Goliath, the Virgin Islands against a huge corporation, but we will not stop until we get to the bottom of this and make it clear to our residents as well as the American people that we have to do something transformational. We cannot continue to rely on fossil fuel. Vice President Gore has made that clear. We have to look at renewable energy. That's the only solution. And it's troubling that as the polar caps melt, you have companies that are looking at that as an opportunity to go and drill, to go and get more oil. Why? How selfish can you be? Your product is destroying this earth and your strategy is, let's get to the polar caps first so we can get more oil to do what? To destroy the planet further? And we have documents showing that. So this is very troubling to us and we will continue our fight. Thank you.

- AG Schneiderman: Thank you and Eric. And I do want to note, scripture reports David was not alone in fact, Brother Walker. Eric and Matt will take on-topic questions.
- **Moderator**: Please just say your name and publication.
- **Press Person**: John [inaudible] with *The New York Times*. I count two people who have actually said that they're launching new investigations. I'm wondering if we could go through the list and see who's actually in and who is not in yet.
- AG Schneiderman: Well, I know that prior to today, it was, and not every investigation gets announced at the outset as you know, but it had already been announced that New York and California had begun investigations with those stories. I think Maura just indicated a Massachusetts investigation and the Virgin Islands has, and we're meeting with our colleagues to go over a variety of things. And the meeting goes on into the afternoon. So, I am not sure exactly where everyone is. Different states have - it's very important to understand - different states have different statutes, different jurisdictions. Some can proceed under consumer protection law, some securities fraud laws, there are other issues related to defending taxpayers and pension funds. So there are a variety of theories that we're talking about and collaborating and to the degree to which we can cooperate, we share a common interest, and we will. But, one problem for journalists with investigations

is, part of doing an investigation is you usually don't talk a lot about what you're doing after you start it or even as you're preparing to start it.

- **Press Person:** Shawn McCoy with *Inside Sources*. A *Bloomberg Review* editorial noted that the Exxon investigation is preposterous and a dangerous affirmation of power. *The New York Times* has pointed out that Exxon has published research that lines up with mainstream climatology and therefore there's not a comparison to Big Tobacco. So is this a publicity stunt? Is the investigation a publicity stunt?
- AG Schneiderman: No. It's certainly not a publicity stunt. I think the charges that have been thrown around – look, we know for many decades that there has been an effort to influence reporting in the media and public perception about this. It should come as no surprise to anyone that that effort will only accelerate and become more aggressive as public opinion shifts further in the direction of people understanding the imminent threat of climate change and other government actors, like the folks represented here step up to the challenge. The specific reaction to our particular subpoena was that the public reports that had come out, Exxon said were cherry picked documents and took things out of context. We believe they should welcome our investigation because, unlike journalists, we will get every document and we will be able to put them in context. So I'm sure that they'll be pleased that we're going to get everything out there and see what they knew, when they knew it, what they said and what they might have said.
- **Press Person**: David [inaudible] with *The Nation*. Question for General Schneiderman. What do you hope to accomplish with your Exxon investigation? I'm thinking with reference to Peabody where really there was some disclosure requirements but it didn't do a great deal of [inaudible]. Is there a higher bar for Exxon? What are the milestones that you hope to achieve after that investigation?
- AG Schneiderman: It's too early to say. We started the investigation. We received a lot of documents already. We're reviewing them. We're not prejudging anything, but the situation with oil companies and coal companies is somewhat different because the coal companies right now are, the market is already judging the coal industry very harshly. Coal companies, including Peabody, are teetering on the brink. The evidence that we advanced and what was specifically disclosed about Peabody were pretty clear cut examples of

misrepresentations made in violation with the Securities and Exchange Commission, made to investors. It's too early to say what we're going to find with Exxon but we intend to work as aggressively as possible, but also as carefully as possible. We're very aware of the fact that everything we do here is going to be subject to attack by folks who have a huge financial interest in discrediting us. So we're going to be aggressive and creative but we are also going to be as careful and meticulous and deliberate as we can.

VP Gore: Could I respond to the last couple of questions just briefly. And in doing so, I'd like to give credit to the journalistic community and single out the Pulitzer Prize winning team at InsideClimate News, also the Los Angeles Times and the student-led project at Columbia School of Journalism under Steve Coll. And the facts that were publicly presented during, in those series of articles that I have mentioned, are extremely troubling, and where Exxon Mobil in particular is concerned. The evidence appears to indicate that, going back decades, the company had information that it used for the charting of its plan to explore and drill in the Arctic, used for other business purposes information that largely was consistent with what the mainstream scientific community had collected and analyzed. And yes, for a brief period of time, it did publish some of the science it collected, but then a change came, according to these investigations. And they began to make public statements that were directly contrary to what their own scientists were telling them. Secondly, where the analogy to the tobacco industry is concerned, they began giving grants - according to the evidence collected – to groups that specialize in climate denial, groups that put out information purposely designed to confuse the public into believing that the climate crisis was not real. And according to what I've heard from the preliminary inquiries that some of these attorneys general have made, the same may be true of information that they have put out concerning the viability of competitors in the renewable energy space. So, I do think the analogy may well hold up rather precisely to the tobacco industry. Indeed, the evidence indicates that, that I've seen and that these journalists have collected, including the distinguished historian of science at Harvard, Naomi Oreskes wrote the book The Merchants of Doubt with her co-author, that they hired several of the very same public relations agents that had perfected this fraudulent and deceitful craft working for the tobacco companies. And so as someone who

has followed the legislative, the journalistic work very carefully, I think the analogy does hold up.

- **Press Person**: [inaudible] with *InsideClimate News*. Along the lines of talking about that analogy: from a legal framework, can you talk about a comparison, similarities and differences between this potential case and that of Big Tobacco?
- AG Schneiderman: Well, again, we're at the early stages of the case. We are not prejudging the evidence. We've seen some things that have been published by you and others, but it is our obligation to take a look at the underlying documentation and to get at all the evidence, and we do that in the context of an investigation where we will not be talking about every document we uncover. It's going to take some time, but that's another reason why working together collectively is so important. And we are here today because we are all committed to pursuing what you might call an all-levers approach. Every state has different laws, different statutes, different ways of going about this. The bottom line is simple. Climate change is real, it is a threat to all the people we represent. If there are companies, whether they are utilities or they are fossil fuel companies, committing fraud in an effort to maximize their short-term profits at the expense of the people we represent, we want to find out about it. We want to expose it, and we want to pursue them to the fullest extent of the law.
- Moderator: Last one.

Press Person: Storms, floods will arise they are all going to continue to destroy property and the taxpayers . . .

Moderator: What's your name and . . .

- **Press Person**: Oh, sorry. Matthew Horowitz from *Vice*. Taxpayers are going to have to pay for these damages from our national flood insurance claims. So if fossil fuel companies are proven to have committed fraud, will they be held financially responsible for any sorts of damages?
- AG Schneiderman: Again, it's early to say but certainly financial damages are one important aspect of this but, and it is tremendously important and taxpayers it's been discussed by my colleagues we're already paying billions and billions of dollars to deal with the consequences of climate change and that will be one aspect of –

early foreseeing, it's far too early to say. But, this is not a situation where financial damages alone can deal with the problem. We have to change conduct, and as the Vice President indicated, other places in the world are moving more rapidly towards renewables. There is an effort to slow that process down in the United States. We have to get back on that path if we're going to save the planet and that's ultimately what we're here for.

Moderator: We're out of time, unfortunately. Thank you all for coming.

AG Schneiderman: Thank you.

Exhibit 5
Emails: Eco-Activists Plotted Oil Industry Lawsuits Long Before Anti-Exxon Stories Released



By MICHAEL BASTASCH

May 16, 2016

Emails released as part of a lawsuit against a George Mason University climate scientist show environmental activists had been working behind the scenes to "hold fossil fuel companies legally accountable" for their stances on global warming long before stories were published bashing ExxonMobil's climate stance.

Peter Frumhoff, president of the Union of Concerned Scientists, wrote to a GMU climate scientist championing a letter asking the Obama administration to prosecute companies pushing global warming skepticism, spilling the beans that UCS had been working to get state attorneys general to prosecute fossil fuel companies.

"Just so you know, we're also in the process of exploring other state-based approaches to holding fossil fuel companies legally accountable," Frumhoff wrote in a July 2015 email, adding "we think there'll likely be a strong basis for encouraging state (e.g. AG) action to ntext, opportunities for climate scientists to weigh in."

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hail was to GMU climate scientist Jagadish Shukla, who was asking the UCS head to support a letter he was sending to the White House. Frumhoff declined to support Shukla's letter, and instead pointed to work his group was taking behind the scenes to take down fossil fuel companies.

"It would be very interesting — and perhaps very useful — to consider how calls for legal accountability will play out in the court of public opinion in different states/with different subsets of the American public –something perhaps we could work with you all on as this unfolds," Frumhoff wrote to Shukla.

Frumhoff has been a major proponent of using government prosecutors to investigate fossil fuel companies that fund groups or individuals skeptical of catastrophic man-made global warming. Frumhoff was recently invited to brief a group of largely Democratic state attorneys general investigating ExxonMobil for allegedly misleading the public on global warming — a fact AGs tried to cover-up.

Frumhoff also participated in a 2012 meeting held in La Jolla, California, where prominent environmentalists brainstorming how to bring legal action against companies funding global warming skepticism, citing the anti-racketeering case brought against the tobacco industry.

"A key breakthrough in the public and legal case for tobacco control came when internal documents came to light showing the tobacco industry had knowingly misled the public," reads a memo of the 2012 meeting. "Similar documents may well exist in the vaults of the fossil fuel industry and their trade associations and front groups, and there are many possible approaches to unearthing them."

Four years later and activists were trumpeting news articles published by *InsideClimate News* and Columbia University claiming Exxon knew about the negative effects of global warming for decades, but funded right-wing groups skeptical of man-made warming and opposed to overreaching federal regulations.

Frumhoff's July 2015 email to the GMU professor came just two months before *InsideClimate* released its first report on Exxon's global warming stance. Columbia University published its first anti-Exxon article in October.

Frumhoff's email to Shukla was obtained through a Freedom of Information Act request by the Energy & Environment Legal Institute (EELI). EELI released the emails Friday as part of their investigation into Shukla's sending of a letter to the Obama administration, asking them to prosecute skeptics.

Shukla and 19 other scientists and researchers sent a letter to the Obama administration last year, asking officials to go after fossil fuel companies pushing skepticism. The signatories specifically backed calls for the Justice Department to go after skeptics using the Racketeer Influenced and Corrupt Organizations Act (RICO) as suggested by Rhode Island Democratic Sen. Sheldon Whitehouse.

The letter blew up, and Shukla and his co-signatories found themselves facing a wave of public backlash in their call to prosecute those who disagree with them on global warming. What's more is Shukla and his family were found to have taken \$5.6 million from taxpayers over the years to fund a non-profit he runs.

Congress is now investigating Shukla's potential misuse of taxpayer dollars.

"Since 2001, as President of IGES, Dr. Shukla appears to have paid himself and his wife a total of \$5.6 million in compensation — an excessive amount for a non-profit relying on taxpayer money," Texas Republican Rep. Lamar Smith wrote in March to the inspector general of the National Science Foundation.

Shukla's group, called the Institute of Global Environment and Society (IGES), got virtually all of its funding from U.S. taxpayers, including the National Science Foundation, NOAA and NASA. IGES got some \$3.8 million from taxpayers in 2014, according to tax filings.

That year, Shukla made \$333,000 working part-time, and that's on top of the lucrative salaries earned by his wife and daughter who were also employed by IGES. On top of this, he also got paid by GMU — possibly violating state law and university policies.

"It appears IGES may have improperly commingled taxpayer funds with private charitable contributions when it shifted \$100,000 to an education charity in India founded by Dr. Shukla," Smith wrote. "This raises concerns that taxpayer money intended to be used for climate research was redirected to an overseas organization favored by Dr. Shukla."

Smith also cited a recent audit by George Mason University that allegedly shows Shukla was illegally "double-dipping" by collecting money from the NSF while also getting paid by Virginia taxpayers.

"In other words, he received his full salary at GMU, while working full time at IGES and receiving a full salary there," Smith wrote. "This practice may have violated GMU's university policy, his employment contract with the university, and Virginia state law."

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Exhibit 6

Kline, Scot

From: Sent: To: Cc: Subject: Lemuel Srolovic <Lemuel.Srolovic@ag.ny.gov> Wednesday, March 30, 2016 9:01 PM Matt Pawa Kline, Scot Re: Wall st journal

My ask is if you speak to the reporter, to not confirm that you attended or otherwise discuss the event.

Sent from my iPhone

> On Mar 30, 2016, at 6:31 PM, Matt Pawa <mp@pawalaw.com> wrote:

>

> Lem and Scot - a WSJ reporter wants to talk to me. I may not even talk to her at all but if I do I obviously will have no comment on anything discussed at the meeting. What should I say if she asks if I attended? No comment? Let me know.

>

> MP

>

> Matt Pawa

> Pawa Law Group, P.C.

> 1280 Centre Street, Suite 230

> Newton Centre, MA 02459

> (617) 641-9550

> (617) 641-9551 facsimile

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Exhibit 7

Morgan, Wendy

From: Sent: To: Subject: Morgan, Wendy Friday, March 18, 2016 6:06 PM 'Michael Meade' RF: Clean Power Plan and Exxon Mobil.

Great-thx

From: Michael Meade [mailto:Michael.Meade@ag.ny.gov] Sent: Friday. March 18, 2016 5:43 PM To: Kline, Scot <scot.kline@vermont.gov>; Morgan, Wendy <wendy.morgan@vermont.gov> Cc: Brian Mahanna <Brian.Mahanna@ag.ny.gov>; Peter Washburn <Peter Washburn@ag.ny.gov>; Damien LaVera <Damien LaVera@ag.ny.gov>; Natalia Salgado <Natalia.Salgado@ag.ny.gov>; Lemuel Srolovic <Lemuel.Srolovic@ag.ny.gov>; Eric Soufer <Eric.Sou[er@ag.ny.gov>; Daniel Lavoie <Daniel.Lavoie@ag.ny.gov> Subject: RF: Clean Power Plan and Exxon Mobil

AG Frosh from Maryland will also be joining. That's puts us at 6 AG's present for the press conference—and 13 states participating in the meetings.

Have a great weekend!

Mike

From: Michael Meade Sent: Thursday, March 17, 2016 3:55 PM To: Kline, Scot'; Morgan, Wendy Cc: Brian Mahanna; Peter Washburn; Damien LaVera; Natalia Salgado; Lemuel Srolovic Subject: RE; Clean Power Plan and Exxon Mobil

I wanted to send around some additional thoughts regarding who may do what on 3/29. We can hopefully talk about this some more at 4:00.

Monday, March 28 (Optional) 6:00-8:00 Happy Hour with EPB and visiting AAC's

Attorneys General Climate Change Meeting

Date: March 29, 2016

Location: 120 Broadway, New York, NY

Schedule:

9:00 to 9:30 - Welcome (breakfast provided) <Lem Kicks off meeting and staff intros>

9:30 to 10:15 - Peter Frumhoff, Union of Concerned Scientists, presentation on imperative of taking action now on climate change (AGs and staff only) <Lem Introduces Peter>

10:15 to 10:30 - break

10:30 to 11:15 - Pawa Law office presentation regarding climate change litigation (AGs and staff only) <VT Introduces Pawa>

11:15 to 11:30 - break

11:30 am to 12:30 - press conference around AG climate change coalition's support of federal Clean Power plan and other climate change actions (Attending AGs) <Mike to coordinate-AG's participating, staff sitting in audience>

12:30 to 1:00 - lunch and follow-up from morning (lunch provided)

1:00 to 1:45 - NY AG office presentation regarding fossil fuel company disclosure investigations (AGs and staff only) <NY facilitates>

1:45 to 2:45 - closed working session (AGs and staff only) < VT & NY >

- Sharing of AG office activities
- Discussion of expanding coalition work beyond "EPA-practice," c.g., investigations of fossil fuel company disclosures, utility efforts to barrier renewables.

2:45 to 3:00 - break

3:00 to 4:30 - Continued--closed working session (AGs and staff only) <VT & NY>

- Continued discussion
- Coalition next steps

4:30 - end.

From: Kline, Scot [mailto:scot.kline@vermont.gov] Sent: Tuesday, March 15, 2016 12:06 PM To: Michael Meade; Morgan, Wendy Cc: Brian Mahanna; Peter Washburn; Damien LaVera; Natalia Salgado; Lemuel Scolovic Subject: RE: Clean Power Plan and Exxon-Mobil

Mike:

We are good with the new agenda. One item we should discuss more in our next call is the structuring of the afternoon discussion and who will facilitate it.

Thanks.

Scot

From: Michael Meade (mailto:Michael.Meade@ag.ny.gov) Sent: Monday, March 14, 2016 5:18 PM To: Morgan, Wendy <<u>wendy.morgan@vermont.gov</u>>; Kline, Scot <<u>scot.kline@vermont.gov</u>> Cc: Brian Mahanna <<u>Brian.Mahanna@ag.ny.gov</u>>; Peter Washburn <<u>Peter.Washburn@ag.ny.gov</u>>; Damien LaVera <<u>Damien.LaVera@ag.ny.gov</u>>; Natalia Salgado <<u>Natalia.Salgado@ag.ny.gov</u>>; Lemuel Srolovic <<u>Lemuel.Srolovic@ag.ny.gov</u>> Subject: RE: Clean Power Plan and Exxon Mobil

I made the changes you suggested below. If it looks okay to this group, we can circulate tomorrow.

Draft Schedule for Attorneys General Climate Change Meeting

Date: March 29. 2016

Location: 120 Broadway, New York, NY

Schedule:

9:00 to 9:30 Welcome (breakfast provided)

9:30 to 10:15 - Peter Frumhoff, Union of Concerned Scientists, presentation on imperative of taking action now on climate change (AGs and staff only)

10:15 to 10:30 - break

10:30 to 11:15 Pawa Law office presentation regarding climate change litigation (AGs and staff only)

11:15 to 11:30 - break

11:30 am to 12:30 - press conference around AG climate change coalition's support of federal Clean Power plan and other climate change actions (Attending AGs)

12:30 to 1:00 - lunch and follow-up from morning (lunch provided)

1:00 to 1:45 - NY AG office presentation regarding fossil fuel company disclosure investigations (AGs and staff only)

1:45 to 2:45 - closed working session (AGs and staff only)

- Sharing of AG office activities
 - Discussion of expanding coalition work beyond "EPA-practice," e.g., investigations of fossil fuel company disclosures, utility efforts to barrier renewables.

2:45 to 3:00 - break

3:00 to 4:30 - Continued--closed working session (AGs and staff only)

- Continued discussion
- Coalition next steps

4:30 - end.

From: Morgan, Wendy [mailto:wendy.morgan@vermont.gov] Sent: Friday, March 11, 2016 5:33 AM To: Michael Meade; Kline, Scot Oc: Brian Mahanna; Peter Washburn; Damien LaVera; Natalia Salgado; Lemuel Srolovic Subject: RE: Clean Power Plan and Excon-Mobil

Thanks! I like the clarity on who is invited to what

My two thoughts are:

11:30 am to 12:30 noon - is a little ambiguous do you mean 1230pm?

I also wonder about the afternoon break – I'd put NY and start the staff discussion and have a break closer to 245 – that also allows us to divide the discussion into parts more easily (keep us on track) – maybe identifying those parts should be our next Thursday agenda item?

Have a good weekend - Wendy

From: Michael Meade <u>[mailto: Michael.Meade@ag.nv.gov]</u> Sent: Thursday, March 10, 2016 5:27 PM To: Kline, Scot <<u>scot.kline@vermont.gov</u>>; Morgan, Wendy <<u>wendy.morgan@vermont.gov</u>> Cc: Brian Mahanna <<u>Brian.Mahanna@ag.ny.gov</u>>; Peter Washburn <<u>Peter.Washburn@ag.hv.gov</u>>; Damien LaVera <<u>Damien.LaVera@ag.ny.gov</u>>; Natalia Salgado <<u>Natalia.Salgado@ag.nv.gov</u>>; Lemuel Srolovic <<u>Lemuel.Srolovic@ag.ny.gov</u>>; Subject: RE: Clean Power Plan and Eccon-Mobil

Wendy and Scott-

Here's our latest agenda. If you are okay with it, then we'll start sharing with other offices.

Best, Mike

Draft Schedule for Attorneys General Climate Change Meeting

Date: March 29, 2016

Location: 120 Broadway, New York, NY

Schedule:

9:00 to 9:30 - Welcome (breakfast provided)

9:30 to 10:15 – Peter Frumhoff, Union of Concerned Scientists, presentation on imperative of taking action now on climate change (AGs and staff only)

10:15 to 10:30 - break

10:30 to 11:15 - Pawa Law office presentation regarding climate change litigation (AGs and staff only) 11:15 to 11:30 - break

11:30 am to 12:30 – press conference around AG climate change coalition's support of federal Clean Power plan and other climate change actions (Attending AGs)

12:30 to 1:00 - lunch and follow-up from morning (hinch provided)

1:00 to 1:45 - NY AG office presentation regarding fossil fuel company disclosure investigations (AGs and staff only)

1:45 to 2:45 - closed working session (AGs and staff only)

- Sharing of AG office activities
- Discussion of expanding coalition work beyond "EPA-practice," e.g., investigations of fossil fuel company disclosures, utility efforts to barrier renewables.

2:45 to 3:00 - break

3:00 to 4:30 - Continued--closed working session (AGs and staff only)

- Continued discussion
- Coalition next steps

1:30 - end.

From: Lemuel Stolovic Sent: Thursday, February 25, 2016 10:22 AM To: 'Kline, Scot'; Morgan, Wendy Cc: Brian Mahanna; Michael Meade; Peter Washburn; Damien LaVera; Natalia Salgado Subject; RE: Clean Power Plan and Exxon Mobil

Scot and Wendy - Looking forward to our conversation at 11. Here's our initial thinking about the schedule for the event.

Draft Schedule for Attorneys General Climate Change Meeting at NY AG's Office

Date: On or about April 1, 2016

Location: 120 Broadway, New York, NY

Schedule:

11 am to 12 noon - press conference around AG climate change coalition's support of federal Clean Power plan and other climate change actions

12 noon to 1:30 - follow on media time and lunch

1:30 to 2:15 - NY AG office presentation regarding fossil fuel company investigations (AGs and staff only)

2:15 to 2:30 - break

2:30 to 3:15 - Pawa Law office presentation regarding climate change litigation (AGs and staff only)

3:15 to 3:30 - break

3:30 to 4:30 - closed session AG office discussion

4:30 - end.

From: Kline, Scot [mailto:scot.kline@vermont.gov] Sent: Tuesday, February 23, 2016 3:40 PM To: Lemuel Scolovic Cc: Morgan, Wendy; Brian Mahanna; Tasha L. Bartlett Subject: RE: Clean Power Plan and Exxon-Mobil

Lem:

Wendy has developed a conflict for the Thursday call at 11:30. We are wondering whether you and Brian can do the call earlier that morning -- 11 or earlier?

Thanks.

Scot

From: Lemuel Srolovic [mailto:Lemuel_Srolovic@ag.ny.gov] Sent: Thursday, February 18, 2016 10:04 PM To: Kline, Scot <<u>scot.kline@vermont.gov</u>> Cc: Morgan, Wendy <<u>wendy.morgan@vermont.gov</u>>; Brian Mahanna <<u>Brian.Mahanna@ag.nv.gov</u>>; Tasha L. Bartlett <<u>Tasha.Bartlett@ag.nv.gov</u>> Subject: Re: Clean Power Plan and Exxon-Mobil

Scot -- thanks for update. We'll draft possible run of conference day. Look forward to our next conversation. Lem

Sent from my iPhone

On Feb 18, 2016, at 3:42 PM, Kline, Scot <scot.kline@vermont.gov> wrote:

Lem and Brian:

Wendy and I connected with our AG. He thinks what we talked about today makes sense. We are good with doing the event in NY. Bill recalled that the videotaping for individual AG's was done by AARP at an event. So that was not a regular press event. Sounds like a more traditional press event might be more in line with our event.

if you can get us a preliminary draft of the conference day, that would be helpful. Also, maybe we can target some possible dates for the event in next week's call.

Thanks.

Scot

From: Lemuel Stolovic [mailto:Lemuel.Stolovic@ag.nv.gov] Sent: Wednesday, February 17, 2016 10:13 AM To: Kline, Scot <<u>scot.kline@vermont.gov</u>>; Morgan, Wendy <<u>wendy.morgan@vermont.gov</u>> Cc: Brian Mahanna <<u>Brian.Mahanna@ag.nv.gov</u>>; Tasha L. Bartlett <<u>Tasha.Bartlett@ag.ny.gov</u>> Subject: RL: We Need to Reschedule This Afternoon's Conversation

Excellent! Please call Brian Mahanna's line at 212-416-8579. Speak with you tomorrow, Lem

From: Kline, Scot [mailto:scot.kline@vermont.gov] Sent: Wednesday, February 17, 2016 8:35 AM To: Lemuel Srolovic; Morgán, Wendy Subject: RE; We Need to Reschedule This Afternoon's Conversation

Lem.

Thursday from 2-3 works on this end.

Should we call you? If so, let me know what number.

Thanks.

Scot

From: Lemuel Stolovic [mailto:Lemuel.Stolovic@ag.nv.gov] Sent: Tuesday, February 16, 2016 6:34 PM To: Kline, Scot <<u>scot.kline@vermont.gov</u>>; Morgan, Wendy <<u>wendy.morean@vermont.gov</u>> Subject: RE: We Need to Reschedule This Afternoon's Conversation

Scot and Wendy - wow, for us working this school vacation week here in NYS, it's a bit crazy!

Our deputy chief of staff is now tied up tomorrow at 4. Here's what he and I have free:

Tomorrow at 5:30

Thursday 2-3

Friday before 11.

Hopefully one of these works for you two.

Sorry this is proving to be hard to land.

-2

From: Kline, Scot (mailto:scot.kline@vermont.gov) Sent: Tuesday, February 16, 2016 4:54 PM To: Morgan, Wendy Cc: Lemuel Srolovic Subject: Re: We Need to Reschedule This Afternoon's Conversation

Okay here.

Sent from my iPhone.

On Feb 16, 2016, at 4:52 PM, Morgan, Wendy <wendy.morgan@vermont.gov> wrote:

I can make it work for me.

From: Lemuel Stolovic [mailto:Lemuel.Stolovic@ag.ny.gov] Sent: Tuesday, February 16, 2016 4:48 PM To: Kline, Scot <<u>scot.kline@vermont.gov</u>> Cc: Morgan, Wendy <<u>wendy.morgan@vermont.gov</u>> Subject: RE: We Need to Reschedule This Afternoon's Conversation

Hi Scot and Wendy - sorry I missed the e-mail regarding today at 47. Does tomorrow at 4 still work for you? Regards, Lem

From: Kline, Scot [mailto:scot.kline@vermont.dov] Sent: Tuesday, February 16, 2016 3:25 PM To: Lemuel Srolovic Cc: Morgan, Wendy Subject: Re: We Need to Reschedule This Afternoon's Conversation

Lem: Are we on for a call at 4 today? Thanks, Scot

Sent from my iPhone

On Feb 15, 2016, at 4:25 PM, Kline, Scot «scot.kline@vermiont.gov» wrote:

Lem: Let's try for tomorrow at 4. We may need a call in number if the weather is bad as expected here -- Wendy and I may be calling in from different locations. Thanks. Scot

Sent from my iPhone

On Feb L3, 2016, at 7:20 AM, Lemuel Stolovic <<u>Lemuel Stolovic(@ag.ny.gov> wrote:</u>

Scot -- we can do either Tuo or Wed at 4. Preference?

Lem

Have a good weekend. Winter now for sure!

Lem

Sent from my iPhone.

On Feb 9, 2016, at 2:24 PM, Kline, Scot. <soot kline/avermont.gov> wrote;

Lem:

No problem. Let's shool for Tuesday of Wednesday of this coming week. Tuesday morning until 10 or lare afternoon (4 p.m. on) or Wednesday from 4 on, should work here. Wendy's schedule is a bit up in the air because of legislative work.

Just so you know, we circled back with our AG and the thought on this end is for something scaled down and focused more on Exxon Mobil without a lot of publicity. Maybe an invite or two to the outside for a presentation. It would be an opportunity for states to hear about Exxon-Mobil and your efforts, and explore whether there is interest in doing something together as a group or supporting you in whatever way makes sense.

Please let us know if one of the above times works for you. If not, please suggest some others.

Thanks.

Scot

From: Lemuel Scolovic [mailto:Lemuel.Scolovic@ag.ny.gov] Sent: Tuesday, February 09, 2016 1:10 PM To: Kline, Scot <scot.kline@vermonLgov> Subject: We Need to Reschedule This Afternoon's Conversation Scot (and Wendy) - sorry for late notice but we need to reschedule this afternoon's group call. Something's come up today that's engaging our exec folks.

Could we re-schedule to Tue/Wed. of next week? We're working on framing and substance and want to keep the hall moving forward.

Sorry again for inconvenience.

Lem

Lomuel M. Srolovic Bureau Chief Environmental Protection Bureau New York State Attorney General 212:416:8448 (o) 917:621:6174 (m) Jonuel.srolovic@ag.ny.gov

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Exhibit 8

CLIMATE CHANGE COALITION COMMON INTEREST AGREEMENT

This Common Interest Agreement ("Agreement") is entered into by the undersigned Attorneys General of the States, Commonwealths, and Territories (the "Parties") who are interested in advancing their common legal interests in limiting climate change and ensuring the dissemination of accurate information about climate change. The Parties mutually agree:

1. <u>Common Legal Interests</u>. The Parties share common legal interests with respect to the following topics: (i) potentially taking legal actions to compel or defend federal measures to limit greenhouse gas emissions, (ii) potentially conducting investigations of representations made by companies to investors, consumers and the public regarding fossil fuels, renewable energy and climate change, (iii) potentially conducting investigations of possible illegal conduct to limit or delay the implementation and deployment of renewable energy technology, (iv) potentially taking legal action to obtain compliance with federal and state laws governing the construction and operation of fossil fuel and renewable energy infrastructure, or (v) contemplating undertaking one or more of these legal actions, including litigation ("Matters of Common Interest").

2. <u>Shared Information</u>. It is in the Parties' individual and common interests to share documents, mental impressions, strategies, and other information regarding the Matters of Common Interest and any related investigations and litigation ("Shared Information"). Shared Information shall include (1) information shared in organizing a meeting of the Parties on March 29, 2016, (2) information shared at and after the March 29 meeting, pursuant to an oral common interest agreement into which the Parties entered at the meeting and renewed on April 12, 2016, and (3) information shared after the execution of this Agreement.

3. Legends on Documents. To avoid misunderstandings or inadvertent disclosure, all documents exchanged pursuant to this Agreement should bear the legend "Confidential – Protected by Common Interest Privilege" or words to that effect. However, the inadvertent failure to include such a legend shall not waive any privilege or protection available under this Agreement or otherwise. In addition, any Party may, where appropriate, also label documents exchanged pursuant to this Agreement with other appropriate legends, such as, for example, "Attorney-Client Privileged" or "Attorney Work Product." Oral communications among the Parties shall be deemed confidential and protected under this Agreement when discussing Matters of Common Interest.

4. <u>Non-Waiver of Privileges</u>. The exchange of Shared Information among Parties including among Parties' staff and outside advisors—does not diminish in any way the privileged and confidential nature of such information. The Parties retain all applicable privileges and claims to confidentiality, including the attorney client privilege, work product privilege, common interest privilege, law enforcement privilege, deliberative process privilege and exemptions from disclosure under any public records laws that may be asserted to protect against disclosure of Shared Information to non-Parties (hereinafter collectively referred to as "Privileges"). 5. <u>Nondisclosure</u>. Shared Information shall only be disclosed to: (i) Parties; (ii) employees or agents of the Parties, including experts or expert witnesses; (iii) government officials involved with the enforcement of antitrust, environmental, consumer protection, or securities laws who have agreed in writing to abide by the confidentiality restrictions of this Agreement; (iv) criminal enforcement authorities; (v) other persons, provided that all Parties consent in advance; and (vi) other persons as provided in paragraph 6. A Party who provides Shared Information may also impose additional conditions on the disclosure of that Shared Information. Nothing in this Agreement prevents a Party from using the Shared Information for law enforcement purposes, criminal or civil, including presentation at pre-trial and trial-related proceedings, to the extent that such presentation does not (i) conflict with other agreements that the Party has entered into, (ii) interfere with the preservation of the Privileges, or (iii) conflict with court orders and applicable law.

6. <u>Notice of Potential Disclosure</u>. The Parties agree and acknowledge that each Party is subject to applicable freedom of information or public records laws, and nothing in this Agreement is intended to alter or limit the disclosure requirements of such laws. If any Shared Information is demanded under a freedom of information or public records law or is subject to any form of compulsory process in any proceeding ("Request"), the Party receiving the Request shall: (i) immediately notify all other Parties (or their designees) in writing; (ii) cooperate with any Party in the course of responding to the Request; and (iii) refuse to disclose any Shared Information unless required by law.

7. <u>Inadvertent Disclosure</u>. If a Party discloses Shared Information to a person not entitled to receive such information under this Agreement, the disclosure shall be deemed to be inadvertent and unintentional and shall not be construed as a waiver of any Party's right under law or this Agreement. Any Party may seek additional relief as may be authorized by law.

8. <u>Independently Obtained Information</u>. Provided that no disclosure is made of Shared Information obtained pursuant to this Agreement, nothing in this Agreement shall preclude a Party from (a) pursuing independently any subject matter, including subjects reflected in Shared Information obtained by or subject to this Agreement or (b) using or disclosing any information, documents, investigations, or any other materials independently obtained or developed by such Party.

9. <u>Related Litigation</u>. The Parties continue to be bound by this Agreement in any litigation or other proceeding that arises out of the Matters of Common Interest.

10. <u>Parties to the Agreement</u>. This Agreement may be executed in counterparts. All potential Parties must sign for their participation to become effective.

11. <u>Withdrawal</u>. A Party may withdraw from this Agreement upon thirty days written notice to all other Parties. Withdrawal shall not terminate, or relieve the withdrawing Party of any obligation under this Agreement regarding Shared Information received by the withdrawing Party before the effective date of the withdrawal.

12. <u>Modification</u>. This writing is the complete Agreement between the Parties, and any modifications must be approved in writing by all Parties.

Dated: May 18, 2016

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Michele Van Gelderen Supervising Deputy Attorney General Consumer Law Section Office of Attorney General Kamala D. Harris 300 South Spring Street, Suite 1702 Los Angeles, CA 90013 Tel. (213) 897-2000

Dated: May 3, 2016

Matthew I. Levine Assistant Attorney General Office of the Attorney General 55 Elm Street P.O. Box 120 Hartford, CT 06106

2 ,2016 Dated: Ma

Elizabeth Wilkins Senior Counsel to the Attorney General* Office of the Attorney General for the District of Columbia 441 4th Street N.W. Suite 1100S Washington, D.C. 20001 (202) 724-5568 elizabeth.wilkins@dc.gov

*Admitted to practice only in Maryland. Practicing in the District of Columbia under the direct supervision of Natalie O. Ludaway, a member of the D.C. Bar pursuant to D.C. Court of Appeals Rule 49(c).

Dated: May 2, 2016

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James P. Gignac Environmental and Energy Counsel Illinois Attorney General's Office 69 W. Washington St., 18th Floor Chicago, IL 60602 (312) 814-0660 <u>jgignac@atg.state.il.us</u>

Dated: April 29, 2016

CHRISTOPHE COURCHESNE Assistant Attorney General Chief, Environmental Protection Division One Ashburton Place Boston, MA 02108 christophe.courchesne@state.ma.us

Dated: 1 (0, 2016

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Joshua N. Auerbach Assistant Attorney General 200 Saint Paul Place Baltimore, Maryland 21202 (410) 576-6311 jauerbach@oag.state.md.us

Dated: May 5, 2016

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Gerald D. Reid Assistant Attorney General Chief, Natural Resources Division Maine Office of the Attorney General (207) 626-8545 jerry.reid@maine.gov

). Oleon Date: 5/16/16 Signature:

Karen D. Olson Deputy Attorney General Minnesota Attorney General's Office 445 Minnesota Street, Suite 900 St. Paul, MN 55101 (651) 757-1370 karen.olson@ag.state.mn.us

Dated: April 29, 2016

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JOSEPH A. FOSTER, ATTORNEY GENERAL K. Allen Brooks, Senior Assistant Attorney General 33 Capitol Street Concord, NH 03301 (603) 271-3679 allen.brooks@doj.nh.gov

Dated: Many le , 2016

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Tania Maestas Deputy Attorney General Civil Affairs Office of the New Mexico Attorney General PO Drawer 1508 Santa Fe, NM 87504

Dated: May ____, 2016 2

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Monica Wagner Deputy Chief Environmental Protection Bureau Office of the Attorney General of New York 120 Broadway, 26th floor New York, NY 10271 212-416-6351 Dated: April 29 . , 2016

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Paul Garrahan Attorney-in-Gharge | Natural Resources Section | General Counsel Division Oregon Department of Justice 1162 Court St. NE, Salem, OR 97301-4096 971.673.1943 (Tue, Thu, Fri) (Portland) 503.947.4593 (Mon, Wed) (Salem) 503.929.7553 (Mobile) ÷

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28,2016 Dated:

Gregory S. Schultz Special Assistant Attorney General Rhode Island Department of Attorney General 150 South Main Street Providence, RI 02903 Tel.: (401) 274-4400, Ext. 2400

Rhodes B. Ritenon 5/9/16

Dated: May 9, 2016

Rhodes B. Ritenour Deputy Attorney General Civil Litigation Division Office of the Attorney General 900 East Main Street Richmond, VA 23219 Office: (804) 786-6731 E-mail: RRitenour@oag.state.va.us

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John W. Daniel Deputy Attorney General Commerce, Environmental, and Technology Division Office of the Attorney General 900 East Main Street Richmond, VA 23219 Office: (804) 786-6053 E-mail: JDaniel@oag.state.va.us
Dated: May 10, 2016

Kindel Renee A. Gumbs. Esq.

Renee A. Gumbs, Est. Deputy Attorney General Department of Justice 34-38 Kronprindsens Gade GERS Complex, 2nd flr. St. Thomas, VI 00802 (340) 774-5666. ext. 101 (340) 776-3494 (Fax) Renee.gumbs@doj.vi.gov

Dated: April 29,2016

ciloles J. Personpion 1 Nicholas F. Persampieri

Assistant Attorney General Office of the Attorney General 109 State Street Montpelier, VT 05609-1001 (802)-828-6902 nick.persampieri@vermont.gov

Dated: MAT 1____, 2016

Laura J. Watson Senior Assistant Attorney General Washington State Office of the Attorney General (360)-586-6743 Laura.watson@atg.wa.gov

Exhibit 9



MAURA HEALEY ATTORNEY GENERAL

THE COMMONWEALTH OF MASSACHUSETTS OFFICE OF THE ATTORNEY GENERAL

ONE ASHBURTON PLACE Boston, Massachusetts 02108

> TEL: (617) 727-2200 www.mass.gov/ago

CIVIL INVESTIGATIVE DEMAND

BY HAND DELIVERY

Demand No.: 2016-EPD-36

Date Issued: April 19, 2016

Issued To: Exxon Mobil Corporation c/o Corporation Service Company, its Registered Agent 84 State Street Boston, Massachusetts 02109

This Civil Investigative Demand ("CID") is issued to Exxon Mobil Corporation ("Exxon" or "You") pursuant to Massachusetts General Laws c. 93A, § 6, as part of a pending investigation concerning potential violations of M.G.L. c. 93A, § 2, and the regulations promulgated thereunder arising both from (1) the marketing and/or sale of energy and other fossil fuel derived products to consumers in the Commonwealth of Massachusetts (the "Commonwealth"); and (2) the marketing and/or sale of securities, as defined in M.G.L. c. 110A, § 401(k), to investors in the Commonwealth, including, without limitation, fixed- and floating rate-notes, bonds, and common stock, sold or offered to be sold in the Commonwealth.

This CID requires You to produce the documents identified in <u>Schedule A</u> below, pursuant to M.G.L. c. 93A, § 6(1). The Documents identified in Schedule A must be produced by May 19, 2016, by delivering them to:

I. Andrew Goldberg Assistant Attorney General Office of the Attorney General One Ashburton Place Boston, MA 02108

The documents shall be accompanied by an affidavit in the form attached hereto. AAG Goldberg and such other employees, agents, consultants, and experts of the Office of the Attorney General as needed in its discretion, shall review Your affidavit and the documents produced in conjunction with our investigation.

This CID also requires You to appear and give testimony under oath through Your authorized custodian of records that the documents You produce in response to this CID represent all of the documents called for in this CID; that You have not withheld any documents responsive to this CID; and that all of the documents You produce were records made in good faith and kept in the regular course of Your business, and it was the regular course of Your business to make and keep such records. This testimony will be taken on June 10, 2016, beginning at 9:30 a.m. at the Boston Office of the Attorney General, 100 Cambridge Street, 10th Floor, Boston, Massachusetts. The testimony will be taken by AAG Goldberg or an appropriate designee, before an officer duly authorized to administer oaths by the law of the Commonwealth, and shall proceed, day to day, until the taking of testimony is completed. The witness has the right to be accompanied by an attorney. Rule 30(c) of the Massachusetts Rules of Civil Procedure shall apply. Your attendance and testimony are necessary to conduct this investigation.

This CID also requires You to appear and give testimony under oath through one or more of Your officers, directors or managing agents, or other persons most knowledgeable concerning the subject matter areas enumerated in <u>Schedule B</u>, below. This testimony will be taken on June 24, 2016, beginning at 9:30 a.m. at the Boston Office of the Attorney General, 100 Cambridge Street, 10th Floor, Boston, Massachusetts. The testimony will be taken by AAG Goldberg or an appropriate designee, before an officer duly authorized to administer oaths by the law of the Commonwealth, and shall proceed, day to day, until the taking of testimony is completed. The witness has the right to be accompanied by an attorney. Rule 30(c) of the Massachusetts Rules of Civil Procedure shall apply. Your attendance and testimony are necessary to conduct this investigation.

Under G.L. c. 93A, § 6(7), You may make a motion prior to the production date specified in this notice, or within twenty-one days after this notice has been served, whichever period is shorter, in the appropriate court of law to modify or set aside this CID for good cause shown.

If the production of the documents required by this CID would be, in whole or in part, unduly burdensome, or if You require clarification of any request, please contact AAG Goldberg promptly at the phone number below.

Finally, please note that under G.L. c. 93A, §7, obstruction of this investigation, including the alteration or destruction of any responsive document after receipt of

this CID, is subject to a fine of up to five thousand dollars (\$5,000.00). A copy of that provision is reprinted at <u>Schedule C</u>.

Issued at Boston, Massachusetts, this 19th day of April, 2016.

COMMONWEALTH OF MASSACHUSETTS

MAURA HEALEY ATTORNEY GENERAL

By:

I. Andrew Goldberg Assistant Attorney General Office of the Attorney General One Ashburton Place Boston, MA 02108 Tel. (617) 727-2200

SCHEDULE A

A. General Definitions and Rules of Construction

- "Advertisement" means a commercial message made orally or in any newspaper, magazine, leaflet, flyer, or catalog; on radio, television, or public address system; electronically, including by email, social media, and blog post; or made in person, in direct mail literature or other printed material, or on any interior or exterior sign or display, in any window display, in any point of transaction literature, but not including on any product label, which is delivered or made available to a customer or prospective customer in any manner whatsoever.
- 2. "All" means each and every.
- 3. "Any" means any and all.
- 4. "And" and "or" shall be construed either disjunctively or conjunctively as necessary to bring within the scope of the CID all information or Documents that might otherwise be construed to be outside of its scope.
- 5. "Communication" means any conversation, discussion, letter, email, memorandum, meeting, note or other transmittal of information or message, whether transmitted in writing, orally, electronically or by any other means, and shall include any Document that abstracts, digests, transcribes, records or reflects any of the foregoing. Except where otherwise stated, a request for "Communications" means a request for all such Communications.
- 6. "Concerning" means, directly or indirectly, in whole or in part, relating to, referring to, describing, evidencing or constituting.
- "Custodian" means any Person or Entity that, as of the date of this CID, maintained, possessed, or otherwise kept or controlled such Document.
- 8. "Document" is used herein in the broadest sense of the term and means all records and other tangible media of expression of whatever nature however and wherever created, produced or stored (manually, mechanically, electronically or otherwise), including without limitation all versions whether draft or final, all annotated or nonconforming or other copies, electronic mail ("e-mail"), instant messages, text messages, personal digital assistant or other wireless device messages, voicemail, calendars, date books, appointment books, diaries, books, papers, files, notes, confirmations, accounts statements, correspondence, memoranda, reports, records, journals, registers, analyses, plans, manuals, policies, telegrams, faxes, telexes, wires, telephone logs, telephone messages, message slips, minutes, notes or records or transcriptions of conversations or

Communications or meetings, tape recordings, videotapes, disks, and other electronic media, microfilm, microfiche, storage devices, press releases, contracts, agreements, notices and summaries. Any non-identical version of a Document constitutes a separate Document within this definition, including without limitation drafts or copies bearing any notation, edit, comment, marginalia, underscoring, highlighting, marking, or any other alteration of any kind resulting in any difference between two or more otherwise identical Documents. In the case of Documents bearing any notation or other marking made by highlighting ink, the term Document means the original version bearing the highlighting ink, which original must be produced as opposed to any copy thereof. Except where otherwise stated, a request for "Documents" means a request for all such Documents.

- "Entity" means without limitation any corporation, company, limited liability company or corporation, partnership, limited partnership, association, or other firm or similar body, or any unit, division, agency, department, or similar subdivision thereof.
- "Identify" or "Identity," as applied to any Document means the provision in writing of information sufficiently particular to enable the Attorney General to request the Document's production through CID or otherwise, including but not limited to: (a) Document type (letter, memo, etc.); (b) Document subject matter; (c) Document date; and (d) Document author(s), addressee(s) and recipient(s). In lieu of identifying a Document, the Attorney General will accept production of the Document, together with designation of the Document's Custodian, and identification of each Person You believe to have received a copy of the Document.
- 11. "Identify" or "Identity," as applied to any Entity, means the provision in writing of such Entity's legal name, any d/b/a, former, or other names, any parent, subsidiary, officers, employees, or agents thereof, and any address(es) and any telephone number(s) thereof.
- 12. "Identify" or "Identity," as applied to any natural person, means and includes the provision in writing of the natural person's name, title(s), any aliases, place(s) of employment, telephone number(s), e-mail address(es), mailing addresses and physical address(es).
- 13. "Person" means any natural person, or any Entity.
- 14. "Refer" means embody, refer or relate, in any manner, to the subject of the document demand.

- 15. "Refer or Relate to" means to make a statement about, embody, discuss, describe, reflect, identify, deal with, consist of, establish, comprise, list, or in any way pertain, in whole or in part, to the subject of the document demand.
- 16. "Sent" or "received" as used herein means, in addition to their usual meanings, the transmittal or reception of a Document by physical, electronic or other delivery, whether by direct or indirect means.
- 17. "CID" means this subpoena and any schedules, appendices, or attachments thereto.
- 18. The use of the singular form of any word used herein shall include the plural and vice versa. The use of any tense of any verb includes all other tenses of the verb.
- 19. The references to Communications, Custodians, Documents, Persons, and Entities in this CID encompass all such relevant ones worldwide.

B. Particular Definitions

- "Exxon," "You," or "Your," means Exxon Mobil Corporation, and any present or former parents, subsidiaries, affiliates, directors, officers, partners, employees, agents, representatives, attorneys or other Persons acting on its behalf, and including predecessors or successors or any affiliates of the foregoing.
- 2. "Exxon Products and Services" means products and services, including without limitation petroleum and natural gas energy products and related services, offered to and/or sold by Exxon to consumers in Massachusetts.
- "Carbon Dioxide" or "CO₂" means the naturally occurring chemical compound composed of a carbon atom covalently double bonded to two oxygen atoms that is fixed by photosynthesis into organic matter.
- 4. "Climate" means the statistical description in terms of the mean and variability of relevant quantities, such as surface variables, including, without limitation, temperature, precipitation, and wind, on Earth over a period of time ranging from months to thousands or millions of years. Climate is the state, including a statistical description, of the Climate System. *See* Intergovernmental Panel on Climate Change (IPCC), 2012: Glossary of terms. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the IPCC. Cambridge University Press, Cambridge, UK, and New York, NY, USA (the "IPCC Glossary"), p. 557.

- 5. "Climate Change" means a change in the state of Earth's Climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. *See* IPCC Glossary, p. 557.
- 6. "Climate Model" means a numerical representation of the Climate System based on the physical, chemical, and biological properties of its components, their interactions, and feedback processes, and that accounts for all or some of its known properties. Climate models are applied as a research tool to study and simulate the climate, and for operational purposes, including monthly, seasonal, interannual, and longer-term climate predictions. *See* IPCC Glossary, p. 557.
- 7. "Climate Risk" means the risk that variables in the Climate System reach values that adversely affect natural and human systems and regions, including those that relate to extreme values of the climate variables such as high wind speed, high river water and sea level stages (flood), and low water stages (drought). These include, without limitation, such risks to ecosystems, human health, geopolitical stability, infrastructure, facilities, businesses, asset value, revenues, and profits, as well as the business risks associated with public policies and market changes that arise from efforts to mitigate or adapt to Climate Change.
- 8. "Climate Science" means the study of the Climate on Earth.
- "Climate System" means the dynamics and interactions on Earth of five major components: atmosphere, hydrosphere, cryosphere, land surface, and biosphere. See IPCC Glossary, p. 557.
- "Global Warming" means the gradual increase, observed or projected, in Earth's global surface temperature, as one of the consequences of radiative forcing caused by anthropogenic emissions.
- 11. "Greenhouse Gas" means a gaseous constituent of Earth's atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. Water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), chlorofluorocarbons (CFCs), and ozone (O₃) are the primary Greenhouse Gases in the Earth's atmosphere. *See* IPCC Glossary, p. 560.
- 12. "Greenhouse Gas Emissions" means the exiting to the atmosphere of Greenhouse Gas.
- 13. "Methane" or "CH₄" means the chemical compound composed of one atom of carbon and four atoms of hydrogen. Methane is the main component of natural gas.

- 14. "Radiative Forcing Effect" means the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism.
- 15. "Security" has the same meaning as defined in M.G.L. c. 110A, § 401(k), and includes, without limitation, any fixed- and floating rate-notes, bonds, and common stock, available to investors for purchase by Massachusetts residents.
- 16. "Sustainable Development" means development that meets the needs of the present without compromising the ability of future generations to meet their own needs. See IPCC Glossary, p. 564.
- 17. "Sustainability Reporting" means the practice of measuring, disclosing and being accountable to internal and external stakeholders for organizational performance towards the goals of Sustainable Development.
- "Acton Institute for the Study of Religion and Liberty" or "Acton Institute" means the nonprofit organization by that name. Acton Institute is located in Grand Rapids, Michigan.
- 19. "American Enterprise Institute for Public Policy Research" or "AEI" means the nonprofit public policy organization by that name. AEI is based in Washington, D.C.
- 20. "Americans for Prosperity" means the nonprofit advocacy group by that name. Americans for Prosperity is based in Arlington, Virginia.
- 21. "American Legislative Exchange Council" or "ALEC" means the nonprofit organization by that name consisting of state legislator and private sector members. ALEC is based in in Arlington, Virginia.
- 22. "American Petroleum Institute" or "API" means the oil and gas industry trade association by that name. API is based in Washington, D.C.
- 23. "Beacon Hill Institute at Suffolk University" means the research arm of the Department of Economics at Suffolk University in Boston, Massachusetts, by that name.
- 24. "Center for Industrial Progress" or "CIP" means the for profit organization by that name. CIP is located in Laguna Hills, California.
- 25. "Competitive Enterprise Institute" or "CEI" means the nonprofit public policy organization by that name. CEI is based in Washington, D.C.

- 26. "George C. Marshall Institute" means the nonprofit public policy organization by that name. George C. Marshall Institute is based in Arlington, Virginia.
- 27. "The Heartland Institute" means the nonprofit public policy organization by that name. The Heartland Institute is based in Arlington Heights, Illinois.
- 28. "The Heritage Foundation" means the nonprofit public policy organization by that name. The Heritage Foundation is based in Washington, D.C.
- 29. "Mercatus Center at George Mason University" means the university-based nonprofit public policy organization by that name. Mercatus Center at George Mason University is based in Arlington, Virginia.

C. Instructions

- 1. Preservation of Relevant Documents and Information; Spoliation. You are reminded of your obligations under law to preserve Documents and information relevant or potentially relevant to this CID from destruction or loss, and of the consequences of, and penalties available for, spoliation of evidence. No agreement, written or otherwise, purporting to modify, limit or otherwise vary the terms of this CID, shall be construed in any way to narrow, qualify, eliminate or otherwise diminish your aforementioned preservation obligations. Nor shall you act, in reliance upon any such agreement or otherwise, in any manner inconsistent with your preservation obligations under law. No agreement purporting to modify, limit or otherwise vary your preservation obligations under law shall be construed as in any way narrowing, qualifying, eliminating or otherwise diminishing such aforementioned preservation obligations, nor shall you act in reliance upon any such agreement. Unless an Assistant Attorney General confirms or acknowledges such agreement in writing, or makes such agreement a matter of record in open court.
- 2. Possession, Custody, and Control. The CID calls for all responsive Documents or information in your possession, custody or control. This includes, without limitation, Documents or information possessed or held by any of your officers, directors, employees, agents, representatives, divisions, affiliates, subsidiaries or Persons from whom you could request Documents or information. If Documents or information responsive to a request in this CID are in your control, but not in your possession or custody, you shall promptly Identify the Person with possession or custody.
- 3. Documents No Longer in Your Possession. If any Document requested herein was formerly in your possession, custody or control but is no longer available, or no longer exists, you shall submit a statement in writing under oath that: (a) describes

in detail the nature of such Document and its contents; (b) Identifies the Person(s) who prepared such Document and its contents; (c) Identifies all Persons who have seen or had possession of such Document; (d) specifies the date(s) on which such Document was prepared, transmitted or received; (e) specifies the date(s) on which such Document became unavailable; (f) specifies the reason why such Document is unavailable, including without limitation whether it was misplaced, lost, destroyed or transferred; and if such Document has been destroyed or transferred, the conditions of and reasons for such destruction or transfer; and (g) Identifies all Persons with knowledge of any portion of the contents of the Document.

- 4. No Documents Responsive to CID Requests. If there are no Documents responsive to any particular CID request, you shall so state in writing under oath in the Affidavit of Compliance attached hereto, identifying the paragraph number(s) of the CID request concerned.
- Format of Production. You shall produce Documents, Communications, and information responsive to this CID in electronic format that meets the specifications set out in <u>Schedule D</u>.
- 6. Existing Organization of Documents to be Preserved. Regardless of whether a production is in electronic or paper format, each Document shall be produced in the same form, sequence, organization or other order or layout in which it was maintained before production, including but not limited to production of any Document or other material indicating filing or other organization. Such production shall include without limitation any file folder, file jacket, cover or similar organizational material, as well as any folder bearing any title or legend that contains no Document. Documents that are physically attached to each other in your files shall be accompanied by a notation or information sufficient to indicate clearly such physical attachment.
- 7. Document Numbering. All Documents responsive to this CID, regardless of whether produced or withheld on ground of privilege or other legal doctrine, and regardless of whether production is in electronic or paper format, shall be numbered in the lower right corner of each page of such Document, without disrupting or altering the form, sequence, organization or other order or layout in which such Documents were maintained before production. Such number shall comprise a prefix containing the producing Person's name or an abbreviation thereof, followed by a unique, sequential, identifying document control number.
- 8. Privilege Placeholders. For each Document withheld from production on ground of privilege or other legal doctrine, regardless of whether a production is electronic or in hard copy, you shall insert one or more placeholder page(s) in the

production bearing the same document control number(s) borne by the Document withheld, in the sequential place(s) originally occupied by the Document before it was removed from the production.

- 9. Privilege. If You withhold or redact any Document responsive to this CID of privilege or other legal doctrine, you shall submit with the Documents produced a statement in writing under oath, stating: (a) the document control number(s) of the Document withheld or redacted; (b) the type of Document; (c) the date of the Document; (d) the author(s) and recipient(s) of the Document; (e) the general subject matter of the Document; and (f) the legal ground for withholding or redacting the Document. If the legal ground for withholding or redacting the Document privilege, you shall indicate the name of the attorney(s) whose legal advice is sought or provided in the Document.
- 10. Your Production Instructions to be Produced. You shall produce a copy of all written or otherwise recorded instructions prepared by you concerning the steps taken to respond to this CID. For any unrecorded instructions given, you shall provide a written statement under oath from the Person(s) who gave such instructions that details the specific content of the instructions and any Person(s) to whom the instructions were given.
- 11. Cover Letter. Accompanying any production(s) made pursuant to this CID, You shall include a cover letter that shall at a minimum provide an index containing the following: (a) a description of the type and content of each Document produced therewith; (b) the paragraph number(s) of the CID request to which each such Document is responsive; (c) the Identity of the Custodian(s) of each such Document; and (d) the document control number(s) of each such Document.
- 12. Affidavit of Compliance. A copy of the Affidavit of Compliance provided herewith shall be completed and executed by all natural persons supervising or participating in compliance with this CID, and you shall submit such executed Affidavit(s) of Compliance with Your response to this CID.
- 13. Identification of Persons Preparing Production. In a schedule attached to the Affidavit of Compliance provided herewith, you shall Identify the natural person(s) who prepared or assembled any productions or responses to this CID. You shall further Identify the natural person(s) under whose personal supervision the preparation and assembly of productions and responses to this CID occurred. You shall further Identify all other natural person(s) able competently to testify: (a) that such productions and responses are complete and correct to the best of such person's knowledge and belief; and (b) that any Documents produced are authentic, genuine and what they purport to be.

- 14. Continuing Obligation to Produce. This CID imposes a continuing obligation to produce the Documents and information requested. Documents located, and information learned or acquired, at any time after your response is due shall be promptly produced at the place specified in this CID.
- 15. No Oral Modifications. No agreement purporting to modify, limit or otherwise vary this CID shall be valid or binding, and you shall not act in reliance upon any such agreement, unless an Assistant Attorney General confirms or acknowledges such agreement in writing, or makes such agreement a matter of record in open court.
- 16. Time Period. Except where otherwise stated, the time period covered by this CID shall be from April 1, 2010, through the date of the production.

D. Documents to be Produced

- For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning Exxon's development, planning, implementation, review, and analysis of research efforts to study CO₂ emissions (including, without limitation, from fossil fuel extraction, production, and use), and the effects of these emissions on the Climate, including, without limitation, efforts by Exxon to:
 - (a) analyze the absorption rate of atmospheric CO₂ in the oceans by developing and using Climate Models;
 - (b) measure atmospheric and oceanic CO₂ levels (including, without limitation, through work conducted on Exxon's *Esso Atlantic* tanker);
 - (c) determine the source of the annual CO₂ increment that has been increasing over time since the Industrial Revolution by measuring changes in the isotopic ratios of carbon and the distribution of radon in the ocean; and/or
 - (d) assess the financial costs and environmental consequences associated with the disposal of CO₂ and hydrogen sulfide gas from the development of offshore gas from the seabed of the South China Sea off Natuna Island, Indonesia.
- For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning papers prepared, and presentations given, by James F. Black, at times Scientific Advisor in the Products Research Division of Exxon Research and Engineering, author of, among others, the paper *The Greenhouse Effect*, produced in or around 1978.

- For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning the paper CO₂ Greenhouse Effect A Technical Review, dated April 1, 1982, prepared by the Coordination and Planning Division of Exxon Research and Engineering Company.
- 4. For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning the paper CO₂ Greenhouse and Climate Issues, dated March 28, 1984, prepared by Henry Shaw, including all Documents:
 - (a) forming the basis for Exxon's projection of a 1.3 to 3.1 degree Celsius average temperature rise by 2090 due to increasing CO₂ emissions and all Documents describing the basis for Exxon's conclusions that a 2 to 3 degree Celsius increase in global average temperature could:
 - Be "amplified to about 10 degrees C at the poles," which could cause "polar ice melting and a possible sea-level rise of 0.7 meter[sic] by 2080"
 - Cause redistribution of rainfall
 - Cause detrimental health effects
 - Cause population migration
 - (b) forming the basis for Exxon's conclusion that society could "avoid the problem by sharply curtailing the use of fossil fuels."
- 5. Documents and Communications with any of Acton Institute, AEI, Americans for Prosperity, ALEC, API, Beacon Hill Institute at Suffolk University, CEI, CIP, George C. Marshall Institute, The Heartland Institute, The Heritage Foundation, and/or Mercatus Center at George Mason University, concerning Climate Change and/or Global Warming, Climate Risk, Climate Science, and/or communications regarding Climate Science by fossil fuel companies to the media and/or to investors or consumers, including Documents and Communications relating to the funding by Exxon of any of those organizations.
- 6. For the time period from September 1, 1997, through the date of this production, Documents and Communications concerning the API's draft *Global Climate Science Communications Plan* dated in or around 1998.
- For the time period from January 1, 2007, through the date of this production, Documents and Communications concerning Exxon's awareness of, and/or response to, the Union of Concerned Scientists report Smoke, Mirrors & Hot Air: How ExxonMobil Uses Big Tobacco's Tactics to Manufacture Uncertainty on Climate Science, dated January 2007.

- For the time period from April 1, 1997, through the date of this production, Documents and Communications concerning the decision making by Exxon in preparing, and substantiation of, the following statements in the remarks *Energy – key to growth and a better environment for Asia-Pacific nations*, by then Chairman Lee R. Raymond to the World Petroleum Congress, Beijing, People's Republic of China, 10/13/97 (the "Raymond WPC Statements"):
 - It is highly unlikely that the temperature in the middle of the next century will be significantly affected whether policies are enacted now or 20 years from now. (Raymond WPC Statements, p. 11)
 - Forecasts of future warming come from computer models that try to replicate Earth's past climate and predict the future. They are notoriously inaccurate. None can do it without significant overriding adjustments. (Raymond WPC Statements, p. 10)
 - Proponents of the agreements [that could result from the Kyoto Climate Change Conference in December 1997] say they are necessary because burning fossil fuels causes global warming. Many people – politicians and the public alike – believe that global warming is a rock-solid certainty. But it's not. (Raymond WPC Statements, p. 8)
 - To achieve this kind of reduction in carbon dioxide emissions most advocates are talking about, governments would have to resort to energy rationing administered by a vast international bureaucracy responsible to no one. (Raymond WPC Statements, p. 10)
 - We also have to keep in mind that most of the greenhouse effect comes from natural sources, especially water vapor. Less than a quarter is from carbon dioxide, and, of this, only four percent of the carbon dioxide entering the atmosphere is due to human activities – 96 percent comes from nature. (Raymond WPC Statements, p. 9)
- 9. Documents and Communications concerning Chairman Rex W. Tillerson's June 27, 2012, address to the Council on Foreign Relations, including those sufficient to document the factual basis for the following statements:
 - Efforts to address climate change should focus on engineering methods to adapt to shifting weather patterns and rising sea levels rather than trying to eliminate use of fossil fuels.
 - Humans have long adapted to change, and governments should create policies to cope with the Earth's rising temperatures.

- Changes to weather patterns that move crop production areas around we'll adapt to that. It's an engineering problem and it has engineering solutions.
- Issues such as global poverty [are] more pressing than climate change, and billions of people without access to energy would benefit from oil and gas supplies.
- 10. Documents and Communications concerning Chairman Tillerson's statements regarding Climate Change and Global Warming, on or about May 30, 2013, to shareholders at an Exxon shareholder meeting in Dallas, Texas, including Chairman Tillerson's statement "What good is it to save the planet if humanity suffers?"
- 11. Documents and Communications concerning Chairman Tillerson's speech Unleashing Innovation to Meet Our Energy and Environmental Needs, presented to the 36th Annual Oil and Money Conference in London, England, 10/7/15 (the "2015 Oil and Money Conference Speech"), including Documents sufficient to demonstrate the factual basis for Chairman Tillerson's representation that Exxon's scientific research on Climate Change, begun in the 1970s, "led to work with the U.N.'s Intergovernmental Panel on Climate Change and collaboration with academic institutions and to reaching out to policymakers and others, who sought to advance scientific understanding and policy dialogue."
- Documents and Communications concerning any public statement Chairman Tillerson has made about Climate Change or Global Warming from 2012 to present.
- 13. Documents and Communications concerning changes in the design, construction, or operation of any Exxon facility to address possible variations in sea level and/or other variables, such as temperature, precipitation, timing of sea ice formation, wind speed, and increased storm intensity, associated with Climate Change, including but not limited to:
 - (a) adjustments to the height of Exxon's coastal and/or offshore drilling platforms; and
 - (b) adjustments to any seasonal activity, including shipping and the movement of vehicles.
- 14. Documents and Communications concerning any research, analysis, assessment, evaluation, Climate Modeling or other consideration performed by Exxon, or with funding provided by Exxon, concerning the costs for CO₂ mitigation, including,

without limitation, concerning the 2014 Exxon report to shareholders *Energy and Carbon – Managing the Risks* (the "2014 Managing the Risks Report").

- 15. Documents and Communications substantiating or refuting the following claims in the 2014 Managing the Risks Report:
 - [B]y 2030 for the 450ppm CO2 stabilization pathway, the average American household would face an added CO2 cost of almost \$2,350 per year for energy, amounting to about 5 percent of total before-tax median income. (p. 9)
 - These costs would need to escalate steeply over time, and be more than double the 2030 level by mid-century. (p. 9)
 - Further, in order to stabilize atmospheric GHG concentrations, these CO2 costs would have to be applied across both developed and undeveloped countries. (p. 9)
 - [W]e see world GDP growing at a rate that exceeds population growth through [the year 2040], almost tripling in size from what it was globally in 2000 [fn. omitted]. It is largely the poorest and least developed of the world's countries that benefit most from this anticipated growth. However, this level of GDP growth requires more accessible, reliable and affordable energy to fuel growth, and it is vulnerable populations who would suffer most should that growth be artificially constrained. (pp. 3 4)
 - [W]e anticipate renewables growing at the fastest pace among all sources through [the year 2040]. However, because they make a relatively small contribution compared to other energy sources, renewables will continue to comprise about 5 percent of the total energy mix by 2040. Factors limiting further penetration of renewables include scalability, geographic dispersion, intermittency (in the case of solar and wind), and cost relative to other sources. (p. 6)
 - In assessing the economic viability of proved reserves, we do not believe a scenario consistent with reducing GHG emissions by 80 percent by 2050, as suggested by the "low carbon scenario," lies within the "reasonably likely to occur" range of planning assumptions, since we consider the scenario highly unlikely. (p. 16)
- 16. Documents and Communications that formed the basis for the following statements in Exxon's January 26, 2016, press release on Exxon's 2016 Energy Outlook:

- In 2040, oil and natural gas are expected to make up nearly 60 percent of global supplies, while nuclear and renewables will be approaching 25 percent. Oil will provide one third of the world's energy in 2040, remaining the No. 1 source of fuel, and natural gas will move into second place.
- ExxonMobil's analysis and those of independent agencies confirms our long-standing view that all viable energy sources will be needed to meet increasing demand.
- The Outlook projects that global energy-related carbon dioxide emissions will peak around 2030 and then start to decline. Emissions in OECD nations are projected to fall by about 20 percent from 2014 to 2040.
- 17. Documents and Communications concerning any research, study, and/or evaluation by Exxon and/or any other fossil fuel company regarding the Climate Change Radiative Forcing Effect of natural gas (Methane), and potential regulation of Methane as a Greenhouse Gas.
- 18. Documents and Communications concerning Exxon's internal consideration of public relations and marketing decisions for addressing consumer perceptions regarding Climate Change and Climate Risks in connection with Exxon's offering and selling Exxon Products and Services to consumers in Massachusetts.
- 19. Documents and Communications concerning the drafting and finalizing of text, including all existing drafts of such text, concerning Greenhouse Gas Emissions and the issue of Climate Change or Global Warming filed with the U.S. Securities and Exchange Commission (the "SEC") by Exxon, including, without limitation, Exxon's Notices of Meeting; Form 10-Ks; Form 10-Qs; Form 8-Ks; Prospectuses; Prospectus Supplements; and Free Will Prospectuses; and/or contained in any offering memoranda and offering circulars from filings with the SEC under Regulation D (17 CFR § 230.501, et seq.).
- 20. Documents and Communications concerning Exxon's consideration of public relations and marketing decisions for addressing investor perceptions regarding Climate Change, Climate Risk, and Exxon's future profitability in connection with Exxon's offering and selling Securities in Massachusetts.
- Documents and Communications related to Exxon's efforts in 2015 and 2016 to address any shareholder resolutions related to Climate Change, Global Warming, and how efforts to reduce Greenhouse Gas Emissions will affect Exxon's ability to operate profitably.
- 22. For the time period from January 1, 2006, through the date of this production, Documents and Communications concerning Exxon's development of its program

for Sustainability Reporting addressing Climate Change and Climate Risk, including, without limitation, regarding Exxon's annual "Corporate Citizenship Report" and Exxon's "Environmental Aspects Guide."

- 23. Documents and Communications concerning information exchange among Exxon and other companies and/or industry groups representing energy companies, regarding marketing of energy and/or fossil fuel products to consumers in light of public perceptions regarding Climate Change and Climate Risk.
- 24. Exemplars of all advertisements, flyers, promotional materials, and informational materials of any type, including but not limited to web-postings, blog-posts, social media-postings, print ads (including ads on op-ed pages of newspapers), radio and television advertisements, brochures, posters, billboards, flyers and disclosures used by or for You, Your employees, agents, franchisees or independent contractors to solicit or market Exxon Products and Services in Massachusetts, including but not limited to:
 - A copy of each print advertisement placed in the Commonwealth;
 - A DVD format copy of each television advertisement that ran in the Commonwealth;
 - An audio recording of each radio advertisement and audio portion of each internet advertisement;
 - A copy of each direct mail advertisement, brochure, or other written promotional materials;
 - A printout, screenshot or copy of each advertisement, information, or communication provided via the internet, email, Facebook, Twitter, You Tube, or other electronic communications system; and/or
 - A copy of each point-of-sale promotional material used by You or on Your behalf.
- 25. Documents and Communications sufficient to show where each of the exemplars in Demand No. 24 was placed and the intended or estimated consumers thereof, including, where appropriate, the number of hits on each internet page and all Commonwealth Internet Service Providers viewing same.
- 26. Documents and Communications substantiating the claims made in the advertisements, flyers, promotional materials, and informational materials identified in response to Demand Nos. 22 through 24.
- 27. Documents and Communications concerning Your evaluation or review of the impact, success or effectiveness of each Document referenced in Demand Nos. 22 through 24, including but not limited to Documents discussing or referring in any way to: (a) the effects of advertising campaigns or communications; (b) focus groups; (c) copy tests; (d) consumer perception; (e) market research; (f) consumer

research; and/or (g) other study or survey or the reactions, perceptions, beliefs, attitudes, wishes, needs, or understandings of potential consumers of Exxon Products and Services in light of public perceptions of Climate Change, Greenhouse Gas Emissions, and Climate Risk.

- 28. Documents sufficient to show Exxon's organizational structure and leadership over time, including but not limited to organizational charts, reflecting all Exxon Entities in any way involved in:
 - (a) the marketing, advertisement, solicitation, promotion, and/or sale of Exxon Products and Services to consumers in the Commonwealth; and/or
 - (b) the marketing, advertisement, solicitation, promotion, and/or sale to investors of Exxon Securities in the Commonwealth.
- 29. Documents and Communications sufficient to identify each agreement entered into on or after April 1, 2010, through the present, between and among Exxon and the Commonwealth of Massachusetts, its agencies, and/or its political subdivisions, for Exxon to provide Exxon Products and Services in Massachusetts.
- 30. Documents sufficient to identify all claims, lawsuits, court proceedings and/or administrative or other proceedings against You in any jurisdiction within the United States concerning Climate Change and relating to Your solicitation of consumers of Exxon Products and Services and/or relating to Your solicitation of consumers of Exxon Securities, including all pleadings and evidence in such proceedings and, if applicable, the resolution, disposition or settlement of any such matters.
- 31. Documents sufficient to identify and describe any discussion or consideration of disclosing in any materials filed with the SEC or provided to potential or existing investors (e.g., in prospectuses for debt offerings) information or opinions concerning the environmental impacts of Greenhouse Gas Emissions, including, without limitation, the risks associated with Climate Change, and Documents sufficient to identify all Persons involved in such consideration.
- 32. Transcripts of investor calls, conferences or presentations given by You at which any officer or director spoke concerning the environmental impacts of Greenhouse Gas Emissions, including, without limitation, the risks associated with Climate Change.
- 33. Documents and Communications concerning any subpoena or other demand for production of documents or for witness testimony issued to Exxon by the New

York State Attorney General's Office concerning Climate Change and Your marketing of Exxon Products and Services and/or Exxon Securities, including, through the date of Your production in response to this CID, all Documents produced to the New York State Attorney General's Office pursuant to any such subpoena or demand.

- 34. Documents sufficient to Identify all other federal or state law enforcement or regulatory agencies that have issued subpoenas or are otherwise currently investigating You concerning Your marketing of Exxon Products and Services to consumers and/or of Exxon Securities to investors.
- 35. Documents sufficient to Identify any Massachusetts consumer who has complained to You, or to any Massachusetts state or local consumer protection agency, concerning Your actions with respect to Climate Change, and for each such consumer identified, documents sufficient to identify each such complaint; each correspondence between You and such consumer or such consumer's representative; any internal notes or recordings regarding such complaint; and the resolution, if any, of each such complaint.
- 36. Documents and communications that disclose Your document retention policies in effect between January 1, 1976 and the date of this production.
- 37. Documents sufficient to Identify Your officers, directors and/or managing agents, or other persons most knowledgeable concerning the subject matter areas enumerated in <u>Schedule B</u>, below.
- Documents sufficient to identify all natural persons involved in the preparation of Your response to this CID.

SCHEDULE B

Pursuant to the terms of this CID, you are commanded to produce one or more witnesses at the above-designated place and time, or any agreed-upon adjourned place and time, who is or are competent to testify as to the following subject matter areas:

- Your compliance with Massachusetts General Law Chapter 93A, § 2, and the regulations promulgated thereunder concerning, the marketing, advertising, soliciting, promoting, and communicating or sale of: (1) Exxon Products and Services in the Commonwealth and/or to Massachusetts residents; and (2) Securities in the Commonwealth and/or to Massachusetts residents.
- 2. The marketing, advertising, soliciting, promoting, and communicating or sale of Exxon Products and Services in the Commonwealth and/or to Massachusetts residents, including their environmental impacts with respect to Greenhouse Gas Emission, Climate Change and/or Climate Risk.
- 3. The marketing, advertising, soliciting, promoting, and communicating or sale of Securities in the Commonwealth and/or to Massachusetts residents, including as to Exxon's disclosures of risks to its business related to Climate Change.
- 4. All topics covered in the demands above.
- 5. Your recordkeeping methods for the demands above, including what information is kept and how it is maintained.
- 6. Your compliance with this CID.

SCHEDULE C

CHAPTER 93A. REGULATION OF BUSINESS PRACTICES FOR CONSUMERS PROTECTION

Chapter 93A: Section 7. Failure to appear or to comply with notice

Section 7. A person upon whom a notice is served pursuant to the provisions of section six shall comply with the terms thereof unless otherwise provided by the order of a court of the commonwealth. Any person who fails to appear, or with intent to avoid, evade, or prevent compliance, in whole or in part, with any civil investigation under this chapter, removes from any place, conceals, withholds, or destroys, mutilates, alters, or by any other means falsifies any documentary material in the possession, custody or control of any person subject to any such notice, or knowingly conceals any relevant information, shall be assessed a civil penalty of not more than five thousand dollars.

The attorney general may file in the superior court of the county in which such person resides or has his principal place of business, or of Suffolk county if such person is a nonresident or has no principal place of business in the commonwealth, and serve upon such person, in the same manner as provided in section six, a petition for an order of such court for the enforcement of this section and section six. Any disobedience of any final order entered under this section by any court shall be punished as a contempt thereof.

SCHEDULE D

See attached "Office of the Attorney General - Data Delivery Specification."

AFFIDAVIT OF COMPLIANCE WITH CIVIL INVESTIGATIVE DEMAND

State of

County of

I, _____, being duly sworn, state as follows:

1. I am employed by ______ in the position of

- The enclosed production of documents and responses to Civil Investigative Demand 2016-EPD-36 of the Attorney General of the Commonwealth of Massachusetts, dated April 19, 2016 (the "CID") were prepared and assembled under my personal supervision;
- 3. I made or caused to be made a diligent, complete and comprehensive search for all Documents and information requested by the CID, in full accordance with the instructions and definitions set forth in the CID;
- 4. The enclosed production of documents and responses to the CID are complete and correct to the best of my knowledge and belief;
- 5. No Documents or information responsive to the CID have been withheld from this production and response, other than responsive Documents or information withheld on the basis of a legal privilege or doctrine;
- 6. All responsive Documents or information withheld on the basis of a legal privilege or doctrine have been identified on a privilege log composed and produced in accordance with the instructions in the CID;
- 7. The Documents contained in these productions and responses to the CID are authentic, genuine and what they purport to be;
- 8. Attached is a true and accurate record of all persons who prepared and assembled any productions and responses to the CID, all persons under whose personal supervision the preparation and assembly of productions and responses to the CID occurred, and all persons able competently to testify: (a) that such productions and responses are complete and correct to the best of such person's knowledge and belief; and (b) that any Documents produced are authentic, genuine and what they purport to be; and
- 9. Attached is a true and accurate statement of those requests under the CID as to

which no responsive Documents were located in the course of the aforementioned search.

Signature of Affiant

Date

Printed Name of Affiant

Subscribed and sworn to before me

this day of 2016.

Notary Public My commission expires:



I. General

- Images produced to the Office of the Attorney General should be single page series IV TIFF images, 300 dpi or better quality. TIFFs may be Black & White or color.
- Bates Numbers should be placed in the lower right hand corner unless to do so would obscure the underlying image. In such cases, the Bates number should be placed as near to that position as possible while preserving the underlying image. Bates numbers should contain no spaces, hyphens or underscores. Example: AG0000000001.
- Spreadsheets and Powerpoint ESI should be produced as native ESI and name for the bates number associated with the first page of the item. If the item has a confidentiality designation, please *DO NOT* append it to the bates numbered file name. The designation should be stored in a field in the DAT.
- For any ESI that exists in encrypted format or is password-protected, instructions on means for access should be provided with the production to the AGO. (For example, by supplying passwords.)
- 5. All records should include at least the following fields of created data:
 - a. Beginning Bates Number (where TIFF Images are produced)
 - b. Ending Bates Number
 - c. Beginning Attachment Range
 - d. Ending Attachment Range
 - e. RemovedFrom: If records were globally deduplicated, this field should contain a concatenated list of all custodians or sources which originally held the item.
 - f. MD5 Hash or other hash value
 - g. Custodian / Source
 - h. Original file path or folder structure
 - i. FamilyID
 - j. Path/Link to natives
 - k. Path/Link to text files (do not produce inline text in the dat file)
 - I. Redacted Bit Character field (1 or 0 where 1=Yes and 0=No)
 - m. Production date
 - n. Volume name
 - o. Confidentiality or other treatment stamps
- 6. Email should be produced with at least the following fields of metadata:
 - a. TO
 - b. FROM
 - c. CC
 - d. BCC
 - e. Subject
 - f. Path to text file (do not produce inline text in the dat file)

- g. Sent Date (dates and times must be stored in separate fields)
- h. Sent Time (dates and times must be stored in separate fields and without time zones)
- i. File extension (.txt, .msg, etc.)
- j. Attachment count.
- 7. eFiles should be produced with at least the following individual fields of metadata:
 - a. Author
 - b. CreateDate (dates and times must be stored in separate fields)
 - c. CreateTime (dates and times must be stored in separate fields with no time zones or am/pm)
 - d. LastModifiedDate (dates and times must be stored in separate fields)
 - LastModifiedTime (dates and times must be stored in separate fields with no time zones or am/pm).
- 8. Deduplication (Removed From data field)
 - a. If the producing entity wishes to deduplicate, exact hash value duplicates may be removed on a global basis if the producing entity provides a field of created data for each deduplicated item that provides a concatenated list of all custodians or other sources where the item was original located. This list should be provided in the RemovedFrom data field.
 - Any other form of deduplication must be approved in advance by the Office of the Attorney General.
- II. File Types and Load File Requirements
 - a. File Types

Data: Text, images and native files should each be delivered as subfolders in a folder named "DATA". See screen shot "Example Production Deliverable."

- Images: Single page TIFF images delivered in a folder named "IMAGES."
- Text: Multipage text files (one text file per document), delivered in a folder named "TEXT."
- Natives: Delivered in a folder named 'NATIVES".

Load Files: Concordance format data load file and Opticon format image load file should be delivered in a folder named LOAD (at the same level as the folder DATA in the structure). See screen shot "Example Production Deliverable."



b. Fields to be Produced in ONE Data Load File - Concordance Format-

Field Name	Description/Notes
BegBates	Starting Bates Number for document
EndBates	Ending Bates Number for document
BegAttach	Starting Bates Number of Parent document
EndAttach	Ending Bates Number of last attachment in family
FamilyID	Parent BegBates
Volume	Name of Volume or Load File
MD5Hash	
Custodian_Source	If the source is a human custodian, please provide the name: Last name, first name. If this results in duplicates, add numbers or middle initials Last name, first name, middle initial or # If the source is not a human custodian, please provide a unique name for the source. Ex: AcctgServer
FROM	Email
то	Email
CC	Email
BCC	Email
Subject	Email
Sent Date	Email
Sent Time	Email
File Extension	
Attch Count	Email
Doc Type	Email, attachment
Original FilePath	Original location of the item at time of Preservation.
FileName	
CreateDate	Loose files or attachments. Date and Time must be in separate fields.
CreateTime	Loose files or attachments. Date and Time must be in separate fields and the Time field should not include Time Zone (EDT, EST etc)
LastModDate	Loose files or attachments (Date and Time must be in separate fields)
LastModTime	Loose files or attachments. Date and Time must be in separate fields and the Time field should not include Time Zone (EDT, EST, AM, PM etc)
Redacted	This is a Boolean/bit character field. Data value should be "0" or "1" where 0 = No and 1=Yes.
Confidentiality Designation	NOTE: Do not append the Confidentiality Designation to the native file name
RemovedFrom	Last name, first name with semi colon as separator Lastname, firstname; nextlastname, nextfirstname etc.

Encrypted_pwp	This is a single character field. Data value should be "N" or "Y". (File is or is not encrypted/password protected)
EncryptKey_password	For those files where Encrypted_pwp is Y, provide password or encryption key information in this field.
ProdDate	MM\DD\YYYY
TextLink	path to the text files should begin with TEXT\
NativeLink	path to the native files should begin with NATIVES\

The Data load file for ONE is the same as a Concordance load file, with the same field delimiters () and text qualifiers (b). Here is a screen shot of part of a ONE load file with the fields identified above:

begBatesb[bEndSatesb[bEndSatesb]bEndAttachb]bEndAttachb]bFamilyIDp[bY01umsb]bHD5Hasbb]bCustodian_Sourceb[bERChp[bCOp[bCOp[bCOp[bSCD]bSubjectb]bSent Timeb[bFile Extensionb]bD pAc000004507b]bAG00004510p[bAG00004507b]bAG00004507b]bAG00004507b]bV0L001b]bp[bD0e, Johnb]bjohndoe@someplace.comb]bjdoe@somewhereelse.comb]btheboss@someplace.comb]bb]baG00004511b]bAG000045507b]bAG000045512b]bAG000045512b]bAG000045512b]bAG00004552b]bAG000004552b]bAG000004502b]bAG000004502b]bAG000004502b]bAG000004502b]bAG000004502b]bAG000004502b]bAG000004502b]bAG0000004502b]bAG0000004502b]bAG000004502b]bAG0000004502b]bAG000

c. Fields required for an Images Load File - Opticon Format

The Images load file for ONE is the same as an OPTICON load file. It contains these fields, although Folder Break and Box Break are often not used.

Field Name	Description/Notes
Alias	Imagekey/Image link - Beginning bates or ctrl number for the document
Volume	Volume name or Load file name
Path	relative path to Images should begin with IMAGES\ and include the full file name and file extension (tif, jpg)
Document Break	Y denotes image marks the beginning of a document
Folder Break	N/A - leave blank
Box Break	N/A - leave blank
Pages	Number of Pages in document

Here is a screen shot of an opticon load file format in a text editor with each field separated by a comma. Alias, Volume, Path, Document Break, Folder Break (blank), Box Break (blank), Pages.

AG000004507, V0L001, IMAGES\00\00\AG000004507.TIF,Y,,,4 AG000004508, V0L001, IMAGES\00\00\AG000004508.TIF,,,, AG000004509, V0L001, IMAGES\00\00\AG000004508.TIF,,,, AG000004510, V0L001, IMAGES\00\00\AG000004511.TIF,Y,,2 AG000004511, V0L001, IMAGES\01\00\AG000004511.TIF,Y,,2

Technical questions regarding this specification should be addressed to:

Diane E. Barry AAG / eDiscovery Attorney Office of the Attorney General One Ashburton Place Boston MA 02108 Diane.E.Barry@state.ma.us

(617) 963-2120

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Exhibit 10

TOLLING AGREEMENT

This Tolling Agreement ("AGREEMENT") is entered into by and between the Attorney General of the Commonwealth of Massachusetts (the "COMMONWEALTH") and Exxon Mobil Corporation, its predecessors, successors, assigns, subsidiaries, parents, and affiliates (collectively, "EXXON MOBIL" or the "COMPANY"). The COMMONWEALTH and EXXON MOBIL are referred to collectively herein as the "PARTIES." This AGREEMENT is entered into with reference to the following facts and circumstances:

WHEREAS on April 19, 2016, the COMMONWEALTH served a Civil Investigative Demand, No. 2016-EPD-36 (the "CID"), invoking Massachusetts General Laws c. 93A, § 6, on EXXON MOBIL, by hand delivery to the COMPANY's registered agent in Massachusetts;

WHEREAS it is the COMMONWEALTH's position that the CID relates to a pending investigation (the "INVESTIGATION") concerning potential violations by EXXON MOBIL of M.G.L. c. 93A, § 2, and the regulations promulgated thereunder arising both from (1) the marketing and/or sale of energy and other fossil fuel derived products to consumers in the COMMONWEALTH; and (2) the marketing and/or sale of securities, as defined in M.G.L. c. 110A, § 401(k), to investors in the COMMONWEALTH, including, without limitation, fixedand floating rate-notes, bonds, and common stock, sold or offered to be sold in the COMMONWEALTH;

WHEREAS on June 15, 2016, EXXON MOBIL filed a Complaint for Declaratory and Injunctive Relief, as well as a Motion for a Preliminary Injunction, challenging the issuance of the CID, in the United States District Court for the Northern District of Texas, Fort Worth Division, No. 4:16-CV-469-K (the "TEXAS FEDERAL COURT CHALLENGE"); WHEREAS on June 16, 2016, EXXON MOBIL filed a motion and petition, challenging the issuance of the CID, in the Massachusetts Suffolk Superior Court, Civil Action No. 16-1888F (the "MASSACHUSETTS STATE COURT CHALLENGE");

WHEREAS the PARTIES agree that any time limit for the assertion of any claims arising from the INVESTIGATION that have not expired as of the EFFECTIVE DATE (as defined below) be tolled and postponed;

WHEREAS the COMMONWEALTH agrees that, with the exception of seeking the dismissal of the TEXAS FEDERAL COURT CHALLENGE and litigating any cross-motion to compel compliance in the MASSACHUSETTS STATE COURT CHALLENGE, and in consideration of EXXON MOBIL's entering into this AGREEMENT, the COMMONWEALTH will not seek to enforce the CID until both the TEXAS FEDERAL COURT CHALLENGE and the MASSACHUSETTS STATE COURT CHALLENGE have been fully adjudicated, including through appeal;

NOW THEREFORE, the PARTIES hereby agree, in consideration of the foregoing and the mutual covenants contained herein, to be legally bound as follows:

- The EFFECTIVE DATE of this AGREEMENT is June 18, 2016 (the "EFFECTIVE DATE").
- 2. The PARTIES agree that with respect to any claims that might be brought by the COMMONWEALTH related to the INVESTIGATION, all limitations-period or time-related defenses, either in law or in equity, including but not limited to statute of limitations, statute of repose, and doctrines of laches ("TIME-RELATED DEFENSES"), are tolled for the period beginning on the EFFECTIVE DATE and during the pendency of the TEXAS FEDERAL COURT CHALLENGE and the MASSACHUSETTS STATE COURT CHALLENGE, through a date sixty (60) days after the date both the TEXAS FEDERAL COURT CHALLENGE and the MASSACHUSETTS STATE COURT CHALLENGE have been fully adjudicated, including through appeal;
- 3. The COMMONWEALTH agrees that, with the exception of seeking the dismissal of the TEXAS FEDERAL COURT CHALLENGE and litigating any cross-motion to
compel compliance in the MASSACHUSETTS STATE COURT CHALLENGE, it will not seek to enforce the CID and EXXON MOBIL need not comply with the CID until both the TEXAS FEDERAL COURT CHALLENGE and the MASSACHUSETTS STATE COURT CHALLENGE have been fully adjudicated, including through appeal;

- 4. This AGREEMENT shall not preclude EXXON MOBIL from asserting TIME-RELATED DEFENSES as to any claims that were time-barred before the EFFECTIVE DATE, if any such claims exist, and this AGREEMENT shall not revive any of the COMMONWEALTH's claims that were time-barred before the EFFECTIVE DATE, if any such claims exist;
- 5. Entry into this AGREEMENT by the COMMONWEALTH does not in any way limit the COMMONWEALTH's ability or right to assert in any suit or claim brought against EXXON MOBIL that the doctrine of fraudulent concealment, misrepresentation, and/or breach of any duty to disclose or any other doctrine or statute, may be applicable to toll or otherwise affect the running of any TIME-RELATED DEFENSE with respect to any cause of action arising out of or relating to the INVESTIGATION, or that no statute of limitation applies to claims brought by the COMMONWEALTH, subject to any applicable defenses by EXXON MOBIL to such arguments;
- 6. The AGREEMENT shall be governed, construed, enforced, and administered in accordance with the laws of the State of Massachusetts;
- The AGREEMENT constitutes the entire agreement between the PARTIES with respect to the claims and matters covered. No prior statement, representation, promise, or inducement made by any PARTY on this subject matter that is not contained in this AGREEMENT shall be valid or binding;
- The COMMONWEALTH and EXXON MOBIL represent and warrant that each has the full legal power and authority to bind each of the PARTIES, respectively;
- This AGREEMENT shall not be altered or amended except in writing signed by the PARTIES;
- This AGREEMENT may be executed by facsimile signature and in counterparts, each
 of which shall be deemed an original and all of which together shall constitute one
 and the same instrument;
- This AGREEMENT shall be binding on the PARTIES and their predecessors, successors, assigns, subsidiaries, parents, and affiliates;
- The COMMONWEALTH and EXXON MOBIL each represents that it has the legal power, capacity and authority to enter into this AGREEMENT;

- 13. The COMMONWEALTH's entry into this AGREEMENT shall not waive or in any way impair any defense that the COMMONWEALTH might raise in the TEXAS FEDERAL COURT CHALLENGE, including sovereign immunity, Eleventh Amendment immunity and lack of personal jurisdiction, among others;
- 14. EXXON MOBIL's entry into this AGREEMENT shall not waive or in any way impair any claims or defenses that it might raise in the TEXAS FEDERAL COURT CHALLENGE or the MASSACHUSETTS STATE COURT CHALLENGE, except as expressly set forth herein with respect to TIME-RELATED DEFENSES;
- 15. The PARTIES agree that, other than to enforce the terms of this AGREEMENT, neither party shall use the AGREEMENT, the fact of its existence, or any of its terms to support any claim or argument in the TEXAS FEDERAL COURT CHALLENGE, the MASSACHUSETTS STATE COURT CHALLENGE, or in any other litigation between the PARTIES.

On behalf of Exxon Mobil Corporation

Date: 4 24 16

By: Justin Anderson

Paul, Weiss, Rifkind, Wharton & Garrison LLP Thomas Frongillo Fish & Richardson, P.C. Counsel for Exxon Mobil Corporation

On behalf of the Commonwealth of Massachusetts

Date: 6/24/14

By: I. Andrew Goldberg

Assistant Attorney General Office of the Attorney General Commonwealth of Massachusetts

Exhibit 11

INFORMATIONAL ALERT

Public Health - Related Alerts

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PRESS RELEASE

AG Healey Sues Exxon for Deceiving Massachusetts Consumers and Investors

Massachusetts Becomes First State to Challenge Company's Ongoing Campaign to Mislead Both Consumers and Investors About the Climate-Driven Risks Posed by its Fossil Fuel Products

FOR IMMEDIATE RELEASE: 10/24/2019 Office of Attorney General Maura Healey

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BOSTON – Massachusetts Attorney General Maura Healey today sued Exxon Mobil Corporation (Exxon), the world's largest publicly traded oil and gas company, for deceptive advertising to Massachusetts consumers and for misleading Massachusetts investors about the risks to Exxon's business posed by fossil fuel-driven climate change—including systemic financial risk.

The **complaint**

(/files/documents/2019/10/24/Complaint%20-%20Comm.%20v.%20Exxon%20Mobil%20Corporation%20-%2010-24-19.pdf), filed today in Suffolk Superior Court, alleges that Exxon has repeatedly violated the state's consumer and investor protection law and related regulations. Specifically, the complaint alleges that Exxon systematically and intentionally has misled Massachusetts investors about material climate-driven risks to its business and has deceived consumers about the central role its fossil fuel products play in causing climate change. The complaint alleges that Exxon's violations have taken the form of both significant factual misstatements and the failure to make disclosures to investors and consumers that would have been material to decisions by Massachusetts investors to purchase, sell, retain, and price ExxonMobil securities and by Massachusetts consumers to purchase ExxonMobil oil and gasoline products.

"Exxon has known for decades about the catastrophic climate impacts of burning fossil fuels—its chief product," said AG Healey. "Yet, to this day, Exxon continues to deceive Massachusetts consumers and investors about the dangerous climate harms caused by its oil and gasoline products and the significant risks of climate change—and efforts to address it—to Exxon's business. We are suing to stop this illegal deception and penalize the company for its misconduct."

As early as 1982, Exxon predicted the exact amount of carbon dioxide (CO₂) that would be in the atmosphere in 2019—415 parts per million, the highest level in human history, as a result, largely, of increasing fossil fuel use. Exxon also recognized decades ago that reducing emissions and maintaining a safe climate would require "sharply curtailing the use of fossil fuels." One of the company's own scientists described the consequences of climate change as "catastrophic." However, rather than disclosing what it knew about the future impact of its oil and gasoline products on communities and the environment, the complaint alleges that Exxon engaged in a decades-long campaign to deceive consumers and investors about the climate-related impacts of its products that continues to this day.

AG Healey Sues Exxon for Deceiving Massachusetts Consumers and Investors | Mass.gov

The complaint alleges that Exxon has hidden from investors its own knowledge of the systemic financial risk of climate change to the global economy and to Exxon's fossil fuel business. Citing internal Exxon documents, the complaint alleges that in 1980, an expert retained by Exxon presented findings to Exxon that the projected rise in global temperatures caused by burning fossil fuels would have "major economic consequences," even "bring[ing] world economic growth to a halt." The complaint alleges that such systemic impacts to the global economy, which regulators and central banks are now predicting will impact home values, bank lending, and insurance, will have a significant effect on Exxon's business around the world, and its shareholders in Massachusetts. Although major global companies are now disclosing \$1 trillion dollars in climate-related costs, the complaint alleges that Exxon has failed to disclose any such estimates to investors, in violation of Massachusetts law.

The complaint also alleges that, since 2007, the company has illegally misrepresented to its investors that it has factored in to its financial planning and investment decisions the cost of complying with carbon regulations, the so-called "proxy cost of carbon," when internal documents show that it has not done so. This deception misled Massachusetts investors by inflating the value of the company's portfolio of oil and gas projects around the world, including its high-cost and heavily polluting oil sands assets in western Canada.

According to the complaint, the company is also engaging in an ongoing campaign to deceive Massachusetts consumers, including the drivers who use the nearly 300 Exxon-branded gas stations in Massachusetts, by making misleading statements in its advertising that its gasoline and diesel products, sold under the name "Synergy," and its so-called "green" Mobil 1 oil products reduce greenhouse gas emissions. The company claims these products "reduce energy use and CO2 emissions," and enhance "environmental performance." In fact, development and use of these fossil fuel products emit large volumes of greenhouse gases, which are causing global average temperatures to rise and destabilizing the global climate system. The complaint alleges that it is deceptive for Exxon to market fossil fuel products as a climate solution.

The AG's Office is further alleging that the company violates Massachusetts law through a deceptive "greenwashing" marketing campaign that misleadingly presents Exxon as a leader in cutting-edge clean energy research and climate action. The complaint alleges that Exxon's advertisements and related marketing target consumers with deceptive messaging about Exxon as a good environmental steward and of its products as "green" while the company is massively ramping up fossil fuel production and spending only about one-half of 1% of revenues on developing clean energy.

The AG's Office alleges that the company's misleading statements to consumers and investors about its fossil fuel products and its failure to disclose that the products themselves are disrupting the climate "are particularly deceptive given the stark contrast between the company's long internal knowledge of the role its fossil fuel products play in causing climate change and the extensive marketing statements in which the company promotes the purported environmental benefits of those same products." Exxon's unlawful conduct, the complaint alleges, contributed to decades of delay in market recognition of the climate dangers of fossil fuel products and the urgent need to reduce greenhouse gas emissions.

AG Healey first served the company with a civil investigative demand

(/files/documents/2016/10/op/ma-exxon-cid-.pdf) in April 2016, after the release of several detailed national news stories outlining the company's decades-long pattern of deception regarding its knowledge about the impact of burning fossil fuels on the climate and the impacts of climate change on its own business. Rather than comply with the investigation, the company sued the AG's Office in Massachusetts state court and federal court.

Exxon's attacks on the AG's Office and its investigation have been rejected by every court to decide them. In January 2017, the Massachusetts Superior Court <u>ordered</u> (/files/documents/2017/01/px/order-on-emergency-motion-superior-court.pdf) the company to comply with the AG's investigation. The Massachusetts <u>Supreme Judicial Court</u> (/news/statement-from-ag-healey-on-victory-over-exxon-in-massachusetts-supreme-court) upheld the ruling in April 2018, and that same month, the Southern District of New York <u>dismissed</u> (/files/documents/2018/03/29/Exxon%20SDNY%20Decision.pdf) Exxon's federal lawsuit. In January, the U.S. Supreme Court denied Exxon's request to hear its appeal of the Supreme Judicial Court ruling. While Exxon's litigation against AG Healey's Office has been pending, AG Healey has continued her investigation of the company's deceptive practices.

By filing the lawsuit, AG Healey is asking the Court to find that the company is violating the state's Consumer Protection Act and order the company to pay civil penalties to the state, perform comprehensive injunctive relief, and pay the AG's Office's reasonable attorney and investigation fees.

This matter is being handled by AG Healey's Energy & Environment Bureau with assistance from her Office's Insurance & Financial Services Division and Consumer Protection Division.

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Office of Attorney General Maura Healey

(/orgs/office-of-attorney-general-maura-healey)

Attorney General Maura Healey is the chief lawyer and law enforcement officer of the Commonwealth of Massachusetts.

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Exhibit 12

COUNCIL on FOREIGN RELATIONS

CEO Speaker Series: A Conversation with Rex W. Tillerson

Wednesday, June 27, 2012

Speaker

Rex W. Tillerson Chairman and Chief Executive Officer, Exxon Mobil Corporation

Presider

Alan S. Murray Deputy Managing Editor and Executive Editor, Online, *Wall Street Journal*

CEO Speaker Series

ALAN MURRAY: Thank you. I want to welcome everyone to today's CFR meeting, which is part of the CEO Speaker Series. I also want to remind you to completely turn off -- not just put on vibrate, but completely turn off your cellphones. And I can see that there's a bunch of avid tweeters in this audience. I'm sorry, you're not going to be able tweet today. Also remind you that this session is an on-the-record – on-the-record session.

Our guest this morning really needs no introduction. Rex Tillerson is the CEO of Exxon Mobil, the largest publicly traded oil company in the world. He's been in that position for six years. He was responsible for the big move into natural gas, the \$30 billion acquisition of XTO Energy in 2009. In his new book, "Private Empire," Steve Coll refers to Exxon Mobil as a corporate state within the American state, with its own intricate web of international relations and, in a sense, its own foreign policy. So I think it's particularly fitting that Rex Tillerson is speaking to this group at the Council on Foreign Relations today.

He will speak for 15 minutes, then he and I will have a conversation up here for about 10 minutes or so, and then we'll open it up to your questions.

Mr. Tillerson. (Applause.)

REX TILLERSON: Thank you, Alan. And, Richard, thank you for the invitation to speak and address this group this morning. I spoke to this group – I guess it's now been about five years ago, 2007. I was looking back and at that time talked about U.S. energy security, talked a little bit about, you know, how I thought our nation could strengthen trade in energy supplies through broader engagement, through education of the public on the importance of energy and how it affects their daily lives.

So here we are five years later. And you go back to 2007 – now, these issues are still important today, obviously, but when I last had the opportunity to speak, a lot of things have happened since then. You know, oil prices from 2007, on the strength of a very robust global economy and a very robust emerging China, many of you will recall, ramped up to near \$150 a barrel. Then we had the financial – U.S. financial collapse. Oil prices collapsed all the way down to \$40 a barrel.

Now, there's been in a prolonged recession and a kind of stumbling along economy, but China and other parts of the world have continued to do well with their economies, although slowing today, and oil prices crept their way back up to 120 (dollars), \$130 Brent, and now with the overhang of the European economic problems, China beginning to slow a bit, which all of us I'm sure are seeing, prices pulling back in response to some weakening – or weak demand, but also in response to a surge in supply. And I'm going to talk a little bit about that surge in supply.

So that's what's happened with oil prices, you know, during that time – (inaudible) – a little bit of demand. Well, in response to that demand and in response to those high prices – and this is the way things work in our industry; everything has fairly lengthy timelines – but the industry did respond to those high prices. The Saudis made massive investments to increase their capacity to meet that demand, because what shot those prices up, if you recall, to \$150 was a – was a shrinking surplus in global capacity. There's always been a big of a surplus that was fairly recognizable by the market. And that had shrunk to less than 2 million barrels – somewhere in the million to million and a half barrel range. And the markets were very nervous about the absence of that surplus.

So the Saudis invested heavily, developed an additional roughly 2 to 2 1/2 million barrels a day of capacity, which they have been using of late to stabilize markets, and such that through that period of time, even throughout a lot of supply disruptions, the events in Libya, the Arab Spring, the uncertainties that have existed in the marketplace for a whole host of reasons, the markets have remained well supply (sic). No one anywhere, any place in the world, has not been able to get the crude oil they normally would need to fuel their economy.

So I think it's important to keep that in your mind and maintain that context; that, you know, these prices, while they swing around a lot, the system's quite efficient and it's quite effective at allocating the supplies that are available, even when they get very tight.

Now the second thing that's happened in response to that supply is what -- is what I'm going to talk a bit this morning, is what's gone on here in North America, which has been, I think, nothing short of extraordinary. And I would be less than honest if I were to say to you, and we saw it all coming, because we did not, quite frankly. We did recognize the potential of the shale resources in North America. We recognized there was technology solutions to a portion of that. We grossly

underestimated the capacity of both the rocks, the capacity of the technology to release the hydrocarbon, natural gas from the shale gas and now oil from tight oil rocks. We underestimated just how effective that technology was going to be, and we also underestimated how rapidly the deployment of that technology would occur – again, all in response to fairly high prices. Again, think back to natural gas prices in the United States. We were up in the 6 to 9 to higher dollar per Btu, dollar per KCF range, you know, depending on the time of the year or the seasons.

So again, market's pretty effective with our industry. Markets sends us a signal. People go out; they take risk; they find a way to develop resources that were previously not accessible, not available because of technological reasons. Now we've got a lot of other resource capacity that's not available for political reasons, but I'm just talking about when the industry has access to rocks, to ground, the places we can work, it has always demonstrated the ability to respond to the market's price signals.

It takes a little time. That's why you get these gyrations in prices, because they're not perfectly matched. But over long periods of time, that system has worked quite effectively to ensure the world always has the energy it needs.

So this morning I want to make a few comments about this – transformative technologies that have enabled us to unlock a whole new array of resource capacity, oil and natural gas, in North America, the United States most particularly. But I want to talk a bit this morning in a North American context because, as I think about the future of energy policy for the United States, I think almost everyone would agree that the real objective is energy security. There's a lot of – a lot of talk about energy independence, and people tend to get words interchanged. They're quite different. Energy independence and energy security are really two different things. And I think what the U.S. policy and what's in the best interest of American consumers has been and should be – is securing access to energy in a reliable, relatively affordable way. And if we're able to do that, where it comes from should be of little consequence to us, if it's reliable, if I have a system of policies that ensure I have reliable, affordable sources of energy.

If you don't like the people you're buying it from, that's a different issue. That's a different issue.

So for decades, I think here in North America we have shown, as I was trying to make (sic) with that little introduction, that we can sustain investments if you provide an environment that allows our industry to invest, allows us to take the risk. It is still a very risky business. People still go out of this business every day because they took too much risk. We still drill dry holes. We drilled a very expensive 250-million dry hole this year. It was quite painful. But it's what we do. We go out, we explore, we take risk. And our successes have to pay for all that.

But if you set the right conditions -- and I think there's, without question, enormous capacity in the United States and in North America to achieve that energy security, and it is now within the visible future. For most of my career, and I've been at this now more than 37 years, we also talked about it but it was never in what I would call the visible future. It's now in the visible future for us to achieve that, and it's just a matter of policy choices now as to whether we will achieve that.

You know, if you ask the average person on the street about U.S. energy, and U.S. oil, in particular, our situation, most Americans would say, oh, we're energy poor; we don't have enough oil, we don't have enough natural gas. And that's been the line for years and years. And yet the United States today remains the third-largest oil producer in the world, second only to Saudi Arabia and Russia, and a sizable gap between numbers four, five and six. We are an energy leader in oil production in the world. And if you look at the remaining resource base in the United States, adding in now what we know we can recover through these technology applications, we have sufficient resources to carry us well into the latter part of this century at current production rates.

Similarly on the natural gas side, United States, given the seasonality of the year, at any time is either the world's largest natural gas producer or the second-largest natural gas producer. We go back and forth with Russia. So to say the U.S. is energy poor is simply not accurate. And to say we don't have the capacity to pursue and achieve energy security is also not accurate. Again, it's just a matter of policy choices.

Now, with these new technologies that evolve always come a lot of questions. Ours is an industry that is built on technology, it's built on science, it's built on engineering, and because we have a society that by and large is illiterate in these areas, science, math and engineering, what we do is a mystery to them and they find it scary. And because of that, it creates easy opportunities for opponents of development, activist organizations, to manufacture fear.

And so as these technologies emerge, we know the immediate response from certain parts of interested parties out there is going to be to manufacture fear because that's how you slow this down. And nowhere is it more effective than in the United States. And so that's – the pace at which these things occur oftentimes is our ability to deal with the manufactured fear, our ability as an industry, working with well-intended regulators and policymakers to address the fears.

It requires a lot of education, requires taking an illiterate public – illiterate in the sciences, engineering and mathematics – and trying to help them understand why we can manage these risks. And that's a very intensive, almost one-on-one process – town by town, city council by city council, state by state. So it takes a while. And we're not particularly aided in our efforts by the broad-based media, because it's a lot sexier to write the fear stories than it is to write the here's-how-you-manage-it story.

Now, that's just a fact, it's not a complaint But it's part of why do things take so long. Well, that's one of the reasons it takes us a long time to get the policy solutions, because it all becomes then a political process instead of a scientific process.

There are important questions about the things that people worry about, and we have an obligation to address them, and we devote a tremendous amount of effort in addressing those. But I think if you look at the technologies that are front and center today around the shale resources – hydraulic fracturing, horizontal drilling, the integration of those technologies, how we drill these wells, how we protect fresh water zone, how we protect emissions – we have all of that engineered. And as long as we as an industry follow good engineering practices and standards, these risks are entirely manageable. And the consequences of a misstep by any member of our industry – and I'm speaking again about the shale revolution – the consequences of a misstep in a well, while large to the immediate people that live around that well, in the great scheme of things are pretty small, and even to the immediate people around the well, they could be mitigated.

These are not life-threatening, they're not long-lasting, and they're not new. They are the same risks that our industry has been managing for more than 100 years in the conventional development of oil and natural gas. There's nothing new in what we're doing, and we've been

hydraulically refracturing (sic) wells in large numbers since the 1960s; first developed in 1940. So this is an old technology just being applied, integrated with some new technologies. So the risks are very manageable.

The fears are real. We don't discount that people's fears are their fears. We have to address that. We want to address it with sound science, we want to address it with real data, and somehow we have to overcome the manufactured fear which gets most of the headlines. The "Gasland" movie did more to set us back in this endeavor than anything else out there, and yet every aspect of that movie has been completely, scientifically debunked. Nobody's written that story. I don't know why, but nobody's written that story.

But looking ahead, natural gas is going to be enormously important to this country. It's going to be enormously important to the world. And that's for a number of reasons: its abundance, its affordability, its functionality. And natural gas, we expect, over the next 25 to 30 years is going to – the world's demand for natural gas is going to increase about 60 percent. It's going to be the fastest-growing energy source in the world, and at that time it will satisfy more than 25 percent of total global energy demand.

Most importantly, it is functional into power generation because the fastest-growing energy demand sector in the world is power generation, electricity. In this country, it's a lot of electricity mix switching; but globally, electricity is what is growing the fastest. Large, large portions of global population still are not served with electricity. Electricity underpins their quality of life, but it underpins economic growth: industrial activities, manufacturing. So electricity is why – demand for electricity is why natural gas is going to grow so rapidly.

Natural gas obviously brings with it a number of quality-of-life environmental benefits because it is a relatively clean-burning fuel. It has a CO₂ footprint, but it has no particulates. It has none of the other emissions elements that are of concern to public health that other forms of powergeneration fuels do have: coal, fuel oil, others.

We're already seeing a shift here in the United States from coal as a fuel into power generation, which has historically been the largest fuel into power generation, to natural gas. The International Energy Agency, I think, just put out some numbers here that U.S. emissions have fallen by 430 million tons, or almost 8 percent, since 2006. The IEA says this is the largest reduction of all countries or regions. This drop in emissions, according to the IEA, is due in large part to the shift from coal to natural gas in the power sector, and that's occurring elsewhere in the world.

So natural gas brings with it enormous quality-of-life and risk-management benefits in how we're going to manage risk around global climate change. So natural gas offers a number of hopeful solutions in our long-term energy outlook.

But you take these same technology down to the U.S., and you move them over to oil, and most of you have heard of the Bakken shale development that's going on in North Dakota. Four years ago we were producing about 10(,000) to 15,000 barrels a day from the Bakken shale. It's now producing more than half a million barrels a day in a very short period of time. Obviously that has completely transformed North Dakota's economy. It's created tens of thousands of jobs. It's elevated North Dakota to now the second leading oil-producing state in the nation – they overtook Alaska – up from eighth place in 2006. And depending on your view of the levels of industry activity, the pace of things, many are expecting that the Bakken will produce in excess of a million barrels per day within the next few years, less than five, and some view it has the capacity to go beyond that.

So these are technologies in our industry that we think are providing that pathway to that energy security future that all of us have hoped for for most of our lives. Similarly, if you step back from North – U.S. and think about North America, Canada, our neighbor to the north, is possessed with enormous oil and natural gas resources. A lot of that is in the oil sands, which here again is – gets a lot of press and a lot of manufactured fear, in my view.

When you think about all of these resources – and I've given you example in the shales and the tight oil – whenever people identify risk around these resources, you should be assured and know that we know that those risks are there too. And if we choose to invest in those resources as a corporation or as a company, we've taken that risk on. So we invest a lot in research and technology development to overcome, mitigate and manage those risks. In the oil sands, the concern has been over the amount of emissions, because it's a very intensive form of oil production associated with developing that resources.

Well, our industry is never standing still. We're always working on new technology solutions. And our Pearl Sands oil shales project development that's under way in Canada, one of the largest, that will start up production end of this year, the first phase – in preparing for that, we recognized we had to come forward with a different technology solution to lower the overall emissions associated with developing that resource.

So we did. So we developed a different methodology of separating of the bitumen from the sand. It's basically a mining operation until get ready to then have to separate the bitumen from the sand. And the bitumen is what we produce and ultimately take to the refineries to refine into the products that we all use as consumers.

So we developed technologies around that separation process that are very low in energy intensity and technologies around transporting the bitumen to already existing refineries so we don't have to refine this bitumen twice. The largest oil sands project in Canada, the Syncrude project, was one of the first.

And at the technology that we had at that time, 25 years ago, we had to build an upgrader on the site -- it's like a massive refinery. So we separate the bitumen, but it's still not of quality that any refiner can use it, so we upgraded it to what's called a synthetic oil, Syncrude. It's not really synthetic, we just have beaten the tar out of the molecules and turned them into a different chain the refiner can now use them.

So then it gets – so it gets refined twice. Well, a lot of energy consumption and a lot of emissions with that. So one of our quests, when we took on the Pearl Sand, we told our technologists, you got to do this in one step. We got to rid of that second refinery, because that's where all the emissions are coming from. And we have successfully done that, the point being there are always technological solutions to these challenges and the risk associated with resource development. Some of them take a long time. And we've been working on the oil sands for more than 30 years to get to this point. So we're never standing still.

And so when people manufacture this fear that we can't allow this to go forward because our answer is yes we can, because we will have a technological solution and we will have risk mitigation and risk management practices around those resources to ensure they can be developed in a way that mitigates risk -- it doesn't eliminate it, but when you put it into the risk versus benefit balance, it comes back into a balance that most reasonable people in society would say, I can live with that. I get in my car and get on the road everyday; I can live with that. It's a risk calculation that people make.

So again, coming back to North America and the size of the resource endowment, Canada has a huge resource endowment; the United States has a huge resource endowment; Mexico has a huge resource endowment. All three countries manage that resource endowment differently, but these three countries also have a long-standing historic relationship in free trade through NAFTA and, because of NAFTA, have a close relationship through their economies, through co-investing in one another. And certainly between the three of us, there's a long historical relationship in energy supply.

Canada and Mexico have long been important suppliers of oil and natural gas, from Canada to the U.S. Well, with these technologies that are now available and being deployed throughout Canada and the U.S. – and we're hopeful that Mexico, as it continues its pathway to reforms around how it manages its own oil and natural gas resources through continuing reforms around PEMEX, that that will open up opportunities for greater partnerships and collaborations and bringing technology to bear on the huge resources that Mexico has as well.

And certainly if you listen to the presidential candidates in Mexico, all of them have said we support continuing reforms of PEMEX that will lead to a greater development of their domestic resources as well, important for their economy, important for their energy security, important for the growth of their nation.

But as I think about energy policy and this question of energy security, I have always felt that if we stepped back and said -- and could look in North America -- we said, now, we approach energy policy and energy security from a North American perspective, the resource base, the technologies that are available and the like-minded policies that could be put in place could rapidly achieve that energy security that we have been in quest of for all of my career. The resources are there, we understand the resources, we understand the technologies necessary to develop those resources, and we understand the risks that are associated with that and how to manage them. So it's my hope that at some point energy security can become a policy issue in our foreign policy discussions with Mexico, Canada and the United States. Between the three of our countries today, we produce 15 million barrels of oil a day. That is a force to be dealt with in global oil markets. Our expectation by the year 2020 is that North America will be producing 18 million barrels a day, and there is more capacity in the system to go beyond that, and to go beyond it at even potentially a faster rate.

So within the North American countries, we have a unique opportunity, because of this technology that has now emerged just in the last less than a decade, in the last five or six years, to, I think, get on a pathway to that energy security that we have all wanted and hoped for.

It's simply a matter of policy. It's simply a matter of choosing. You know, John F. Kennedy once said in a speech that to lead is to choose. Well, we need to choose. We need to choose. Are we going to have energy security and are we willing to deal with the real fears, the real concerns, and manage the risk and acknowledge that we can do that, and when we put it in the scales and the balance of what's in the best interest of society and our peoples, we're going to have a policy that allows this to happen.

It's not clear to me that we are. It's not a foregone conclusion that we will. It's very much an open question. But I think it's an important question for not just the United States, it's an important question for North America. And we can get into a whole wide-ranging discussion of the impacts that would have on the U.S.'s global foreign policy as well.

So it has -- it can have a dramatic impact, and I think we have a terrific and wonderful opportunity in front of us. And I hope, as a person who spent his life in this industry, that I'm going to be around to see it happen.

Thank you. (Applause.)

MURRAY: Thank you.

I'd like to stay on this topic of energy security as distinct from energy independence. There's a story on the front page of the Journal this morning – it's somewhat below the story about the breakup of News Corp., so it took me a while to get to it –

TILLERSON: (Laughs.) Right.

MURRAY: -- but I did get to it. And it says at current trends, we will halve our imports of oil from the Middle East by the end of the decade; that, obviously, a move towards both security and independence, right? That has to be a good thing.

TILLERSON: Well, I think clearly -- back to this energy-security question -- that clearly, having our supplies come more from North America, where you have less geopolitical disruption, lower geopolitical risk, has to move us up the security curve.

Now, having said that, again I want to remind you of something I said early on as well. Throughout all the disruptions of the past five years since I was last here – revolutions in major oil-supplying countries, threats to major oil-supplying routes – the oil markets have stayed well supplied. So some of the fears around energy security, I would say, are not well-founded in fact either, but clearly, more supply coming from North America, a more stable region than other parts of the world, has to improve your energy security.

MURRAY: So you could get close to the -- yeah, I mean, we are within sight of something close to energy independence, if we wanted it, for North America.

TILLERSON: Well, I – when people say "energy independence," that's an interesting phrase. And you wonder: What do they mean?

Canada has been a net exporter of energy for decades. What do you think people in Canada pay for their energy? They pay the same thing we pay. It's because they allow markets to work, they allow free markets, they allow free trade.

So the translation of the cost of energy – if people are thinking energy independence means low prices – and that's the way a lot of people seem to want to have the conversations; when we get energy independent, we wouldn't subject to these price swings that happen every time the guys over there that don't like us, you know, do these things, they do it to us – and the truth of the matter is, they don't do anything to do us. I mean, it's just – it's just natural supply/demand, ebbs and flows, and these long timelines for supply to respond to those demand signals.

So if people are equating energy independence to some kind of price stability or narrow price band, then they have to be putting that in a context of a very rigid policy and regulatory control around that system, because otherwise it's going to continue to move with the global prices.

If they're putting it in the context of I don't have to worry about a supply interruption and therefore that may take some element of the price forward curve out, then it may have a positive effect.

MURRAY: But I think also people would ask the question, if we halve our reliance on oil from the Middle East, does that reduce our involvement in the problems of the Middle East?

TILLERSON: Well, that -- and that's -- that's a very interesting question, too. If you -- if you said the U.S. never, ever again needed to import a barrel of crude oil for -- through the Persian Gulf, then it becomes a national security question. It changes our economic interdependencies with that region because that is really the source of our economic interdependencies, is our energy dependency. There's not a lot of economic activity between us -- some.

Now it becomes a question of what's our national security interest in the region, because you have an enormous – as all of you know, enormous national defense footprint in the Middle East because of our interest in the area.

So if then the U.S. said, well, we can now redeploy those defense resources elsewhere in the world, the question you have to ask is, well, then who steps into that void? And most likely it's going to be a large consuming country is going to step into that void.

If that happens --

MURRAY: You mean a China?

TILLERSON: Well, they're a large consuming country. (Laughter.)

MURRAY: (Chuckles.) OK. Right.

TILLERSON: So -- well, they step into the void, and given the history of the region and all of the issues and challenges of the region, and how that has spilled over onto us, the American people, is that a good thing, from a national security standpoint, that someone else then steps into that void, or is it a bad thing? Well, I'm not expert enough on that one to say, but you have to anticipate what happens then and what do you -- and when you say we're no longer dependent on them, so it changes our relationship, well, it may redefine the priorities of the relationship, but does it fundamentally change the relationship and our interest in the region and our interest in that -- those peoples and their issues?

MURRAY: So oil doesn't drive those relationships and won't even if we could wean ourselves from all their oil.

TILLERSON: I have never felt oil drove the – were the only underpinnings in those relationships. It is important not just because we get our oil, because if you really look at the amount of oil we physically get, it's important, but we could replace it with a little higher cost. It's more a question of the importance of that region to global economic stability. And we're going to still be interested in that. So if you have a supply – if we're no longer getting any oil from the Middle East because we're secure here, a disruption of oil supplies from that region will have devastating impacts on global economies. Now is that important to us? Probably so.

So I'm not sure it changes the relationship dramatically. I think it may redefine the priorities around the relationship, but I'm not sure it changes it dramatically.

MURRAY: But there is this sort of broader issue -- which a lot of people in this room have spent a lot of time thinking about -- that we live in economies that are driven by oil, and oil tends to come from some of the least stable countries, nations in the world. I mean, you're investing heavily in Russia, you've got problems in Iraq, in Kurdistan. Is there an opportunity in this explosion of resources in North America to alleviate some of those issues that we've been dealing with for the past century?

TILLERSON: Only if you think the rest of the world doesn't matter. (Laughter.) It goes back to what I said about the Middle East. You said that oil is so fundamental to economic growth, and you're absolutely right. You know, energy is fundamental to economic growth, and oil is

fundamental because to this point in time, we have not found, through technology or other means, another fuel that can substitute for the role that oil plays in transportation, not just passenger, individual transportation, but commercial transportation, jet fuel, marine, all the ways in which we use oil as a fuel to move people and things about this planet. And we've just not found a good substitute for that.

So to the extent that is important to economies, and global economies are important to our economy, which we all know they are, you never divorce yourself from that. And this is back -- that's why I say this energy independence and energy security discussion it seems to me to get --

MURRAY: Get it wrong?

TILLERSON: People get the terms interchangeable, and they're really not.

MURRAY: Let's go back to the price issue for a minute, because you talked about a global price for oil, which there is. There isn't a global price for natural gas. I mean, we're paying \$2.50 or \$3. In China they're paying, what, \$15, \$16? I mean it's significantly higher.

TILLERSON: Well, actually, in China domestically they're paying about \$4, because the Chinese control the price.

MURRAY: But they would pay for imports.

TILLERSON: The little bit of imports that they are making, natural gas, they're paying this kind of – Japanese price.

MURRAY: So I was with the CFO of Siemens yesterday, who was basically lecturing a group of American businesspeople, saying you have an historic opportunity right now to rebuild the American economy on cheap natural gas. Do you agree with that?

TILLERSON: Well, generally I do. I'd maybe say that we have a historic opportunity to rejuvenate the American economy and rejuvenate and restore American manufacturing competitiveness because we now have long-term, secure, stable supplies of natural gas at some price. Cheap is a – I mean cheap is in the eye of the beholder. MURRAY: Relative, yeah.

TILLERSON: It will be supplied at whatever its cost to supply will be. And what I can tell you is the cost to supply is not \$2.50. We are all losing our shirts today. You know, we're making no money. It's all in the red. And so right now, we're enjoying the overhang, which again, it's this – we're not – the system is so enormous, the price supply/demand signals are always slightly out of sync. They're always doing this – (gesturing) – you know. We just can't quite hit – we can't hit a bull's-eye. Hopefully, we can hit the backboard. (Laughter.)

But today we're seeing these very low prices because the industry overshot when we had those \$6, \$7, \$8, \$9 prices, and we overdeveloped the supply, and now people are just -- they're getting by on cash in some cases. I can tell you it's negative earnings, by and large, and some people -- or it's negative on cash for them, depending on how efficient they may be. So today's price is not sustainable to deliver that energy security.

What -- you know, what the price is that's necessary to do that, the market will seek it and it will find it. It's not \$9, I can tell you that. And so, clearly, in a global -- if you're thinking about what others are paying for natural gas and those that are importing LNG, liquefied natural gas, it will be substantially below the cost of that to maintain a secure supply.

MURRAY: I want to open it up to questions from the group, but before I do, I think I should probably ask about your media comments. At the time of the Deepwater Horizon oil spill, folks in your company urged us not to treat all oil companies the same. So I wonder if I could ask you if perhaps you're painting with a very broad brush when you talk about media covering hydraulic fracturing.

TILLERSON: There's probably a couple of camel hairs in the brush that I would say don't apply. (Laughter.) But this is an ongoing dialogue I've been having with people in your profession now for some time; that for whatever reason, a large number of people in the journalism profession simply are unwilling to do their work. They're unwilling to do the homework. And so they get something delivered to them from the manufacturers of fear; it makes a great story. I mean, it – I mean, it does. It makes a great story. People love that kind of stuff. The consuming public loves it, because it goes to what, you know, their fears are.

What I would wish and hope that people would do is return to a journalism standard that says, you know, I need to check and see what's what before I run with this. And there's not a lot of that going on, quite frankly. And it's not because we're not trying. We provide a lot of information. There are a lot of sources of science-based information. There are a lot of sources that can debunk claims that are made specific – you know, specific examples.

Farmer Joe lit his faucet on fire, and that's because there was gas drilling going on, you know, in his back (porch ?). And we can go out there and we can prove with science that that is biogenic gas; it's been in the water table for millions of years; it finally made its way Farmer Jones' (sic) faucet, it had nothing to do with any oil and gas activities. And part of when you're dealing with the subsurface strata is you've got to – you got to understand that Mother Nature has done a lot of things in the subsurface that have nothing to do with anything man has done. And it changes. It moves around all the time. So what once was will change.

And we encounter this all the time. And we deal with it from a risk management standpoint, because these present risks to us as well. We have to understand what's going on. So I just – you know, it's a question of will people – will people do their homework? And what I'm finding is that a large segment are just lazy. They just don't do their work. It's as simple as that.

MURRAY: Let's open it up. (Laughter.)

TILLERSON: You asked. (Laughs.)

MURRAY: I did. I did. Wow. Lot's of questions. Roger. Well, I'll try to get to as many of them as possible.

QUESTIONER: Mr. Tillerson, we read that some fleets – trucking fleets and other fleets are starting to convert to compressed natural gas as a transportation fuel. Tell us how far you think that can go and whether it can ultimately spread to average Americans using natural gas, in effect, as a transportation fuel.

TILLERSON: Well, we've done that analysis, and when you take into consideration conversion costs or cost of a natural gas engine or a flexible engine – because what most people are going to want, most commercial truck drivers, and certainly what passenger vehicle people want, is they

want flexibility because they certainly don't want get caught somewhere where they can't refuel. It's similar to the hybrid today. So you can call the natural gas vehicle a different kind of hybrid.

When we look at the economics around that, and the likelihood of a broad-based infrastructure to serve the fuel disposition needs, we think it's highly unlikely that it ever becomes material. Now, we have, and I have had calls from CEOs of companies that are considering, who have large fleet vehicles. And I have advised them, if you have a fleet situation, you should – you should definitely evaluate that, because it makes a lot of sense. So if you're a UPS or you're an AT&T, huge service vehicle fleets that go back to central location every night, you can afford to put in your own infrastructure to refuel, standard spare parts, you can lower the cost of maintenance. You can do all that – all those things because you have economies of scale.

In a commercial truck – semis, tractor-trailer fleet – there will be – they'll be some conversions. What most – or many are doing are they're going to liquefied natural gas as opposed to compressed natural gas because you get some economies of scale on the vehicle itself, higher density of energy in a liquid form. And then they also have their own LNG refueling sites along their routes where they can refuel. But I think overcoming the infrastructure cost and the build out, overcoming the conversion costs put it pretty unlikely to me that it becomes material as an alternative transportation fuel.

MURRAY: Yes, question in the back. Just hold on for the microphone and identify yourself before you ask your question, please.

QUESTIONER: Hi. My question – I'm John Levin of Levin Capital Strategies. My question follows exactly Roger's, and that extremely interesting answer. Does the same logic apply, however, to using our natural gas reserves to put it through our underutilized power plants at night to try to produce power to power electric or hybrid cars? The assumption is the transportation has been run by oil. And the assumption of some of us is that that could be substituted through our utility plans, which are not utilized, to an entirely new auto industry.

TILLERSON: Absent -- I mean, it certainly could. And as with any power generation source, whether it's wind, solar, or natural gas, the issue with electric cars is not so much the source of the electricity, although if you're going to do a -- if you're doing this for carbon CO₂ issues

management, you do want to undertake what we call a well-to-wheels analysis, which means go back to the – to the raw source of the energy going into power conversion, what's the thermal efficiency of the conversion, what's the thermal efficiency of conversion through the vehicle all the way to turning the wheels. And when you do that, some of those systems have some promise and some don't.

The bigger issue with the electric vehicle is with the vehicle itself still. The technology simply has not advanced sufficiently to make those vehicles attractive for most individuals. So large-scale deployment to passenger use – we think, it's going to be – continue to be pretty slow, and it has to do with the battery technologies. And while there's been a lot of research and there have clearly been incremental improvements in battery technology, there have been no fundamental breakthroughs in batteries.

We've been funding research out at Stanford now for almost 10 years, and one of their research areas is they're trying to – they're studying the battery – somebody's got to come up with a different architecture for the battery. And we're waiting for that breakthrough, and they're doing a lot of really interesting things – (chuckles) – with battery architecture.

MURRAY: Do you think we're close?

TILLERSON: No, I think we're not, which is why I'm not optimistic because it is a -- it's a very, very difficult science-physics problem to overcome. But having said that, we do believe -- in our own energy outlook, we accommodate an ongoing penetration at a fairly healthy rate of hybrids, and we do think the hybrid electric does hold a lot of promise.

It still suffers from many of the same deficiencies in the battery. But we think the public -- the part of the problem with the battery's the public's not going to put up with it -- (chuckles) -- basically in a -- in a broad deployment.

MURRAY: There's a question over here.

Yes, sir, right there.

Well, I was pointing to him, but that's all right. Since you're there, let's do this one, and then we'll go there.

QUESTIONER: Hi, I'm David Fenton (ph).

Mr. Tillerson, I want to talk about science and risk, and I agree with you that's the way we must proceed. So, as you know, it's a basic fact of physics that CO₂ traps heat, and too much CO₂ will mean it will get too hot, and we will face enormous risks as a result of this not only to our way of life, but to the world economy. It will be devastating: The seas will rise, the coastlines will be unstable for generations, the price of food will go crazy. This is what we face, and we all know it.

Now -- so my question for you is since we all know this knowledge, we're a little in denial of it. You know, if we burn all these reserves you've talked about, you can kiss future generations good-bye. And maybe we'll find a solution to take it out of the air. But, as you know, we don't have one. So what are you going to do about this? We need your help to do something about this.

TILLERSON: Well, let me – let me say that we have studied that issue and continue to study it as well. We are and have been long-time participants in the IPCC panels. We author many of the IPCC subcommittee papers, and we peer-review most of them. So we are very current on the science, our understanding of the science, and importantly – and this is where I'm going to take exception to something you said – the competency of the models to predict the future. We've been working with a very good team at MIT now for more than 20 years on this area of modeling the climate, which, since obviously it's an area of great interest to you, you know and have to know the competencies of the models are not particularly good.

Now you can plug in assumptions on many elements of the climate system that we cannot model -- and you know what they all are. We cannot model aerosols; we cannot model clouds, which are big, big factors in how the CO₂ concentrations in the atmosphere affect temperatures at surface level. The models we need -- and we are putting a lot of money supporting people and continuing to work on these models, try and become more competent with the models. But our ability to predict, with any accuracy, what the future's going to be is really pretty limited. So our approach is we do look at the range of the outcomes and try and understand the consequences of that, and clearly there's going to be an impact. So I'm not disputing that increasing CO₂ emissions in the atmosphere is going to have an impact. It'll have a warming impact. The – how large it is is what is very hard for anyone to predict. And depending on how large it is, then projects how dire the consequences are.

As we have looked at the most recent studies coming – and the IPCC reports, which we – I've seen the drafts; I can't say too much because they're not out yet. But when you predict things like sea level rise, you get numbers all over the map. If you take a – what I would call a reasonable scientific approach to that, we believe those consequences are manageable. They do require us to begin to exert – or spend more policy effort on adaptation. What do you want to do if we think the future has sea level rising four inches, six inches? Where are the impacted areas, and what do you want to do to adapt to that?

And as human beings as a – as a – as a species, that's why we're all still here. We have spent our entire existence adapting, OK? So we will adapt to this. Changes to weather patterns that move crop production areas around – we'll adapt to that. It's an engineering problem, and it has engineering solutions. And so I don't – the fear factor that people want to throw out there to say we just have to stop this, I do not accept.

I do believe we have to -- we have to be efficient and we have to manage it, but we also need to look at the other side of the engineering solution, which is how are we going to adapt to it. And there are solutions. It's not a problem that we can't solve.

MURRAY: But let's stick with that for just a second. I mean, Exxon Mobil, before you became CEO, was very aggressive and overt in challenging and mounting a public relations campaign against the sorts of things that Mr. Fenton (sp) just managed. You changed that when you came in. But I guess the question I'd ask – I was at my daughter's graduation last weekend, and the graduation speaker said that global warming is the great challenge of your generation. Do you agree with that? Would you agree that it's in – at least one of the top five challenges of the generation, or do you personally think that it's been way overblown?

TILLERSON: No, I think it's – I think it's a great challenge, but I think it's a question back to priorities. And I think, as I just described based on our understanding of the system and the models and the science and that there are engineering solutions to adapting, that we think it's solvable.

And I think there are much more pressing priorities that we as a – as a human being race and society need to deal with. There are still hundreds of millions, billions of people living in abject poverty around the world. They need electricity. They need electricity they can count on, that they can afford. They need fuel to cook their food on that's not animal dung. There are more people's health being dramatically affected because they could – they don't even have access to fossil fuels to burn. They'd love to burn fossil fuels because their quality of life would rise immeasurably, and their quality of health and the health of their children and their future would rise immeasurably. You'd save millions upon millions of lives by making fossil fuels more available to a lot of the part of the world that doesn't have it, and do it in the most efficient ways, using the most efficient technologies we have today.

And we continue, and have for many, many years, talked on our energy outlook about the importance of ongoing energy efficiency, continuing to carry out economic activity with a lower energy intensity. And we've been very good as a country at doing that. We've been very good globally at doing that. And there's more potential in it.

MURRAY: Paul.

QUESTIONER: I'm Paul Steiger with ProPublica. A sort of nearer-term issue, and much smaller and, I think, much more manageable is as the development of shale gas and oil proceeds, which uses enormous amounts of water, how do we protect the water supply and in particular make sure that makes this water comes back up from the ground that it's carefully managed and either recycled or stored someplace where it can't get into the water table? And when you got into the natural gas field, when you made your big purchase, there was a lot of enthusiasm because you guys are strong operators; you pay attention to environmental issues. But what kind of regulatory structure needs to be in place to make sure that the lesser operators also take good care to incur the cost and make sure that the water is carefully managed? Shouldn't there be EPA regulation of the water issues connected with shale? TILLERSON: Well, first – and I'll try to start at the beginning of all that. That was – there was a lot in that question. If you look at the water consumption per unit of energy that's provided, shale gas development is one of the lowest water consumptions of any form of energy we can provide you. If you look at the water consumption around coal, the water consumption around a lot of other conventional sources of energy, it is much higher.

The numbers sound large. When we say we're going to pump, you know, 2 1/2 million gallons of water down this well to hydraulically fracture it, that's a – sounds like a lot of water when you look at your monthly water bill. In the grand scheme of water consumption, it's actually pretty low.

I'll give you a little trivia factoid – and water is a big concern, I know, to a lot of people. They're worried about water scarcity. There is plenty of water. It's just not in all the right places. That's the issue. It's not that we're – have a water resource problem; we have a water distribution problem, challenge.

More water flows out – freshwater flows out of the mouth of the Hudson Bay in eight seconds than all the water we used to hydraulically fracture all the wells last year. That's how much water is available. It's a question of how we use it.

Now in terms of how we protect it, we use the same methods that we have used for years and years in handling produced water. In conventional oil and natural gas production, you always produce a lot of formation water, and it's crummy water. It's real salty. It's got heavy metals in it. It's got bad stuff in it.

And we have been handling and managing that water system for decades in terms of how we clean that water up, separate the things that are useable to us out, take the waste product water and dispose of it, either dispose of it through reinjection or dispose of it through reuse or clean it up in other ways and then, through permits, dispose of it through surface disposal.

So we have many, many ways we can deal with that, and so it's not a new -- this whole flow-back issue is nothing. We deal with massive amounts of water in the conventional system today.

In terms of the regulatory question, we have long advocated that when it comes to regulating hydraulic fracturing – and if you think about the kind of issues that you worry about, which is public – you know, protecting the water resources, proper disposal of the water, either reinjection or at the surface – we believe that is best left to the state, state regulatory bodies, because state regulatory bodies are responsible for their water resources, their public drinking resources. They're responsible for land management. And they know – they know those issues in their state better than anyone else does. And they're not the same from state to state. So much of it is a function of geology, topography, the climate that you're operating in – harsh, not harsh. So we – writing a federal standard to apply across a whole range of these conditions we don't think is the most efficient way to go about it.

So – and there are – there are good operating state regulatory models that have functioned well to protect the public interest. We have been promoting – transferring those best practices to some of the new states and emerging states, Ohio and others. Exxon Mobil, working with General Electric, has put – we both put a million dollars apiece into a fund to train state regulators at Penn State, at the Colorado School of Mines and at the University of Texas at Austin; train regional regulators, send them down there and have them be trained by geologists and engineers, so they understand what the issues are, what they should be looking for, so they can be competent regulators. We want competent regulators.

Competent regulators is what gets to your last part, which is, how do you make sure every operator performs well? Well, we've published standards, so everybody has a road map of how you do this well, engineering best practices that we know work. If you follow these, you're not going to have any issues. Regulators then are competent enough to oversee that and say yes, everybody's following the standard and they're following the regulation.

So it's a – we all have our role to play, and we want competent regulators, so that they can play theirs.

MURRAY: A question right here. I'm going to -- if the council folks are OK with it, I'm going to keep going. Mr. Tillerson took a little more than his allotted time, and there are a lot of questions out here. Can we take a couple more questions?

Right here, then right up here.

QUESTIONER: Ed Cox, a director of Noble Energy. Mr. Tillerson, with respect to Saudi Arabia and your comments on oil supply in the world, do you believe that Saudi Arabia has a policy of letting oil prices drop? And if so, what do you think the geostrategic reasons are for that?

TILLERSON: Well, I think the Saudis have been about as transparent as I think it is in their interest to be, and the Saudi oil minister, Ali Naimi, has from time to time indicated where they believe – they have a price at which they believe the global economy is comfortable, and most recently he said around \$100.

What I can tell you is I think from the Saudi perspective, and I've spent a lot of time with them, they do feel a real responsibility to stabilize the markets. They feel that responsibility, obviously, out of a certain self-interest, because they lived through the last time; they didn't do that well and it wasn't good for them. So they take their responsibilities to maintain stability of the marketplace, and to do that, they do it through supply, which is why they invested heavily to reinstate a surplus capacity, so they've invested billions of dollars in capacity that they don't use, on purpose. They do it to stabilize the market.

So I think they have been forthright in trying to signal to the global economy this is kind of where we think things work well. And they do a lot of analysis. It's not set arbitrarily. And it's set more – from my view, it's set more from a perspective of what's going to support the global economy and less from a perspective of what do I need for my national budget; not that the second is unimportant to them.

MURRAY: A question right here, and then we'll take this question right here, and then we'll wrap it up.

QUESTIONER: Hi. Kassia Yanosek with Quadrant Management. And my question is about jobs. I used to work for an oil and gas major, and about five years ago there was a real concern about the dearth of skilled engineers in the industry. And I'd like to see if you could comment on that and if that's changed at all with the revival of oil and gas industry in North America, or if you're finding that you have to import talent, and how you can contribute to job growth in America.

Thanks.

TILLERSON: Well, the availability of scientists and engineers is a real challenge in our country, not just for our industry but for American competitiveness broadly. If you just look at the number of graduating scientists, engineers, and in particular postgraduate degrees – masters and doctorals – it's largely dominated by foreign students. So we are having to go to a lot of sources to meet our own talent needs. Because we are a global company, we recruit outside the United States. We recruit heavily in Europe; we recruit heavily in Asia.

But it is a serious challenge here in the United States in terms of the number of graduating scientists and engineers. If you watch any of our ads, that's what we're trying to do with a lot of our advertising, is draw attention to that issue. And it's not just at the university level. The problem backs all the way into our primary and secondary education processes. We're not – we're not providing the basics to young people and we're not providing the motivation for them to seek careers in these areas. So, you know, we have a lot of effort personally in our company around that, but also collaboratively within the business community.

Yes, we are filling a lot of our needs elsewhere; as I said, recruiting elsewhere. And in terms of what we're going to do about it in the future, it really is – it really is tied up in this very broad education debate that's going on in the country today, because it all gets back to the quality of delivery of education to young people. If we fix that, I'm confident the science, math, engineering demands of our country will be met. So it's really grounded back here in a problem upstream of the university, even.

QUESTIONER: Thank you. And thank you for a very lucid and illuminating presentation. My name is Paula DiPerna. I'm with the NTR Foundation.

Just to go back to demand side and incentivizing and maximizing the high-risk dollars that you're investing, I wonder if you would describe for us the most recent successes you may or may not have had in advocating for a serious, coherent energy-efficiency policy, not only nationally but globally, since that is also a patchwork, mixed bag and, if in place, could certainly leverage your money.
TILLERSON: Well, I think there's – from my perspective in the time that I've really been in a position to work closely with policymakers, I've been encouraged by the amount of progress we've made on, first, educating policymakers of how powerful efficiency is in the total energy balance.

And that was where we had to start was making sure there was an awareness in – on their part, and beginning to see now policy decisions taken to emphasize efficiency, some of which we agree with, some of which we may not agree with, but I think the point being there is a much better awareness among policymakers of how important efficiency and incentivizing efficiency – putting policies in place to do that, how important that is to the overall – to an overall energy policy.

And you see it in this country, whether it's through the – you know, the higher CAFE standards, some of the building code standards, a number of steps that are now being taken, all being driven by this recognition that if we improve the efficiency – and I would say most of it is more to the greenhouse gas question – there's a recognition that if you improve the efficiency, you'll lower the emissions. But we also say if you improve the efficiency – (chuckles) – you improve your energy security as well. So they're – you know, they're very consistent with one another.

So I'm encouraged. And there – is there more that could be done? There's always – you know, it's a question of how do you want to incent that. We are free market, free trade advocates. And so, you know, what we'd like is for market forces to incent that and for technologies to make their way into that space that consumers recognize, that's a good value proposition; I'm going to buy that; I'm going to use that, as opposed to mandating certain answers.

When you mandate certain outcomes – I have long stated and I believe to be true that when you mandate certain outcomes, you actually inhibit innovation. If you leave the field wide open, the greatness of entrepreneurial spirit in the United States and the creativity and innovation of young people to find a solution to something because they think they can be the next billionaire is pretty powerful. So we don't like mandates. We don't like those kinds of solutions because we think they block innovation pathways, and rather let – you know, let markets work, let things work, and we'll continue to improve. And again, our record is pretty good on energy efficiency.

QUESTIONER: (Off mic.)

TILLERSON: That's a tough one.

QUESTIONER: (Off mic.)

MURRAY: OK. Thank you all for coming.

Mr. Tillerson, thank you very much. (Applause.)

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THIS IS A RUSH TRANSCRIPT.

ALAN MURRAY: Thank you. I want to welcome everyone to today's CFR meeting, which is part of the CEO Speaker Series. I also want to remind you to completely turn off -- not just put on vibrate, but completely turn off your cellphones. And I can see that there's a bunch of avid tweeters in this audience. I'm sorry, you're not going to be able tweet today. Also remind you that this session is an on-the-record -- on-the-record session.

Our guest this morning really needs no introduction. Rex Tillerson is the CEO of Exxon Mobil, the largest publicly traded oil company in the world. He's been in that position for six years. He was responsible for the big move into natural gas, the \$30 billion acquisition of XTO Energy in 2009. In his new book, "Private Empire," Steve Coll refers to Exxon Mobil as a corporate state within the American state, with its own intricate web of international relations and, in a sense, its own foreign policy. So I think it's particularly fitting that Rex Tillerson is speaking to this group at the Council on Foreign Relations today.

He will speak for 15 minutes, then he and I will have a conversation up here for about 10 minutes or so, and then we'll open it up to your questions.

Mr. Tillerson. (Applause.)

REX TILLERSON: Thank you, Alan. And, Richard, thank you for the invitation to speak and address this group this morning. I spoke to this group -- I guess it's now been about five years ago, 2007. I was looking back and at that time talked about U.S. energy security, talked a little bit about, you know, how I thought our nation could strengthen trade in energy supplies through broader engagement, through education of the public on the importance of energy and how it affects their daily lives.

So here we are five years later. And you go back to 2007 – now, these issues are still important today, obviously, but when I last had the opportunity to speak, a lot of things have happened since then. You know, oil prices from 2007, on the strength of a very robust global economy and a very robust emerging China, many of you will recall, ramped up to near \$150 a barrel. Then we had the financial – U.S. financial collapse. Oil prices collapsed all the way down to \$40 a barrel.

Now, there's been in a prolonged recession and a kind of stumbling along economy, but China and other parts of the world have continued to do well with their economies, although slowing today, and oil prices crept their way back up to 120 (dollars), \$130 Brent, and now with the overhang of the European economic problems, China beginning to slow a bit, which all of us I'm sure are seeing, prices pulling back in response to some weakening – or weak demand, but also in response to a surge in supply. And I'm going to talk a little bit about that surge in supply.

So that's what's happened with oil prices, you know, during that time – (inaudible) – a little bit of demand. Well, in response to that demand and in response to those high prices – and this is the way things work in our industry; everything has fairly lengthy timelines – but the industry did respond to those high prices. The Saudis made massive investments to increase their capacity to meet that demand, because what shot those prices up, if you recall, to \$150 was a – was a shrinking surplus in global capacity. There's always been a big of a surplus that was fairly recognizable by the market. And that had shrunk to less than 2 million barrels – somewhere in the million to million and a half barrel range. And the markets were very nervous about the absence of that surplus.

So the Saudis invested heavily, developed an additional roughly 2 to 2 1/2 million barrels a day of capacity, which they have been using of late to stabilize markets, and such that through that period of time, even throughout a lot of supply disruptions, the events in Libya, the Arab Spring, the uncertainties that have existed in the marketplace for a whole host of reasons, the markets have remained well supply (sic). No one anywhere, any place in the world, has not been able to get the crude oil they normally would need to fuel their economy.

So I think it's important to keep that in your mind and maintain that context; that, you know, these prices, while they swing around a lot, the system's quite efficient and it's quite effective at allocating the supplies that are available, even when they get very tight.

Now the second thing that's happened in response to that supply is what – is what I'm going to talk a bit this morning, is what's gone on here in North America, which has been, I think, nothing short of extraordinary. And I would be less than honest if I were to say to you, and we saw it all coming, because we did not, quite frankly. We did recognize the potential of the shale resources in North America. We recognized there was technology solutions to a portion of that. We grossly underestimated the capacity of both the rocks, the capacity of the technology to release the hydrocarbon, natural gas from the shale gas and now oil from tight oil rocks. We underestimated just how effective that technology was going to be, and we also underestimated how rapidly the deployment of that technology would occur – again, all in response to fairly high prices. Again, think back to natural gas prices in the United States. We were up in the 6 to 9 to higher dollar per Btu, dollar per KCF range, you know, depending on the time of the year or the seasons.

So again, market's pretty effective with our industry. Markets sends us a signal. People go out; they take risk; they find a way to develop resources that were previously not accessible, not available because of technological reasons. Now we've got a lot of other resource capacity that's not available for political reasons, but I'm just talking about when the industry has access to rocks, to ground, the places we can work, it has always demonstrated the ability to respond to the market's price signals.

It takes a little time. That's why you get these gyrations in prices, because they're not perfectly matched. But over long periods of time, that system has worked quite effectively to ensure the world always has the energy it needs.

So this morning I want to make a few comments about this – transformative technologies that have enabled us to unlock a whole new array of resource capacity, oil and natural gas, in North America, the United States most particularly. But I want to talk a bit this morning in a North American context because, as I think about the future of energy policy for the United States, I think almost everyone would agree that the real objective is energy security. There's a lot of – a lot of talk about energy independence, and people tend to get words interchanged. They're quite different. Energy independence and energy security are really two different things. And I think what the U.S. policy and what's in the best interest of American consumers has been and should be – is securing access to energy in a reliable, relatively affordable way. And if we're able to do that, where it comes from should be of little consequence to us, if it's reliable, if I have a system of policies that ensure I have reliable, affordable sources of energy.

If you don't like the people you're buying it from, that's a different issue. That's a different issue.

So for decades, I think here in North America we have shown, as I was trying to make (sic) with that little introduction, that we can sustain investments if you provide an environment that allows our industry to invest, allows us to take the risk. It is still a very risky business. People still go out of this business every day because they took too much risk. We still drill dry holes. We drilled a very expensive 250-million dry hole this year. It was quite painful. But it's what we do. We go out, we explore, we take risk. And our successes have to pay for all that.

But if you set the right conditions -- and I think there's, without question, enormous capacity in the United States and in North America to achieve that energy security, and it is now within the visible future. For most of my career, and I've been at this now more than 37 years, we also talked about it but it was never in what I would call the visible future. It's now in the visible future for us to achieve that, and it's just a matter of policy choices now as to whether we will achieve that.

You know, if you ask the average person on the street about U.S. energy, and U.S. oil, in particular, our situation, most Americans would say, oh, we're energy poor; we don't have enough oil, we don't have enough natural gas. And that's been the line for years and years. And yet the United States today remains the third-largest oil producer in the world, second only to Saudi Arabia and Russia, and a sizable gap between numbers four, five and six. We are an energy leader in oil production in the world. And if you look at the remaining resource base in the United States, adding in now what we know we can recover through these technology applications, we have sufficient resources to carry us well into the latter part of this century at current production rates.

Similarly on the natural gas side, United States, given the seasonality of the year, at any time is either the world's largest natural gas producer or the second-largest natural gas producer. We go back and forth with Russia. So to say the U.S. is energy poor is simply not accurate. And to say we don't have the capacity to pursue and achieve energy security is also not accurate. Again, it's just a matter of policy choices.

Now, with these new technologies that evolve always come a lot of questions. Ours is an industry that is built on technology, it's built on science, it's built on engineering, and because we have a society that by and large is illiterate in these areas, science, math and engineering, what we do is a mystery to them and they find it scary. And because of that, it creates easy opportunities for opponents of development, activist organizations, to manufacture fear.

And so as these technologies emerge, we know the immediate response from certain parts of interested parties out there is going to be to manufacture fear because that's how you slow this down. And nowhere is it more effective than in the United States. And so that's – the pace at which these things occur oftentimes is our ability to deal with the manufactured fear, our ability as an industry, working with well-intended regulators and policymakers to address the fears.

It requires a lot of education, requires taking an illiterate public -- illiterate in the sciences, engineering and mathematics -- and trying to help them understand why we can manage these risks. And that's a very intensive, almost one-on-one process -- town by town, city council by city council, state by state. So it takes a while. And we're not particularly aided in our efforts by the broad-based media, because it's a lot sexier to write the fear stories than it is to write the here'show-you-manage-it story.

Now, that's just a fact, it's not a complaint But it's part of why do things take so long. Well, that's one of the reasons it takes us a long time to get the policy solutions, because it all becomes then a political process instead of a scientific process.

There are important questions about the things that people worry about, and we have an obligation to address them, and we devote a tremendous amount of effort in addressing those. But I think if you look at the technologies that are front and center today around the shale resources – hydraulic fracturing, horizontal drilling, the integration of those technologies, how we drill these wells, how we protect fresh water zone, how we protect emissions – we have all of that engineered. And as long as we as an industry follow good engineering practices and standards, these risks are entirely manageable. And the consequences of a misstep by any member of our industry – and I'm speaking again about the shale revolution – the consequences of a misstep in a well, while large to the immediate people that live around that well, in the great scheme of things are pretty small, and even to the immediate people around the well, they could be mitigated.

These are not life-threatening, they're not long-lasting, and they're not new. They are the same risks that our industry has been managing for more than 100 years in the conventional development of oil and natural gas. There's nothing new in what we're doing, and we've been hydraulically refracturing (sic) wells in large numbers since the 1960s; first developed in 1940. So this is an old technology just being applied, integrated with some new technologies. So the risks are very manageable.

The fears are real. We don't discount that people's fears are their fears. We have to address that. We want to address it with sound science, we want to address it with real data, and somehow we have to overcome the manufactured fear which gets most of the headlines. The "Gasland" movie did more to set us back in this endeavor than anything else out there, and yet every aspect of that movie has been completely, scientifically debunked. Nobody's written that story. I don't know why, but nobody's written that story.

But looking ahead, natural gas is going to be enormously important to this country. It's going to be enormously important to the world. And that's for a number of reasons: its abundance, its affordability, its functionality. And natural gas, we expect, over the next 25 to 30 years is going to – the world's demand for natural gas is going to increase about 60 percent. It's going to be the fastest-growing energy source in the world, and at that time it will satisfy more than 25 percent of total global energy demand.

Most importantly, it is functional into power generation because the fastest-growing energy demand sector in the world is power generation, electricity. In this country, it's a lot of electricity mix switching; but globally, electricity is what is growing the fastest. Large, large portions of global population still are not served with electricity. Electricity underpins their quality of life, but it underpins economic growth: industrial activities, manufacturing. So electricity is why – demand for electricity is why natural gas is going to grow so rapidly.

Natural gas obviously brings with it a number of quality-of-life environmental benefits because it is a relatively clean-burning fuel. It has a CO₂ footprint, but it has no particulates. It has none of the other emissions elements that are of concern to public health that other forms of powergeneration fuels do have: coal, fuel oil, others.

We're already seeing a shift here in the United States from coal as a fuel into power generation, which has historically been the largest fuel into power generation, to natural gas. The International Energy Agency, I think, just put out some numbers here that U.S. emissions have fallen by 430 million tons, or almost 8 percent, since 2006. The IEA says this is the largest reduction of all countries or regions. This drop in emissions, according to the IEA, is due in large part to the shift from coal to natural gas in the power sector, and that's occurring elsewhere in the world.

So natural gas brings with it enormous quality-of-life and risk-management benefits in how we're going to manage risk around global climate change. So natural gas offers a number of hopeful solutions in our long-term energy outlook.

But you take these same technology down to the U.S., and you move them over to oil, and most of you have heard of the Bakken shale development that's going on in North Dakota. Four years ago we were producing about 10(,000) to 15,000 barrels a day from the Bakken shale. It's now producing more than half a million barrels a day in a very short period of time. Obviously that has completely transformed North Dakota's economy. It's created tens of thousands of jobs. It's elevated North Dakota to now the second leading oil-producing state in the nation -- they overtook Alaska -- up from eighth place in 2006. And depending on your view of the levels of industry activity, the pace of things, many are expecting that the Bakken will produce in excess of a million barrels per day within the next few years, less than five, and some view it has the capacity to go beyond that.

So these are technologies in our industry that we think are providing that pathway to that energy security future that all of us have hoped for for most of our lives. Similarly, if you step back from North – U.S. and think about North America, Canada, our neighbor to the north, is possessed with enormous oil and natural gas resources. A lot of that is in the oil sands, which here again is – gets a lot of press and a lot of manufactured fear, in my view.

When you think about all of these resources – and I've given you example in the shales and the tight oil – whenever people identify risk around these resources, you should be assured and know that we know that those risks are there too. And if we choose to invest in those resources as a corporation or as a company, we've taken that risk on. So we invest a lot in research and technology development to overcome, mitigate and manage those risks. In the oil sands, the concern has been over the amount of emissions, because it's a very intensive form of oil production associated with developing that resources.

Well, our industry is never standing still. We're always working on new technology solutions. And our Pearl Sands oil shales project development that's under way in Canada, one of the largest, that will start up production end of this year, the first phase – in preparing for that, we recognized we had to come forward with a different technology solution to lower the overall emissions associated with developing that resource.

So we did. So we developed a different methodology of separating of the bitumen from the sand. It's basically a mining operation until get ready to then have to separate the bitumen from the sand. And the bitumen is what we produce and ultimately take to the refineries to refine into the products that we all use as consumers.

So we developed technologies around that separation process that are very low in energy intensity and technologies around transporting the bitumen to already existing refineries so we don't have to refine this bitumen twice. The largest oil sands project in Canada, the Syncrude project, was one of the first.

And at the technology that we had at that time, 25 years ago, we had to build an upgrader on the site -- it's like a massive refinery. So we separate the bitumen, but it's still not of quality that any refiner can use it, so we upgraded it to what's called a synthetic oil, Syncrude. It's not really synthetic, we just have beaten the tar out of the molecules and turned them into a different chain the refiner can now use them.

So then it gets – so it gets refined twice. Well, a lot of energy consumption and a lot of emissions with that. So one of our quests, when we took on the Pearl Sand, we told our technologists, you got to do this in one step. We got to rid of that second refinery, because that's where all the emissions are coming from. And we have successfully done that, the point being there are always technological solutions to these challenges and the risk associated with resource development. Some of them take a long time. And we've been working on the oil sands for more than 30 years to get to this point. So we're never standing still.

And so when people manufacture this fear that we can't allow this to go forward because our answer is yes we can, because we will have a technological solution and we will have risk mitigation and risk management practices around those resources to ensure they can be developed in a way that mitigates risk – it doesn't eliminate it, but when you put it into the risk versus benefit balance, it comes back into a balance that most reasonable people in society would say, I can live with that. I get in my car and get on the road everyday; I can live with that. It's a risk calculation that people make.

So again, coming back to North America and the size of the resource endowment, Canada has a huge resource endowment; the United States has a huge resource endowment; Mexico has a huge resource endowment. All three countries manage that resource endowment differently, but these three countries also have a long-standing historic relationship in free trade through NAFTA and, because of NAFTA, have a close relationship through their economies, through co-investing in one another. And certainly between the three of us, there's a long historical relationship in energy supply.

Canada and Mexico have long been important suppliers of oil and natural gas, from Canada to the U.S. Well, with these technologies that are now available and being deployed throughout Canada and the U.S. – and we're hopeful that Mexico, as it continues its pathway to reforms around how it manages its own oil and natural gas resources through continuing reforms around PEMEX, that that will open up opportunities for greater partnerships and collaborations and bringing technology to bear on the huge resources that Mexico has as well.

And certainly if you listen to the presidential candidates in Mexico, all of them have said we support continuing reforms of PEMEX that will lead to a greater development of their domestic resources as well, important for their economy, important for their energy security, important for the growth of their nation.

But as I think about energy policy and this question of energy security, I have always felt that if we stepped back and said -- and could look in North America -- we said, now, we approach energy policy and energy security from a North American perspective, the resource base, the technologies that are available and the like-minded policies that could be put in place could rapidly achieve that energy security that we have been in quest of for all of my career. The resources are there, we understand the resources, we understand the technologies necessary to develop those resources, and we understand the risks that are associated with that and how to manage them. So it's my hope that at some point energy security can become a policy issue in our foreign policy discussions with Mexico, Canada and the United States. Between the three of our countries today, we produce 15 million barrels of oil a day. That is a force to be dealt with in global oil markets. Our expectation by the year 2020 is that North America will be producing 18 million barrels a day, and there is more capacity in the system to go beyond that, and to go beyond it at even potentially a faster rate.

So within the North American countries, we have a unique opportunity, because of this technology that has now emerged just in the last less than a decade, in the last five or six years, to, I think, get on a pathway to that energy security that we have all wanted and hoped for.

It's simply a matter of policy. It's simply a matter of choosing. You know, John F. Kennedy once said in a speech that to lead is to choose. Well, we need to choose. We need to choose. Are we going to have energy security and are we willing to deal with the real fears, the real concerns, and manage the risk and acknowledge that we can do that, and when we put it in the scales and the balance of what's in the best interest of society and our peoples, we're going to have a policy that allows this to happen.

It's not clear to me that we are. It's not a foregone conclusion that we will. It's very much an open question. But I think it's an important question for not just the United States, it's an important question for North America. And we can get into a whole wide-ranging discussion of the impacts that would have on the U.S.'s global foreign policy as well.

So it has -- it can have a dramatic impact, and I think we have a terrific and wonderful opportunity in front of us. And I hope, as a person who spent his life in this industry, that I'm going to be around to see it happen.

Thank you. (Applause.)

MURRAY: Thank you.

I'd like to stay on this topic of energy security as distinct from energy independence. There's a story on the front page of the Journal this morning – it's somewhat below the story about the breakup of News Corp., so it took me a while to get to it –

TILLERSON: (Laughs.) Right.

MURRAY: -- but I did get to it. And it says at current trends, we will halve our imports of oil from the Middle East by the end of the decade; that, obviously, a move towards both security and independence, right? That has to be a good thing.

TILLERSON: Well, I think clearly -- back to this energy-security question -- that clearly, having our supplies come more from North America, where you have less geopolitical disruption, lower geopolitical risk, has to move us up the security curve.

Now, having said that, again I want to remind you of something I said early on as well. Throughout all the disruptions of the past five years since I was last here – revolutions in major oil-supplying countries, threats to major oil-supplying routes – the oil markets have stayed well supplied. So some of the fears around energy security, I would say, are not well-founded in fact either, but clearly, more supply coming from North America, a more stable region than other parts of the world, has to improve your energy security.

MURRAY: So you could get close to the -- yeah, I mean, we are within sight of something close to energy independence, if we wanted it, for North America.

TILLERSON: Well, I – when people say "energy independence," that's an interesting phrase. And you wonder: What do they mean?

Canada has been a net exporter of energy for decades. What do you think people in Canada pay for their energy? They pay the same thing we pay. It's because they allow markets to work, they allow free markets, they allow free trade.

So the translation of the cost of energy – if people are thinking energy independence means low prices – and that's the way a lot of people seem to want to have the conversations; when we get energy independent, we wouldn't subject to these price swings that happen every time the guys over there that don't like us, you know, do these things, they do it to us – and the truth of the matter is, they don't do anything to do us. I mean, it's just – it's just natural supply/demand, ebbs and flows, and these long timelines for supply to respond to those demand signals.

So if people are equating energy independence to some kind of price stability or narrow price band, then they have to be putting that in a context of a very rigid policy and regulatory control around that system, because otherwise it's going to continue to move with the global prices.

If they're putting it in the context of I don't have to worry about a supply interruption and therefore that may take some element of the price forward curve out, then it may have a positive effect.

MURRAY: But I think also people would ask the question, if we halve our reliance on oil from the Middle East, does that reduce our involvement in the problems of the Middle East?

TILLERSON: Well, that -- and that's -- that's a very interesting question, too. If you -- if you said the U.S. never, ever again needed to import a barrel of crude oil for -- through the Persian Gulf, then it becomes a national security question. It changes our economic interdependencies with that region because that is really the source of our economic interdependencies, is our energy dependency. There's not a lot of economic activity between us -- some.

Now it becomes a question of what's our national security interest in the region, because you have an enormous – as all of you know, enormous national defense footprint in the Middle East because of our interest in the area.

So if then the U.S. said, well, we can now redeploy those defense resources elsewhere in the world, the question you have to ask is, well, then who steps into that void? And most likely it's going to be a large consuming country is going to step into that void.

If that happens --

MURRAY: You mean a China?

TILLERSON: Well, they're a large consuming country. (Laughter.)

MURRAY: (Chuckles.) OK. Right.

TILLERSON: So -- well, they step into the void, and given the history of the region and all of the issues and challenges of the region, and how that has spilled over onto us, the American people, is that a good thing, from a national security standpoint, that someone else then steps into that void, or is it a bad thing? Well, I'm not expert enough on that one to say, but you have to anticipate what happens then and what do you -- and when you say we're no longer dependent on them, so it changes our relationship, well, it may redefine the priorities of the relationship, but does it fundamentally change the relationship and our interest in the region and our interest in that -- those peoples and their issues?

MURRAY: So oil doesn't drive those relationships and won't even if we could wean ourselves from all their oil.

TILLERSON: I have never felt oil drove the – were the only underpinnings in those relationships. It is important not just because we get our oil, because if you really look at the amount of oil we physically get, it's important, but we could replace it with a little higher cost. It's more a question of the importance of that region to global economic stability. And we're going to still be interested in that. So if you have a supply – if we're no longer getting any oil from the Middle East because we're secure here, a disruption of oil supplies from that region will have devastating impacts on global economies. Now is that important to us? Probably so.

So I'm not sure it changes the relationship dramatically. I think it may redefine the priorities around the relationship, but I'm not sure it changes it dramatically.

MURRAY: But there is this sort of broader issue -- which a lot of people in this room have spent a lot of time thinking about -- that we live in economies that are driven by oil, and oil tends to come from some of the least stable countries, nations in the world. I mean, you're investing heavily in Russia, you've got problems in Iraq, in Kurdistan. Is there an opportunity in this explosion of resources in North America to alleviate some of those issues that we've been dealing with for the past century?

TILLERSON: Only if you think the rest of the world doesn't matter. (Laughter.) It goes back to what I said about the Middle East. You said that oil is so fundamental to economic growth, and you're absolutely right. You know, energy is fundamental to economic growth, and oil is

fundamental because to this point in time, we have not found, through technology or other means, another fuel that can substitute for the role that oil plays in transportation, not just passenger, individual transportation, but commercial transportation, jet fuel, marine, all the ways in which we use oil as a fuel to move people and things about this planet. And we've just not found a good substitute for that.

So to the extent that is important to economies, and global economies are important to our economy, which we all know they are, you never divorce yourself from that. And this is back -- that's why I say this energy independence and energy security discussion it seems to me to get --

MURRAY: Get it wrong?

TILLERSON: People get the terms interchangeable, and they're really not.

MURRAY: Let's go back to the price issue for a minute, because you talked about a global price for oil, which there is. There isn't a global price for natural gas. I mean, we're paying \$2.50 or \$3. In China they're paying, what, \$15, \$16? I mean it's significantly higher.

TILLERSON: Well, actually, in China domestically they're paying about \$4, because the Chinese control the price.

MURRAY: But they would pay for imports.

TILLERSON: The little bit of imports that they are making, natural gas, they're paying this kind of – Japanese price.

MURRAY: So I was with the CFO of Siemens yesterday, who was basically lecturing a group of American businesspeople, saying you have an historic opportunity right now to rebuild the American economy on cheap natural gas. Do you agree with that?

TILLERSON: Well, generally I do. I'd maybe say that we have a historic opportunity to rejuvenate the American economy and rejuvenate and restore American manufacturing competitiveness because we now have long-term, secure, stable supplies of natural gas at some price. Cheap is a - Imean cheap is in the eye of the beholder. MURRAY: Relative, yeah.

TILLERSON: It will be supplied at whatever its cost to supply will be. And what I can tell you is the cost to supply is not \$2.50. We are all losing our shirts today. You know, we're making no money. It's all in the red. And so right now, we're enjoying the overhang, which again, it's this – we're not – the system is so enormous, the price supply/demand signals are always slightly out of sync. They're always doing this – (gesturing) – you know. We just can't quite hit – we can't hit a bull's-eye. Hopefully, we can hit the backboard. (Laughter.)

But today we're seeing these very low prices because the industry overshot when we had those \$6, \$7, \$8, \$9 prices, and we overdeveloped the supply, and now people are just -- they're getting by on cash in some cases. I can tell you it's negative earnings, by and large, and some people -- or it's negative on cash for them, depending on how efficient they may be. So today's price is not sustainable to deliver that energy security.

What – you know, what the price is that's necessary to do that, the market will seek it and it will find it. It's not \$9, I can tell you that. And so, clearly, in a global – if you're thinking about what others are paying for natural gas and those that are importing LNG, liquefied natural gas, it will be substantially below the cost of that to maintain a secure supply.

MURRAY: I want to open it up to questions from the group, but before I do, I think I should probably ask about your media comments. At the time of the Deepwater Horizon oil spill, folks in your company urged us not to treat all oil companies the same. So I wonder if I could ask you if perhaps you're painting with a very broad brush when you talk about media covering hydraulic fracturing.

TILLERSON: There's probably a couple of camel hairs in the brush that I would say don't apply. (Laughter.) But this is an ongoing dialogue I've been having with people in your profession now for some time; that for whatever reason, a large number of people in the journalism profession simply are unwilling to do their work. They're unwilling to do the homework. And so they get something delivered to them from the manufacturers of fear; it makes a great story. I mean, it – I mean, it does. It makes a great story. People love that kind of stuff. The consuming public loves it, because it goes to what, you know, their fears are.

What I would wish and hope that people would do is return to a journalism standard that says, you know, I need to check and see what's what before I run with this. And there's not a lot of that going on, quite frankly. And it's not because we're not trying. We provide a lot of information. There are a lot of sources of science-based information. There are a lot of sources that can debunk claims that are made specific – you know, specific examples.

Farmer Joe lit his faucet on fire, and that's because there was gas drilling going on, you know, in his back (porch ?). And we can go out there and we can prove with science that that is biogenic gas; it's been in the water table for millions of years; it finally made its way Farmer Jones' (sic) faucet, it had nothing to do with any oil and gas activities. And part of when you're dealing with the subsurface strata is you've got to – you got to understand that Mother Nature has done a lot of things in the subsurface that have nothing to do with anything man has done. And it changes. It moves around all the time. So what once was will change.

And we encounter this all the time. And we deal with it from a risk management standpoint, because these present risks to us as well. We have to understand what's going on. So I just – you know, it's a question of will people – will people do their homework? And what I'm finding is that a large segment are just lazy. They just don't do their work. It's as simple as that.

MURRAY: Let's open it up. (Laughter.)

TILLERSON: You asked. (Laughs.)

MURRAY: I did. I did. Wow. Lot's of questions. Roger. Well, I'll try to get to as many of them as possible.

QUESTIONER: Mr. Tillerson, we read that some fleets – trucking fleets and other fleets are starting to convert to compressed natural gas as a transportation fuel. Tell us how far you think that can go and whether it can ultimately spread to average Americans using natural gas, in effect, as a transportation fuel.

TILLERSON: Well, we've done that analysis, and when you take into consideration conversion costs or cost of a natural gas engine or a flexible engine – because what most people are going to want, most commercial truck drivers, and certainly what passenger vehicle people want, is they

want flexibility because they certainly don't want get caught somewhere where they can't refuel. It's similar to the hybrid today. So you can call the natural gas vehicle a different kind of hybrid.

When we look at the economics around that, and the likelihood of a broad-based infrastructure to serve the fuel disposition needs, we think it's highly unlikely that it ever becomes material. Now, we have, and I have had calls from CEOs of companies that are considering, who have large fleet vehicles. And I have advised them, if you have a fleet situation, you should – you should definitely evaluate that, because it makes a lot of sense. So if you're a UPS or you're an AT&T, huge service vehicle fleets that go back to central location every night, you can afford to put in your own infrastructure to refuel, standard spare parts, you can lower the cost of maintenance. You can do all that – all those things because you have economies of scale.

In a commercial truck -- semis, tractor-trailer fleet -- there will be -- they'll be some conversions. What most -- or many are doing are they're going to liquefied natural gas as opposed to compressed natural gas because you get some economies of scale on the vehicle itself, higher density of energy in a liquid form. And then they also have their own LNG refueling sites along their routes where they can refuel. But I think overcoming the infrastructure cost and the build out, overcoming the conversion costs put it pretty unlikely to me that it becomes material as an alternative transportation fuel.

MURRAY: Yes, question in the back. Just hold on for the microphone and identify yourself before you ask your question, please.

QUESTIONER: Hi. My question – I'm John Levin of Levin Capital Strategies. My question follows exactly Roger's, and that extremely interesting answer. Does the same logic apply, however, to using our natural gas reserves to put it through our underutilized power plants at night to try to produce power to power electric or hybrid cars? The assumption is the transportation has been run by oil. And the assumption of some of us is that that could be substituted through our utility plans, which are not utilized, to an entirely new auto industry.

TILLERSON: Absent -- I mean, it certainly could. And as with any power generation source, whether it's wind, solar, or natural gas, the issue with electric cars is not so much the source of the electricity, although if you're going to do a -- if you're doing this for carbon CO₂ issues

management, you do want to undertake what we call a well-to-wheels analysis, which means go back to the – to the raw source of the energy going into power conversion, what's the thermal efficiency of the conversion, what's the thermal efficiency of conversion through the vehicle all the way to turning the wheels. And when you do that, some of those systems have some promise and some don't.

The bigger issue with the electric vehicle is with the vehicle itself still. The technology simply has not advanced sufficiently to make those vehicles attractive for most individuals. So large-scale deployment to passenger use – we think, it's going to be – continue to be pretty slow, and it has to do with the battery technologies. And while there's been a lot of research and there have clearly been incremental improvements in battery technology, there have been no fundamental breakthroughs in batteries.

We've been funding research out at Stanford now for almost 10 years, and one of their research areas is they're trying to – they're studying the battery – somebody's got to come up with a different architecture for the battery. And we're waiting for that breakthrough, and they're doing a lot of really interesting things – (chuckles) – with battery architecture.

MURRAY: Do you think we're close?

TILLERSON: No, I think we're not, which is why I'm not optimistic because it is a -- it's a very, very difficult science-physics problem to overcome. But having said that, we do believe -- in our own energy outlook, we accommodate an ongoing penetration at a fairly healthy rate of hybrids, and we do think the hybrid electric does hold a lot of promise.

It still suffers from many of the same deficiencies in the battery. But we think the public -- the part of the problem with the battery's the public's not going to put up with it -- (chuckles) -- basically in a -- in a broad deployment.

MURRAY: There's a question over here.

Yes, sir, right there.

Well, I was pointing to him, but that's all right. Since you're there, let's do this one, and then we'll go there.

QUESTIONER: Hi, I'm David Fenton (ph).

Mr. Tillerson, I want to talk about science and risk, and I agree with you that's the way we must proceed. So, as you know, it's a basic fact of physics that CO₂ traps heat, and too much CO₂ will mean it will get too hot, and we will face enormous risks as a result of this not only to our way of life, but to the world economy. It will be devastating: The seas will rise, the coastlines will be unstable for generations, the price of food will go crazy. This is what we face, and we all know it.

Now -- so my question for you is since we all know this knowledge, we're a little in denial of it. You know, if we burn all these reserves you've talked about, you can kiss future generations good-bye. And maybe we'll find a solution to take it out of the air. But, as you know, we don't have one. So what are you going to do about this? We need your help to do something about this.

TILLERSON: Well, let me – let me say that we have studied that issue and continue to study it as well. We are and have been long-time participants in the IPCC panels. We author many of the IPCC subcommittee papers, and we peer-review most of them. So we are very current on the science, our understanding of the science, and importantly – and this is where I'm going to take exception to something you said – the competency of the models to predict the future. We've been working with a very good team at MIT now for more than 20 years on this area of modeling the climate, which, since obviously it's an area of great interest to you, you know and have to know the competencies of the models are not particularly good.

Now you can plug in assumptions on many elements of the climate system that we cannot model -- and you know what they all are. We cannot model aerosols; we cannot model clouds, which are big, big factors in how the CO₂ concentrations in the atmosphere affect temperatures at surface level. The models we need -- and we are putting a lot of money supporting people and continuing to work on these models, try and become more competent with the models. But our ability to predict, with any accuracy, what the future's going to be is really pretty limited. So our approach is we do look at the range of the outcomes and try and understand the consequences of that, and clearly there's going to be an impact. So I'm not disputing that increasing CO₂ emissions in the atmosphere is going to have an impact. It'll have a warming impact. The – how large it is is what is very hard for anyone to predict. And depending on how large it is, then projects how dire the consequences are.

As we have looked at the most recent studies coming – and the IPCC reports, which we – I've seen the drafts; I can't say too much because they're not out yet. But when you predict things like sea level rise, you get numbers all over the map. If you take a – what I would call a reasonable scientific approach to that, we believe those consequences are manageable. They do require us to begin to exert – or spend more policy effort on adaptation. What do you want to do if we think the future has sea level rising four inches, six inches? Where are the impacted areas, and what do you want to do to adapt to that?

And as human beings as a – as a – as a species, that's why we're all still here. We have spent our entire existence adapting, OK? So we will adapt to this. Changes to weather patterns that move crop production areas around – we'll adapt to that. It's an engineering problem, and it has engineering solutions. And so I don't – the fear factor that people want to throw out there to say we just have to stop this, I do not accept.

I do believe we have to -- we have to be efficient and we have to manage it, but we also need to look at the other side of the engineering solution, which is how are we going to adapt to it. And there are solutions. It's not a problem that we can't solve.

MURRAY: But let's stick with that for just a second. I mean, Exxon Mobil, before you became CEO, was very aggressive and overt in challenging and mounting a public relations campaign against the sorts of things that Mr. Fenton (sp) just managed. You changed that when you came in. But I guess the question I'd ask – I was at my daughter's graduation last weekend, and the graduation speaker said that global warming is the great challenge of your generation. Do you agree with that? Would you agree that it's in – at least one of the top five challenges of the generation, or do you personally think that it's been way overblown?

TILLERSON: No, I think it's – I think it's a great challenge, but I think it's a question back to priorities. And I think, as I just described based on our understanding of the system and the models and the science and that there are engineering solutions to adapting, that we think it's solvable.

And I think there are much more pressing priorities that we as a -- as a human being race and society need to deal with. There are still hundreds of millions, billions of people living in abject poverty around the world. They need electricity. They need electricity they can count on, that they can afford. They need fuel to cook their food on that's not animal dung. There are more people's health being dramatically affected because they could -- they don't even have access to fossil fuels to burn. They'd love to burn fossil fuels because their quality of life would rise immeasurably, and their quality of health and the health of their children and their future would rise immeasurably. You'd save millions upon millions of lives by making fossil fuels more available to a lot of the part of the world that doesn't have it, and do it in the most efficient ways, using the most efficient technologies we have today.

And we continue, and have for many, many years, talked on our energy outlook about the importance of ongoing energy efficiency, continuing to carry out economic activity with a lower energy intensity. And we've been very good as a country at doing that. We've been very good globally at doing that. And there's more potential in it.

MURRAY: Paul.

QUESTIONER: I'm Paul Steiger with ProPublica. A sort of nearer-term issue, and much smaller and, I think, much more manageable is as the development of shale gas and oil proceeds, which uses enormous amounts of water, how do we protect the water supply and in particular make sure that makes this water comes back up from the ground that it's carefully managed and either recycled or stored someplace where it can't get into the water table? And when you got into the natural gas field, when you made your big purchase, there was a lot of enthusiasm because you guys are strong operators; you pay attention to environmental issues. But what kind of regulatory structure needs to be in place to make sure that the lesser operators also take good care to incur the cost and make sure that the water is carefully managed? Shouldn't there be EPA regulation of the water issues connected with shale? TILLERSON: Well, first – and I'll try to start at the beginning of all that. That was – there was a lot in that question. If you look at the water consumption per unit of energy that's provided, shale gas development is one of the lowest water consumptions of any form of energy we can provide you. If you look at the water consumption around coal, the water consumption around a lot of other conventional sources of energy, it is much higher.

The numbers sound large. When we say we're going to pump, you know, 2 1/2 million gallons of water down this well to hydraulically fracture it, that's a – sounds like a lot of water when you look at your monthly water bill. In the grand scheme of water consumption, it's actually pretty low.

I'll give you a little trivia factoid – and water is a big concern, I know, to a lot of people. They're worried about water scarcity. There is plenty of water. It's just not in all the right places. That's the issue. It's not that we're – have a water resource problem; we have a water distribution problem, challenge.

More water flows out – freshwater flows out of the mouth of the Hudson Bay in eight seconds than all the water we used to hydraulically fracture all the wells last year. That's how much water is available. It's a question of how we use it.

Now in terms of how we protect it, we use the same methods that we have used for years and years in handling produced water. In conventional oil and natural gas production, you always produce a lot of formation water, and it's crummy water. It's real salty. It's got heavy metals in it. It's got bad stuff in it.

And we have been handling and managing that water system for decades in terms of how we clean that water up, separate the things that are useable to us out, take the waste product water and dispose of it, either dispose of it through reinjection or dispose of it through reuse or clean it up in other ways and then, through permits, dispose of it through surface disposal.

So we have many, many ways we can deal with that, and so it's not a new -- this whole flow-back issue is nothing. We deal with massive amounts of water in the conventional system today.

In terms of the regulatory question, we have long advocated that when it comes to regulating hydraulic fracturing – and if you think about the kind of issues that you worry about, which is public – you know, protecting the water resources, proper disposal of the water, either reinjection or at the surface – we believe that is best left to the state, state regulatory bodies, because state regulatory bodies are responsible for their water resources, their public drinking resources. They're responsible for land management. And they know – they know those issues in their state better than anyone else does. And they're not the same from state to state. So much of it is a function of geology, topography, the climate that you're operating in – harsh, not harsh. So we – writing a federal standard to apply across a whole range of these conditions we don't think is the most efficient way to go about it.

So -- and there are -- there are good operating state regulatory models that have functioned well to protect the public interest. We have been promoting -- transferring those best practices to some of the new states and emerging states, Ohio and others. Exxon Mobil, working with General Electric, has put -- we both put a million dollars apiece into a fund to train state regulators at Penn State, at the Colorado School of Mines and at the University of Texas at Austin; train regional regulators, send them down there and have them be trained by geologists and engineers, so they understand what the issues are, what they should be looking for, so they can be competent regulators. We want competent regulators.

Competent regulators is what gets to your last part, which is, how do you make sure every operator performs well? Well, we've published standards, so everybody has a road map of how you do this well, engineering best practices that we know work. If you follow these, you're not going to have any issues. Regulators then are competent enough to oversee that and say yes, everybody's following the standard and they're following the regulation.

So it's a – we all have our role to play, and we want competent regulators, so that they can play theirs.

MURRAY: A question right here. I'm going to -- if the council folks are OK with it, I'm going to keep going. Mr. Tillerson took a little more than his allotted time, and there are a lot of questions out here. Can we take a couple more questions?

Right here, then right up here.

QUESTIONER: Ed Cox, a director of Noble Energy. Mr. Tillerson, with respect to Saudi Arabia and your comments on oil supply in the world, do you believe that Saudi Arabia has a policy of letting oil prices drop? And if so, what do you think the geostrategic reasons are for that?

TILLERSON: Well, I think the Saudis have been about as transparent as I think it is in their interest to be, and the Saudi oil minister, Ali Naimi, has from time to time indicated where they believe – they have a price at which they believe the global economy is comfortable, and most recently he said around \$100.

What I can tell you is I think from the Saudi perspective, and I've spent a lot of time with them, they do feel a real responsibility to stabilize the markets. They feel that responsibility, obviously, out of a certain self-interest, because they lived through the last time; they didn't do that well and it wasn't good for them. So they take their responsibilities to maintain stability of the marketplace, and to do that, they do it through supply, which is why they invested heavily to reinstate a surplus capacity, so they've invested billions of dollars in capacity that they don't use, on purpose. They do it to stabilize the market.

So I think they have been forthright in trying to signal to the global economy this is kind of where we think things work well. And they do a lot of analysis. It's not set arbitrarily. And it's set more – from my view, it's set more from a perspective of what's going to support the global economy and less from a perspective of what do I need for my national budget; not that the second is unimportant to them.

MURRAY: A question right here, and then we'll take this question right here, and then we'll wrap it up.

QUESTIONER: Hi. Kassia Yanosek with Quadrant Management. And my question is about jobs. I used to work for an oil and gas major, and about five years ago there was a real concern about the dearth of skilled engineers in the industry. And I'd like to see if you could comment on that and if that's changed at all with the revival of oil and gas industry in North America, or if you're finding that you have to import talent, and how you can contribute to job growth in America.

Thanks.

TILLERSON: Well, the availability of scientists and engineers is a real challenge in our country, not just for our industry but for American competitiveness broadly. If you just look at the number of graduating scientists, engineers, and in particular postgraduate degrees – masters and doctorals – it's largely dominated by foreign students. So we are having to go to a lot of sources to meet our own talent needs. Because we are a global company, we recruit outside the United States. We recruit heavily in Europe; we recruit heavily in Asia.

But it is a serious challenge here in the United States in terms of the number of graduating scientists and engineers. If you watch any of our ads, that's what we're trying to do with a lot of our advertising, is draw attention to that issue. And it's not just at the university level. The problem backs all the way into our primary and secondary education processes. We're not – we're not providing the basics to young people and we're not providing the motivation for them to seek careers in these areas. So, you know, we have a lot of effort personally in our company around that, but also collaboratively within the business community.

Yes, we are filling a lot of our needs elsewhere; as I said, recruiting elsewhere. And in terms of what we're going to do about it in the future, it really is – it really is tied up in this very broad education debate that's going on in the country today, because it all gets back to the quality of delivery of education to young people. If we fix that, I'm confident the science, math, engineering demands of our country will be met. So it's really grounded back here in a problem upstream of the university, even.

QUESTIONER: Thank you. And thank you for a very lucid and illuminating presentation. My name is Paula DiPerna. I'm with the NTR Foundation.

Just to go back to demand side and incentivizing and maximizing the high-risk dollars that you're investing, I wonder if you would describe for us the most recent successes you may or may not have had in advocating for a serious, coherent energy-efficiency policy, not only nationally but globally, since that is also a patchwork, mixed bag and, if in place, could certainly leverage your money.

TILLERSON: Well, I think there's – from my perspective in the time that I've really been in a position to work closely with policymakers, I've been encouraged by the amount of progress we've made on, first, educating policymakers of how powerful efficiency is in the total energy balance.

And that was where we had to start was making sure there was an awareness in – on their part, and beginning to see now policy decisions taken to emphasize efficiency, some of which we agree with, some of which we may not agree with, but I think the point being there is a much better awareness among policymakers of how important efficiency and incentivizing efficiency – putting policies in place to do that, how important that is to the overall – to an overall energy policy.

And you see it in this country, whether it's through the – you know, the higher CAFE standards, some of the building code standards, a number of steps that are now being taken, all being driven by this recognition that if we improve the efficiency – and I would say most of it is more to the greenhouse gas question – there's a recognition that if you improve the efficiency, you'll lower the emissions. But we also say if you improve the efficiency – (chuckles) – you improve your energy security as well. So they're – you know, they're very consistent with one another.

So I'm encouraged. And there – is there more that could be done? There's always – you know, it's a question of how do you want to incent that. We are free market, free trade advocates. And so, you know, what we'd like is for market forces to incent that and for technologies to make their way into that space that consumers recognize, that's a good value proposition; I'm going to buy that; I'm going to use that, as opposed to mandating certain answers.

When you mandate certain outcomes – I have long stated and I believe to be true that when you mandate certain outcomes, you actually inhibit innovation. If you leave the field wide open, the greatness of entrepreneurial spirit in the United States and the creativity and innovation of young people to find a solution to something because they think they can be the next billionaire is pretty powerful. So we don't like mandates. We don't like those kinds of solutions because we think they block innovation pathways, and rather let – you know, let markets work, let things work, and we'll continue to improve. And again, our record is pretty good on energy efficiency.

QUESTIONER: (Off mic.)

TILLERSON: That's a tough one.

QUESTIONER: (Off mic.)

MURRAY: OK. Thank you all for coming.

Mr. Tillerson, thank you very much. (Applause.)

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THIS IS A RUSH TRANSCRIPT.

Exhibit 13

From:	MAGGI Riccardo (CAB-TIMMERMANS)
Sent:	mardi 26 novembre 2019 12:34
To:	SAMSOM Diederik (CAB-TIMMERMANS); NELEN Sarah (CAB-
	TIMMERMANS); HIESINGER Stefanie (CAB-TIMMERMANS);
	STOYNOVA Damyana (CAB-TIMMERMANS); ;
	MES Daniel (CAB-TIMMERMANS); AGOTHA Anthony (CAB-
	TIMMERMANS); BRAUN Helena (CAB-TIMMERMANS); COLOMBANI
	Antoine (CAB-TIMMERMANS); [CAB-
	TIMMERMANS); TOMCZAK Aleksandra (CAB-TIMMERMANS); VISEK
	Lukas (CAB-TIMMERMANS)
Subject:	Meeting with ExxonMobil representatives

Last Thursday,

I met with **three representatives of ExxonMobile** at the request of DS whom they had originally asked to meet:

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•	
•	

They expressed their <u>support</u> for the <u>Paris</u> Climate Agreement and looked forward to the Green Deal. Lamenting the "bifurcated nature" of current US political discourse around the subject, they appreciated that fact that constructive discussions around issues and differences in views were still possible in Europe.

Their major points were:

- <u>2050 is a tough challenge. Important to ensure efficient policies</u> to get there. Carbon pricing and the *ETS must remain at the core*. Give serious consideration to extending ETS *beyond stationary sources*. Tail pipe emission legislation should be substituted with *power plant to wheel emission regulation*.
- 2. No specific view on 2030 targets professed.

- 3. <u>Technology is a crucial part of any solution</u>. <u>Policies must</u> <u>therefore support</u> the development and deployment of the necessary technologies.
 - a. No specific example of what the EU should do differently or more for this. Expressed *appreciation of the Modernization Fund* and the outreach made to industry in this context.
 - b. *Hydrogen and CCS will need to come into the picture*. Strong pitch for CCS (which they claim to do since the 1970s). In their view, technology is not an issue; economics is for the time being (deployment on large scale would need 80 dollar per tonne ETS carbon price).
 - c. First generation biofuels are a problem but this should not mean that (3^{rd} generation) biofuels are abandoned. Lower carbon liquid fuels should remain very much in the picture as they are and will remain necessary for aviation, maritine and heavy road transport.
- 4. International developments:
 - a. US: see above + not doing so bad on emission actually given: great difference between federal and State level and strong pull by favourable economic factors (sharp drops in price of renewable and gas have led to a sharp reduction in the use of coal).
 - b. *China: with India will make or break. Worried* about more recent developments. Increased political relevance of pollution as a problem especially for the growing middle classes supports positive trends but fears that the *leadership will always choose growth over climate action* if growth is imperilled. Expects efforts to have more efficient use of coal

but not drastic choices against coal. Little level of influence on political decision as a Western oil company.

c. *India: more optimistic.* Plans are in the making. Extremely open to policy discussions and, in their view, there is a *possibility* of India *leapfrogging*.

Riccardo Maggi Member of Cabinet



European Commission Cabinet of the First Vice President Frans Timmermans

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Exhibit 14

Energy — key to growth and a better environment for Asia-Pacific nations

By Lee R. Raymond Chairman and Chief Executive Officer Exxon Corporation

World Petroleum Congress Beijing, People's Republic of China

October 13, 1997

Remarks by Lee R. Raymond Chairman and Chief Executive Officer, Exxon Corporation World Petroleum Congress Beijing, People's Republic of China October 13, 1997 – As Given

It's a pleasure to be back in Beijing and an honor to address the World Petroleum Congress.

It's entirely fitting that we meet in this seat of ancient civilization and source of world culture. For centuries, people from far parts of the Earth have come to China seeking commercial and other opportunities.

The Romans came here seeking silk – traveling along a network of trails that became known as the Silk Road. In the 13th century, history's most famous traveling salesman, Marco Polo, took this road to Cathay, returning to Venice with treasures and tales that astonished all of Europe.

More than a century ago, William Herbert Libby, representing Jersey Standard, the predecessor to Exxon, came here to persuade Chinese families to try Esso's kerosene in their lamps and cooking stoves.

The odorless oil and its clear white light proved an instant success, and by 1910 China had become Exxon's largest customer in the Far East.

To build sales, Libby gave away small, inexpensive kerosene lamps that became widely popular. The company was known by the name "Keepers of Light."

Today, Exxon and the world petroleum industry are still "Keepers of Light." We earn that title by providing energy to light the way to economic progress,

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higher standards of living and hope for a brighter future for people around the world.

Nowhere is that progress more evident than in the Asia-Pacific region. I've traveled to this part of the world often in recent years, and I'm constantly impressed by the commitment to economic growth that's prevalent throughout the region.

All across this region – from Bangkok to Beijing, Jakarta to Shanghai, Singapore to Seoul – the signs of growth are unmistakable.

Homes, apartments and office buildings going up. Factories, refineries and power plants under construction. More cars, trains and airplanes on the move than ever before. In 15 years, this region's economy should almost double, shifting the global economic center of gravity toward the East.

The people of this region, representing some 40 percent of the world's population, have a lot to smile about: new and better-paying jobs, more and better consumer goods and services, and greater opportunities for the next generation. Their smiles and looks of hope and optimism are the human face on the economic transformation that's gaining force in Asia.

I know all of us here today want to see this transformation continue. But we have to remember that progress is not automatic. As recent economic difficulties in the region demonstrate, there is no guarantee when it comes to economic growth.

In fact, some argue that the easy growth from increasing capital and labor inputs has already occurred. They say that the road ahead will be more difficult and will require strong boosts in productivity to keep Asian economies growing.

I see no reason why economic growth can't continue strongly in this region in the future. But I do agree that sustained growth is only possible when it is built on sound fundamentals – education and training, a strong work ethic, sound regulatory policies, incentives to invest, and many other factors that don't come easily or cheaply.

We might also remind ourselves that this region's growth depends on strong economic ties with other parts of the world. Today, the world is much more economically interdependent than it was a few years ago.

Advances such as fiber optic cable, communications satellites and the computer have created better tools for communicating and conducting business. As a result, opportunities and challenges flow more quickly from one area of the world to another.

Political change has also played an important role in laying a foundation for growth. As more and more governments have turned to market principles, trade barriers have fallen, fostering a rising tide of international investment and commerce.

One result of these changes is that the area of the world open for energy development has increased by more than one-third.

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That's very good news indeed because, as we all know, economic growth and higher standards of living require energy. Energy use and economic growth are inextricably linked. The countries with the highest economic growth and the highest standards of living are also those with the highest energy use per capita.

Today, most of that energy, both in Asia and in the world as a whole, comes from fossil fuels – about 85 percent. Of these, oil and natural gas supply the majority, with coal also being a major player. That's especially true here in China, where coal remains the dominant fuel source.

I know there are some people who argue that we should drastically curtail our use of fossil fuels for environmental reasons, and I'll have more to say about that in a moment. But let me state at this point my belief that such proposals are neither prudent nor practical.

With no readily available economic alternatives on the horizon, fossil fuels will continue to supply most of the world's and this region's energy for the foreseeable future. Their use is essential both for economic growth and for the elimination of poverty, which is itself the worst polluter.

In recognition of this, we must continue to develop and apply technology and expertise that enable us to use fossil fuels in ways that are efficient and environmentally sound. Doing that will require a great deal, from both government and the petroleum industry.

Looking specifically at oil, demand in the region has grown vigorously, increasing reliance on imports, despite efforts to develop indigenous supplies.

China itself, with growth rates among the highest in the world, became a net importer in 1995.

I do expect some moderation in the rate of oil demand growth in all of the region as economies become larger, more sophisticated and efficient. But with the volume increase that is expected, I do not see how growing import dependence can be avoided.

In anticipation of this, it appears that supply strategies are changing, with Chinese and other Asian companies becoming more active in exploration in other parts of the world. But this change should not cause us to lose sight of the need to maintain and, if possible, increase local production and reserves.

Asia still has numerous areas with hydrocarbon potential. But it will take a major effort to unlock these resources for the benefit of consumers.

Increasingly, this is a difficult task, often involving seismic and drilling in deep waters or harsh terrain, with complex geological formations. Examples include the Sakhalin islands off Russia and the Tarim Basin in China.

Developing such resources at an affordable cost is going to require the application of the very best technology and practices known to the industry. Private petroleum companies have those tools. And so, an essential step to achieve further progress is for governments to accelerate the opening up of prospective resources for development by private industry.

One resource with great potential for Asia is natural gas. But producing and using it will require some visionary thinking and the application of new and as yet unproved technology.

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Vast resources of gas exist off Natura Island in Indonesia, in Papua New Guinea, and along the Northwest Shelf of Australia, to name a few.

Others may develop along the Asia-Pacific coast as far north as Russia. And, of course, there are major gas deposits west of the region as well. The key issues are how to get this gas to markets, and how to develop markets once it is determined that the gas can be produced at reasonable cost.

Today, most gas is transported to this region as liquefied natural gas, LNG. In the United States and Europe, most gas moves through pipelines – as it will in South America in the years ahead. Could the same not take place in Asia?

The distances are greater here, the markets less developed, but technology may yet lead the way to a pipeline grid serving the countries of this region. New high-strength steel and other technology may make pipelines feasible from Sakhalin, Natuna or as far away as Turkmenistan.

On the demand side, we estimate that oil for transportation and industrial use in the region will grow by nearly 10 million barrels per day by 2010. That's equivalent to about 40 new large refineries over that period – 3 per year.

Of course, along with demand comes the need for improved products, new chemicals and better processes. Increasingly, refineries and chemical plants are integrated into single sites as we're seeing in Singapore, for instance.

Finding new and better ways to produce, refine and market oil in the midst of change is not new to the petroleum business. What is new is the remarkable pace at which the need for petroleum fuels and products is accelerating in Asia.

Such conditions are creating opportunities for a synergy between governments of the region and private petroleum companies, with the potential to speed and strengthen the whole process of economic development.

Clearly, private companies such as Exxon have a lot to offer. Developing energy resources in new and difficult areas, building safe, reliable, and efficient refineries and chemical plants, and bringing new and better products to market are just a few of the contributions we can make.

We also bring hard-won technological expertise tested and proven in other areas of the world. This can make it practical to develop resources that would not have been economic just a few years ago. It can also lead to significant employment and educational opportunities. Time will not have to be spent in developing technology or training from scratch – they're already available without the growing pains.

Of course, all of this will require massive outlays of capital – financial, intellectual and technical. Projects will likely be large and complex, requiring multiple management skills. Familiarity with challenging environments, flexibility, and strong technological support will be key elements of a successful venture.

Private petroleum companies offer all of these essentials. But to draw on them, countries must be willing to provide incentives that cause companies to want to invest.

This is particularly true now, with so many new opportunities throughout the world. Competition among countries eager to develop petroleum reserves is at an

all-time high. Resources are being stretched to the limit. To attract companies to make the huge investments needed, nations need to offer tax-and-take provisions that will encourage businesses to bring their best people and technology.

Governments also need to provide a stable investment climate, one that vigorously protects physical and intellectual property rights. They should avoid the temptation to intervene in energy markets in ways that give advantage to one competitor over another – or one fuel over another. Governments' goal should be to promote a fair contest on a level playing field.

Another key contribution governments can make to economic development is in setting rational environmental standards. People the world over want a clean environment, and some are concerned that fossil fuel use – especially oil use – is incompatible with that objective.

Today, concern about the environment focuses on the issue of global climate change. In December, representatives from some 160 nations will meet in the beautiful city of Kyoto, Japan, to decide on legally binding agreements that would have the effect of cutting the use of oil and other fossil fuels. Clearly, all of us here today have a big stake in the decisions that will be made.

Proponents of the agreements say they are necessary because burning fossil fuels causes global warming. Many people – politicians and the public alike – believe that global warming is a rock-solid certainty. But it's not.

Let me briefly address three key questions: Is the Earth really warming? Does burning fossil fuels cause global warming? And do we now have a reasonable scientific basis for predicting future temperature?

In answer to the first question, we know that natural fluctuations in the Earth's temperature have occurred throughout history – with wide temperature swings. The ice ages are a good example.

In fact, one period of cooling occurred from 1940 to 1975. In the 1970s, some of today's prophets of doorn from global warming were predicting the coming of a new ice age.

Some measurements suggest that the Earth's average temperature has risen about half a degree centigrade since the late 19th century. Yet sensitive satellite measurements have shown no warming trend since the late 1970s. In fact, the earth is cooler today than it was 20 years ago.

We also have to keep in mind that most of the greenhouse effect comes from natural sources, especially water vapor. Less than a quarter is from carbon dioxide, and, of this, only four percent of the carbon dioxide entering the atmosphere is due to human activities – 96 percent comes from nature.

Leaping to radically cut this tiny sliver of the greenhouse pie on the premise that it will affect climate defies common sense and lacks foundation in our current understanding of the climate system.

Forecasts of future warming come from computer models that try to replicate Earth's past climate and predict the future. They are notoriously inaccurate. None can do it without significant overriding adjustments.

Even then, 1990's models were predicting temperature increases of two to five degrees Celsius by the year 2100. Last year's models say one to three degrees. Where to next year?

As one climate modeling researcher said in the May issue of the prestigious magazine, *Science*, "The more you learn, the more you understand that you don't understand very much."

So the case for so called global warming is far from air tight. You would think that all the uncertainty would give political leaders pause. Unfortunately, it hasn't, and officials continue to insist that agreement is needed in Kyoto.

To achieve the kind of reduction in carbon dioxide emissions most advocates are talking about, governments would have to resort to energy rationing administered by a vast international bureaucracy responsible to no one. This could include the imposition of punishing, high energy taxes.

This heavy burden of taxes and regulation would take its toll in many ways – in slower economic growth, lost jobs and a profound and unpleasant impact on the way we live. Companies in industrialized nations that compete in world markets would be seriously handicapped.

Currently, most proposals exclude developing nations, including China, Indonesia and many other countries here in the Far East. The rationale is that these

countries are trying to grow economically and need to consume fossil fuels to do so.

Of course, this is true. But excluding developing countries from the reductions will not prevent them from being hurt. Their exports will suffer as the economies of industrialized nations slow.

So all of us would suffer from these proposals. The U.S. Senate recognized that fact this summer when it voted 95-0 in favor of a resolution expressing its concern about the proposals under consideration.

What should we do? First, let's agree there's a lot we really don't know about how climate will change in the 21st century and beyond. That means we need to understand the issue better, and fortunately, we have time. It is highly unlikely that the temperature in the middle of the next century will be significantly affected whether policies are enacted now or 20 years from now.

It also means it's bad public policy to impose very costly regulations and restrictions when their need has yet to be proven, their total impact undefined, and when nations are not prepared to act in concert.

In fact, in the U.S. the administration says it is futile to attempt to determine the impact on the economy in 2010 of reducing CO_2 emissions – although many studies indicate the impact will be vast.

Before we make choices about global climate policies, we need an open debate on the science, an analysis of the risks, and a careful consideration of the costs and benefits. So far, this has not taken place, and until it has, I hope that

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the governments of this region will work with us to resist policies that could strangle economic growth.

Fostering economic growth will require a broader understanding of the environment than many environmental activists seem to appreciate. The most pressing environmental problems of the developing nations are related to poverty, not global climate change. Addressing these problems will require economic growth, and that will necessitate increasing, not curtailing, the use of fossil fuels.

Such use does not mean inevitable environmental degradation. New technologies have allowed industrialized countries to enjoy both economic growth and environmental progress.

Studies in the economic community support this idea. A recent study at Princeton University found "no evidence that environmental quality deteriorates steadily with economic growth." Instead, it found that after an initial decline, a nation's environment improved as its economy grew.

So the real secret to environmental improvement is economic growth. And as this growth continues, the economies of this region will need to import more oil, and, to a lesser extent, gas.

This growing reliance on petroleum imports will cause a major eastward shift in the politics of energy. Nations may form new alliances, some based on commercial interests, others on geo-political considerations. The temptation may be strong to make these exclusive or restrictive, reversing recent trends toward more openness and harmony.

I hope that such factionalism will not be the case. We need the smooth functioning of an increasingly interdependent world economic and energy system. And this requires that barriers to trade and to the free movement of goods, services and people be dismantled, not raised.

It also requires that nations practice energy cooperation, not selfishness – and that they do so both in times of prosperity and of crisis.

Finally, some people say that, in pursuing economic development, Asia must follow a western model. I believe that the region must find its own way.

But I also believe that the most direct path is the one many countries in the region and around the world have chosen over the past 20 years – the free market approach. This approach has many antecedents, including the Chinese philosopher Lao-Tzu.

He wrote in the sixth century B.C.: "Govern a great nation as you would cook a small fish – do not overdo it."

It would be tragic indeed if the people of this region were deprived of the opportunity for continued prosperity by misguided restrictions and regulations.

It is up to all of us – the petroleum industry, the governments of this great region, and the international community – to ensure that this does not happen. By working together, we can lay a solid foundation for continued prosperity and rising standards of living that will benefit not only the people of Asia, but also people around the world. And the petroleum industry, convened at this Congress, will play a key role.

Exhibit 15

Weather and climate

Changes in one

feature can affect

others

In the debate over climate change, there is an understandable tendency to use recent weather events to draw conclusions about global warming. However, weather and climate are not the same — climate is far more complex.

While we all know what weather is, most of us are less clear about climate. A region's climate is defined as the prevailing behavior of its

weather, including variability. Several decades of weather must ordinarily be considered to establish the average conditions and variability of climate.

Thus, the recent record cold weather in the

Northeast U.S. does not indicate a cooling climate, just as last year's record summer heat in Europe does not confirm a warming world.

Geological evidence indicates that Earth's climate has varied continuously, warming and cooling due to changes on and beyond Earth. Factors as diverse as variations in sunlight and Earth's magnetic field, asteroid impacts, Sun-Moon-Earth orbital interactions, cosmic ray fluxes, continental drift, fluctuations in sea level, volcanic eruptions, changes in the biosphere, and massive ebbs and flows of continental glaciers, have significantly influenced climate.

Changes in one feature can affect others. During recent ice ages, another factor, greenhouse gas concentrations, changed for reasons that remain unclear. Evidence suggests that shifts in the flow of dust and nutrients from lands to oceans may have significantly altered the exchange of carbon dioxide between the air and oceans.

Observations and theory both indicate that weather and important aspects of climate, for instance El Niño events, behave in a chaotic fashion that may never allow for definitive, longterm predictions. These and other fluctuations produce significant natural climate variability.

For example, over the past thousand years historical accounts and scientific data show evi-

> dence of a Medieval Warm Period followed by a Little Ice Age.

In the face of natural variability and complexity, the consequences of change in any single factor, for example greenhouse

gases, cannot readily be isolated and prediction becomes difficult. Geological and historical records make clear the need to account for natural climate variability and the integrated response of the entire climate system.

Over the last few decades climate research has made great progress. In particular, research has highlighted the risks to society and ecosystems resulting from the buildup of greenhouse gases. At the same time, scientific uncertainties continue to limit our ability to make objective, quantitative determinations regarding the human role in recent climate change or the degree and consequences of future change.

This reinforces the view that, as countries and societies work to find acceptable approaches to address climate change while continuing to promote global prosperity, there is an ongoing need to support scientific research to inform decisions and guide policies.

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Exhibit 16

Energy and Climate

ExxonMobil¹ appreciates this opportunity to provide comments on the topics of global energy and climate change.

The Importance of Energy

Energy is everywhere and it transforms everything. It is critical to the health, welfare and progress of society. Accessible and affordable energy has made possible many of the breathtaking technological advancements enjoyed by humanity over the past 100 years. These advancements include the growth of agricultural yield, personal mobility, aviation, electrification, chemicals, medical care and manufacturing, to name just a few. The impact of these advancements is real and profound and can be measured in terms of longer life spans, reduced infant mortality, and the effective management and even elimination of diseases that plagued prior generations. Energy is so important to modern-day life, that some consider its ready and affordable access a fundamental right.²

Not everyone in the world has ready access to affordable energy³ and not all access is in the same proportion of energy sources. Energy use tends to rise with improved living standards and varies on a regional basis.

¹ As used in this document, "ExxonMobil" means Exxon Mobil Corporation and/or one or more of its affiliated companies. Statements of future events or conditions in this report are forward-looking statements. Actual future results, including economic conditions and growth rates; energy demand and supply sources; efficiency gains; and capital expenditures, could differ materially due to factors including technological developments; changes in law or regulation; the development of new supply sources; demographic changes; and other factors discussed herein and under the heading "Factors Affecting Future Results" in the Investors section of our website at: <u>www.exxonmobil.com</u>. The information provided includes ExxonMobil's internal estimates and forecasts based upon internal data and analyses, as well as publicly available information from external sources including the International Energy Agency. Citations in this document are used for purposes of illustration and reference only and any citation to outside sources does not necessarily mean that ExxonMobil endorses all views or opinions expressed in or by those sources.

² See e.g., "Energy for a sustainable future", The UN Secretary General's Advisory Group on Energy and Climate Change (AGECC), Summary Report and Recommendations, 28 April 2010, New York and The World Summit on Sustainable Development, September 2002.

³ According to the International Energy Agency, 2.6 billion people still rely on biomass for cooking and over 15% of the world's population lacks access to electricity (<u>http://www.iea.org/topics/energypoverty/</u>).

Climate change poses a risk

While there remains uncertainty in projecting future changes in climate and associated impacts, ExxonMobil believes that changes to the earth's climate, including those that may result from anthropogenic causes, pose a risk; and, in order to address this risk society should consider economically efficient policies that include both mitigation and adaptation, and that balance reduction in climate risk with other global developmental needs, including the need to sustain and provide for growing populations. Climate change is an important consideration for ExxonMobil and its Board, and the Board is updated at least yearly on developments in climate science and policy. We are taking prudent steps on many fronts to address the risks posed by a changing climate, and we also continue to engage the public and policy makers in many ways regarding the issue.⁴

The Outlook for Energy: A View to 2040

Each year ExxonMobil develops and publishes its views on energy sources, requirements and trends.⁵ This Outlook provides the foundation for our business and investment planning and is compiled from the breadth of the company's worldwide experience in and understanding of the energy industry and is based on rigorous analyses of demands, technology, economics and policies. Our most recent Outlook spans the period through 2040. The Outlook is reviewed and discussed extensively with the company's Management Committee and Board prior to its release. The following are some key conclusions from this year's Outlook.

1. Population continues to increase, but at different rates throughout the world

We believe that earth's current population of 7 billion will increase by almost 2 billion through the Outlook period.⁶ Most of the growth will be in the developing

⁴ See discussion, infra, on our Engagement at p. 13.

⁵ The Outlook for Energy: A View to 2040 (Outlook), <u>http://corporate.exxonmobil.com/en/energy/energy-outlook</u>.

 $[\]overline{}^{6}$ See Outlook at p. 10.

world, in many of the same countries that are seeking to improve the living standards of their citizens. Others forecast similar population growth.⁷

2. The world economy grows at a faster pace than population

The world is not only growing larger in terms of population, but it is also growing wealthier. We see the global economy growing over the Outlook period by about 130%, but growth rates will vary around the world. OECD countries are forecast to average a 2% annual growth over the period, whereas non-OECD countries are expected to average a 4.4% annual growth through 2040 as their populations move up the development ladder. Overall, world GDP per capita in 2040 will be 80% larger than it was in 2010, as global GDP will increase on average more than three times the growth rate of population. The resulting economic expansion relative to population means improved living standards for billions of people, especially those in greatest need. It also translates into substantially more demand for energy.

3. Energy demand grows less than GDP thanks to efficiency

As the world grows in population and wealth, it will also become more energy efficient. Due in large part to the factors described above, we forecast that the world will require 35% more energy in 2040 than it currently uses, which is generally consistent with other prominent forecasts.⁸ While this is slightly more than the population growth rate over the Outlook period, it is significantly less

⁷ See e.g., World Population to 2300, Department of Economic and Social Affairs, United Nations, New York, N.Y., and World Bank's database of Health, Nutrition and Population at <u>http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATIO</u> <u>N/EXTDATASTATISTICSHNP/EXTHNPSTATS/0, contentMDK:21737699~menuPK:3385623~pagePK: 64168445~piPK:64168309~theSitePK:3237118,00.html</u>.

⁸ For example, the IEA in its recently released World Energy Outlook, 2013, New Policy Scenario, predicts total energy growth of about a third through 2035, which is slightly higher than our Outlook forecast of 31% growth in total energy use by 2035. For more information on the IEA's World Energy Outlook, See www.worldenergyoutlook.org.

than the rate of anticipated economic expansion.⁹ A key reason why we expect energy demand to grow more slowly than GDP is efficiency. Efficiency gains arise in part due to technological advances and investment. We estimate that the savings to society associated with efficiency gains through the Outlook period are considerable, nearly equaling the *total* amount of energy consumed in 2010¹⁰ and we believe continued focus on enhancing efficiency is one of society's best means of providing the energy society needs while addressing climate change risks.



4. Power generation will be the fastest growing demand sector

Worldwide electricity use is projected to increase by 90 percent from 2010 to 2040, with developing countries accounting for most of the increase. As noted above, about

⁹ For comparison purposes, the anticipated growth in energy demand 2010- 2040 will be only 80% of what it was between 1980-2010, even though economic expansion over the Outlook period is twice that of the 1980-2010 period. See Outlook at p. 13.

¹⁰ It could be as much as 500 quadrillion BTUs by 2040. For comparison purposes, without these efficiency gains, global energy demand could rise by as much as 100% over the Outlook period.

1.3 billion people still lack access to electricity today, with half of them in Africa. Urbanization and improved living standards will lead to substantial increases in global electricity usage.



5. Proxy cost for emissions policy

A key factor in assessing the world's energy outlook is the impact of public policies. One area of significant interest in recent years relates to policies enacted to reduce greenhouse gas (GHG) emissions.

Today there are policies in effect that are designed to limit GHG growth, and we anticipate additional policies developing over time. We expect OECD nations to continue to lead the way in adopting these policies, with developing nations gradually following, led by countries like China and Mexico.

Future policies related to limiting GHG emissions remain uncertain and likely will vary over time and from country to country. However, for our Outlook we use a cost of carbon as a proxy to model a wide variety of potential policies that might be adopted by governments to help stem GHG emissions. For example, in the OECD nations, we apply a proxy cost that is about \$80 per ton in 2040. In the developing world, we apply a range of proxy costs with the more wealthy countries, like China and Mexico, reaching about \$30/ton in 2040.¹¹

The exact nature and the pace of future GHG policy initiatives will likely be affected by their impact on the economy, economic competitiveness, energy security and the ability of society, including those less fortunate, to pay related costs.



CO₂ Policies

This GHG proxy cost is integral to ExxonMobil's planning, and we believe the policies it reflects will increase the pace of efficiency gains and the adoption by society of lower-carbon technologies through the Outlook period, as well as

¹¹ For a more detailed discussion of the implied cost of carbon and how we see this impacting energy mix and GHG emissions, see <u>http://www.exxonmobilperspectives.com/2013/12/05/exxonmobil-on-carbon-policy-and-business-planning/.</u>

accelerate the growth of lower carbon sources of energy like natural gas and renewables, while suppressing the global use of coal.

The proxy cost that ExxonMobil uses is not the same as a "social cost of carbon" (SCC). ExxonMobil's proxy cost seeks to reflect a reasonable approximation of costs associated with policies that society may impose over time on GHG emissions, policies that we believe would drive society towards increased efficiency and changes to the energy system and its fuel mix. The SCC is intended to reflect the current cost of GHG emissions, including future climate change impacts and costs, which we believe are subject to considerably more scientific uncertainty and modelling subjectivity.

6. Emissions stabilize and start decreasing

As the world population grows, becomes wealthier and more efficient, and as more stringent GHG reduction policies are adopted, we believe GHG emissions will plateau and start decreasing during the Outlook period. Energy-based GHG emissions have already peaked and are declining in the OECD countries. While GHG emissions grow initially in a number of the non-OECD countries as these countries develop economically, emissions are expected to start plateauing during the next decade and will begin declining during the subsequent decade. Importantly, we believe China's GHG emissions will plateau and begin to decline by 2030, driven by ongoing efforts to improve energy efficiency and reduce the carbon intensity of their economy, and address pollution. Again, our views in this regard are similar to what others forecast.¹²

As part of our energy outlook process, we do not project overall atmospheric GHG concentration, nor do we model global average temperature impacts.¹³ However, we do project an energy-related CO2 emissions profile through 2040, and this can be

¹² For example, the IEA predicts that energy-related emissions will grow by 20%, on trend but slightly higher than our Outlook. See <u>www.worldenergyoutlook.org</u>.

¹³ These would require data inputs that are well beyond our company's ability to reasonably measure or verify.

compared to the energy-related CO2 emissions profiles from various Intergovernmental Panel on Climate Change (IPCC) scenarios. When we do this, our Outlook emissions profile through 2040 would closely approximate the IPCC's intermediate RCP 4.5 emissions profile pathway in shape, but is slightly under it in magnitude.¹⁴



 Energy use grows and becomes less carbon intensive. Renewables grow fastest, but still account for less than 5% of total energy

Globally we expect energy use to grow by 1% per year from 2010 to 2040, with total energy used about 35% higher in 2040 than 2010. Lower carbon sources of energy, such as natural gas, nuclear and renewables, are expected to grow at the fastest rates. Coal use peaks and then begins to decline for the first time in history. Solar and wind power grow at a very high rate of almost 8%/year throughout the Outlook period, but

¹⁴ The IPCC RCP 4.5 scenario extends 60 years beyond our Outlook period to the year 2100, and incorporates a full carbon cycle analysis. The relevant time horizons differ and we do not forecast potential climate impacts as part of our Outlook, and therefore cannot attest to their accuracy.

due to the vast scale of the global energy system, still account for less than 5% of the total energy mix by 2040.¹⁵



Despite recent improvements in cost, we believe renewable energy sources like wind, solar and biofuels will generally remain more expensive to consumers than more traditional, carbon-based sources of energy. This, especially in relation to the scale of the global energy market, will serve to limit the penetration of renewables in the market during much of the Outlook period, despite the anticipated high rate of growth.

Additionally, wind and solar renewables are intermittent – the wind does not always blow and the sun does not always shine – so they require backup from some other source, typically traditional simple cycle gas-fired generation. Relative economics play an important role in electricity supply choices. A comparison of economic

¹⁵ The inability of renewables to scale up during the Outlook period to meet society's energy needs is well recognized by some climatologists. See e.g., <u>http://www.cnn.com/2013/11/03/world/nuclear-energy-climate-change-scientists-letter/</u>. A number of these recommend nuclear as a means to address the shortfall, but nuclear power raises other considerations for society that may limit its acceptance.

choices for U.S electricity, both without and with a cost to emit CO2, is shown in the chart below. We expect gas, nuclear, and gas with carbon capture and sequestration to remain less expensive power generation options versus wind and solar for at least several decades, particularly when considering the added cost for grid reliability associated with intermittent renewables.



8. Energy use evolves slowly due to the vast size of the global energy system

Society's energy mix has shifted over long periods. As shown in the chart below, for much of humanity's existence, biomass like wood was society's primary fuel. Coal began to supplant biomass in the early 1800's, but did not become the primary fuel source until about 1900 and it took another 50 years before oil overtook coal as the primary source of energy. Because of the vast scale of the global energy system, (as noted above, energy use today is 25 times what it was in 1800) we believe the transition to a low carbon economy will also take decades, despite rapid growth rates for lower carbon energy sources.



Key Objectives for Long Term Climate Policy

We believe it is important that as policymakers seek to provide accessible and affordable energy for all, they also carefully consider the risks posed by climate change, including climate change that may result from anthropogenic causes. The risks of climate change are serious enough to warrant cost-effective policy responses that balance mitigation, adaptation, and other social priorities. Good long-term climate change mitigation policy should adhere to the following principles:

- Promote GHG mitigation policies that are cost effective, economically efficient and science based
- Ensure a uniform and predictable cost of GHG emissions across the economy
- Let market prices drive the selection of solutions
- Promote global participation while recognizing the priorities of the developing world
- Limit consequences of differing national policies on competitiveness
- Minimize complexity, and maximize transparency to consumers and companies

• Adjust to future developments in climate science and the economic impacts of climate policies¹⁶

Additionally, we believe policymakers should seek to encourage more rapid use of existing efficient technologies in both the developed and developing world, and seek to stimulate research and development to create innovative, affordable lower GHG technologies.¹⁷

In addition, adaptation is recognized by the international scientific community as a viable risk-management strategy, consistent with the following excerpt from the IPCC Fourth Assessment Report, published in 2007:

"....the greater the capacity of ecosystems and society to adapt to the impacts of climate change, the higher the level at which atmospheric greenhouse-gas concentrations may be stabilized before climate change becomes dangerous. Adaptation thus complements and can, in theory and until the limits of adaptation are reached, substitute for mitigation in meeting the ultimate objective of the UNFCCC."

Societies are exploring prudent, cost-effective steps <u>to both mitigate and adapt</u> to the risks of climate change, as shown in the following diagram:



Source: Adapted from Smit et al, 1999 from IPCC Fourth Assessment Report

¹⁶ See generally <u>http://corporate.exxonmobil.com/en/current-issues/climate-policy/climate-policy-principles/overview</u>.

¹⁷ For example, supporting natural gas export efforts from gas-rich countries such as the United States could further the adoption of this cleaner-burning fuel by countries that currently rely on more carbon-intensive forms of energy.

Many adaptation measures can be low cost, and prudent in their own right, particularly if they are planned and implemented incrementally as part of normal development over a long time frame. Adaptation can also improve society's resilience to potential weather extremes and offer additional response flexibility.

Lastly, it is important to bear in mind that the world has other social priorities such as access to affordable and reliable energy, poverty reduction, reductions in infant mortality, improvements in educational attainment, and increasing health care and life expectancy that compete for finite financial resources.

What ExxonMobil is doing about climate change

ExxonMobil and its Board take the issues of energy and climate change seriously and the company is taking a multitude of steps on many fronts to address these issues.

1. Engagement

ExxonMobil's business is energy and we actively engage society on requirements for the exploration, development, production and distribution of energy to meet the demands of a growing global population. This engagement is broad and multi-faceted. For example, on a technical level, ExxonMobil personnel are active in a multitude of professional organizations, such as the American Institute of Chemical Engineers, the American Chemical Society, Canada's Oil Sands Innovation Alliance, the Dutch Polymer Institute, the Global Carbon Capture and Storage Institute, the Global Gas Flaring Reduction Institute, the International Petroleum Industry Environmental Conservation Association, the United Nations Environment Programme – Society of Environmental Toxicology and Chemistry Life Cycle Initiative, the International Council of Chemical Associations – Energy and Climate Change Technology Task Force, to name just a few, whose efforts improve the efficiency, effectiveness and environmental footprint of the energy business, its processes and products. The company is also involved in proactively engaging regulators on regimes and approaches that can improve the safety, reliability and sustainability of operations. Finally, the company engages the public and thought-leaders on energy issues.¹⁸

ExxonMobil, like many U.S. companies, labor unions and other entities, engages in lobbying to effectively explain or advocate the corporation's energy views. The corporation has an established practice to determine which public policy issues are important to ExxonMobil and reviews them at least annually with senior management and the Board. Generally speaking, we support policies that promote stable, free-market investment climates for long-term business viability. ExxonMobil's lobbying activities and political contributions comply fully with all legal requirements and are disclosed on exxonmobil.com and other public websites.

ExxonMobil also engages on climate change, both with policy makers and the public.¹⁹ Our senior executives speak often on the issue.²⁰ When considering policy options, ExxonMobil advocates an approach that most closely follows our

²⁰ For example, the company's CEO speaks routinely on the subject. See, e.g., Address of Rex Tillerson before the Royal Institute of International Affairs at Chatham House, London, England, June 21, 2007 (<u>http://www.chathamhouse.org/corporate-leaders-series</u>); Address of Rex Tillerson before the Economic Club of Washington, D.C., October 1, 2009, (<u>http://corporate.exxonmobil.com/en/company/news-and-updates/speeches/promoting-energy-investment-and-innovation</u>); Address of Rex Tillerson to the Global Climate and Energy Project (GCEP), Stanford University, February 17, 2009 (<u>http://corporate.exxonmobil.com/en/company/news-and-updates/speeches/global-climate-and-energy-project</u>); Address of Rex Tillerson before the Woodrow Wilson International Center for Scholars,

¹⁸ The Outlook, for example, is but one of the many ways that ExxonMobil engages society on energy requirements.

¹⁹ The company's website provides extensive materials and insights regarding climate. See <u>http://corporate.exxonmobil.com/en/environment/climate-change</u>; The company addresses climate and related environmental issues expansively in its publications and mass-media communications. See, e.g., 2012 Corporate Citizenship Report, pp 28-33, <u>https://www.youtube.com/watch?v=cfmycXLWoxo</u> and <u>http://www.exxonmobilperspectives.com/2013/10/29/turning-back-the-emissions-clock-to-1994/</u>.

Washington D.C., January 8, 2009 (<u>http://corporate.exxonmobil.com/en/company/news-and-updates/speeches/strengthening-global-energy-security</u>); Address by Rex Tillerson to the Wall Street Journal Council on Foreign Relations, June 27, 2012 (<u>http://www.cfr.org/north-america/new-north-american-energy-paradigm-reshaping-future/p28630</u>); Address by Rex Tillerson to the World Affairs Council of Dallas Fort Worth, April 18, 2013 (<u>http://corporate.exxonmobil.com/en/company/news-and-updates/speeches/from-scarcity-to-abundance</u>); and Address by Rex Tillerson to the Asia Society Global Forum, June 13, 2013 (<u>http://corporate.exxonmobil.com/en/company/news-and-updates/speeches/a-business-perspective-on-global-energy-markets</u>).

stated policy principles.²¹ We take numerous opportunities to articulate these policy positions in our annual Energy Outlook, Corporate Citizenship Report, and Carbon Disclosure Project submission, and through executive speeches, advertising, publications, media interviews and other policy fora. These would include interactions with key government policymakers in North America, Europe and Asia, and policy think tanks like Chatham House, Brookings Institution, Center for Clean Air Policy, and Policy Exchange.

The company also has conducted and supported scientific, economic and technological research on climate change for nearly 30 years. Our research effort has been designed to improve scientific understanding, assess policy options and achieve technological breakthroughs that reduce GHG emissions. As a result of our research, ExxonMobil scientists have published more than 45 papers in peer-reviewed literature. In addition, ExxonMobil scientists have published more than 45 papers in peer-reviewed literature and review editors in assessments of the IPCC since its inception. We have also supported major projects at a wide range of institutions, including the Australian Bureau of Agricultural Resource Economics, Battelle Pacific Northwest Laboratory, Carnegie Mellon, Charles River Associates, The Hadley Center for Climate Prediction, the International Energy Agency Greenhouse Gas R&D Program, Lamont Doherty Earth Observatory at Columbia University, Massachusetts Institute of Technology, Princeton, Yale, Stanford, and the University of Texas.

2. Operations

ExxonMobil is taking action to mitigate climate change risk by reducing GHGs in our operations, helping consumers reduce their emissions and supporting research into technology breakthroughs.

²¹ For example, while the company does not advocate for special fees or taxes on carbon, it does believe that a revenue neutral tax on carbon best meets these policy principles.

a. <u>Continuously improve operations integrity and efficiency</u>

The company constantly strives to enhance the integrity and efficiency of its operations and these factors are measured and evaluated against performance expectations across all levels of the organization. Improving energy efficiency in our operations helps us to reduce costs, improve competitiveness and reduce GHG emissions. Our comprehensive Energy Management Systems (called GEMS and POEMS) are applied across our upstream production, refining and chemical operations to drive ongoing improvements in energy efficiency of our operations. We are also a leader in cogeneration (also known as combined heat and power), with equity ownership in more than 100 cogeneration units at more than 30 sites with over 5200 MW of capacity, which is equivalent to the electricity needs of approximately 2.5 million U.S. households. We have an active pipeline of additional cogeneration projects that are under evaluation and development.

ExxonMobil has made considerable progress in reducing the emissions intensity of its operations over the years.²² Cumulative GHG emissions reductions from ExxonMobil actions, including energy efficiency, cogeneration, and flaring reduction, amount to 8.4 million metric tons of greenhouse gases from 2009 through 2012. ExxonMobil also has active programs to identify and reduce methane emissions from natural gas operations, and to reduce flaring from both upstream and downstream/chemicals operations.

b. <u>Improve product performance to save resources</u>

The company's products help customers and consumers conserve energy and reduce raw material use, which can reduce costs and GHG emissions for society. For example, our tire liner technology has superior air retention capabilities, thereby increasing vehicle fuel economy. Our advanced synthetic

²² See generally, <u>http://corporate.exxonmobil.com/en/current-issues/climate-policy/emissions-reduction/overview?parentId=dfdb24e1-090d-4900-9e84-1b931453fc66.</u>

lubricants not only can improve engine performance and extend oil drain intervals, but also reduce engine friction and increase mileage in cars and trucks. Lubricants can also increase the efficiency and reliability of turbines that are used in wind farms, and the company is a major supplier of specialty lubes to this emerging industry. Our plastics technology can save energy by reducing weight across a broad range of applications, including packaging, consumer products, and automobiles. Individually, these enhancements may not seem like much, but the incremental savings are significant when stretched out across the scale of society's need for energy.²³ A small change in a big base leads to significant overall savings.

c. Develop cutting edge, proprietary technologies to lower GHG emissions The company is actively pursuing new technologies that not only improve the performance of operations while reducing environmental footprint, but offer the potential for breakthrough energy solutions. For example, the company has extensive experience in the component technologies of carbon capture and sequestration (CCS). Our LaBarge plant in Wyoming is one of the largest CO2 capture operations in the world. At LaBarge, captured CO2 is sold via pipeline to third parties for reinjection and enhanced oil recovery. We also capture and sequester CO2 at the Sleipner field in Norway (ExxonMobil is an equity partner), and are participating in the Gorgon natural gas development in Australia that includes CCS. Once operational, Gorgon will have the largest saline reservoir CO2 injection facility in the world. ExxonMobil is building on its vast experience in capturing gas impurities by exploring new methods to reduce the cost of CO2 capture through both in-house and research programs.

ExxonMobil has invested in long-term scientific research for many years, often in fields outside the company's near-term business focus, which may

²³ For example, using these fuel-saving technologies in one-third of U.S. vehicles would translate to a savings of about 5 billion gallons of gasoline and greenhouse gas emissions savings equal to taking about 8 million cars off the road. See <u>http://www.exxonmobilperspectives.com/2010/11/08/driving-for-better-efficiency-fewer-emissions/</u>.

have transformative potential for the economy and the environment. Our efforts typically start by applying a "white paper" process to explore emerging technologies. These studies help to educate the company on technologies, define our potential contribution to the science, and assess the future applicability of the technologies to the energy industry and specifically to our businesses. The Corporation has experts from a variety of disciplines within our research labs who author "white papers" on topics across a wide range of energy areas, ranging from biofuels to geothermal energy. In the course of developing these papers, we may determine a particular technology warrants future investment, a reassessment of our business strategy, or simply routine monitoring. In all cases, a more nuanced view of the technology emerges that helps the company make more informed decisions. For example, recently a white paper on photovoltaics helped refine our views on solar energy-based electricity generation as reflected in our Outlook.

For over a decade, ExxonMobil has conducted research into combustion fundamentals with automotive partners in order to devise concepts to improve the efficiency and reduce emissions of internal combustion engines. We closely monitor evolving technological advancements in the vehicle space, including battery electric vehicles, hybrid vehicles, fuel cell vehicles and alternative fuels. As an example of this research, ExxonMobil has developed an innovative, on-board hydrogen-powered fuel cell system that converts conventional hydrocarbon fuels such as gasoline or diesel into hydrogen for a fuel cell directly under a vehicle's hood, eliminating the need for separate facilities for producing and distributing hydrogen. Measured on a "well-towheels" basis, this on-vehicle hydrogen fuel system could be up to 80 percent more fuel-efficient, and emit 45 percent less carbon dioxide, than an internalcombustion engine. This technology could also be used where small stationary sources of hydrogen are required. We continue to evaluate opportunities for deployment of this technology with potential partners.

ExxonMobil utilizes in-house capability to conduct life cycle assessments (LCAs). LCAs are useful in helping to understand whether a technology can result in environmental improvements across a broad range of factors (e.g., GHGs, water, solid waste) versus an existing or alternative process. Our efforts help to develop consistent comparisons of energy alternatives, as well as to build and extend the science of LCAs by working with leading national laboratories and universities. For example, in 2011, we conducted an LCA to assess the impact of algal biofuel production on GHG emissions, land use, and water use. The study, completed in partnership with Massachusetts Institute of Technology and Synthetic Genomics Inc., demonstrated that with further research and development, algae fuels can be produced with freshwater consumption equivalent to petroleum refining, and enable lower GHG emissions. More recently, we have published life cycle GHG emissions for electricity generated from shale gas including, for the first time, actual field data for Marcellus and Barnett Shales. These studies found that the "well to wire" GHG emissions from shale gas are about half that of coal, and not significantly different from the "well to wire" emissions of conventional gas.

ExxonMobil also has an active algae biofuels research program, focused on understanding the fundamental science of algae growth and product yield necessary to produce algae-based biofuels at a cost and scale that would be meaningful to global energy supply. With significant technical and economic hurdles still to be met, we would expect that commercialization, if eventually successful, would take a decade or more.

ExxonMobil was also a founding member of the Global Climate and Energy Project at Stanford University. This program, now in its 11th year of operation, seeks to develop fundamental, game-changing scientific breakthroughs that could lead to lower GHG emissions and a less carbon-intensive global energy system.

3. Evaluating climate risk in our planning

The company employs a robust process for evaluating investment opportunities and managing our portfolio of operating assets. ExxonMobil requires that all business units use a consistent corporate planning basis, including the proxy cost of carbon discussed above, in evaluating capital expenditures and developing business plans. The company also tests investment opportunities against a broad set of economic assumptions, including low price scenarios that could be representative of a carbon-constrained environment, to help ensure that the investment will perform acceptably across a broad range of economic circumstances during its lifetime. The geographic and asset diversity of the company's portfolio further helps to reduce risk and enhance profitability across a wide variety of economic conditions. Capital plans and our asset portfolio are reviewed extensively with senior management and the Board each year. The company's energy and environmental perspectives, including those relating to climate, are also reviewed with the Board yearly, to help the Board understand financial and other risks associated with its investments.

4. Engineer facilities resilient to extreme events

ExxonMobil also employs robust engineering with regard to its facilities. Local climate, as well as potential changes in local conditions over the life of the investment (such as changes to sea level or permafrost) are carefully assessed and considered. Given the spatial and temporal uncertainties of many extreme weather events, particularly with respect to future changes in climate, facilities are generally engineered to be resilient to extreme event "tails", with the inclusion of additional safety factors. Some jurisdictions, such as Singapore, have specific building standards that are employed in our designs that consider potential climate change impacts.

For existing facilities, processes and systems to manage extreme weather events (such as Gulf Coast hurricanes) are considered along with other factors in the company's Operations Integrity Management System (OIMS),²⁴ both with regard to risk management and extreme event response. These processes are drilled extensively, both internally and cooperatively with local authorities, to ensure readiness when needed, and are systematically evaluated and continuously improved as part of our ongoing OIMS system.

Our commitment

ExxonMobil is committed to exploring, developing, producing and delivering energy that the world needs. Providing accessible, affordable energy not only helps to make modernday life possible in the developed world, it offers hope of progress and opportunities for many in the undeveloped world who have none. We are also committed to supplying energy in a sustainable and environmentally responsible manner. We engage society on important issues associated with energy, such as the risks of climate change, and look forward to continuing the dialogue as the growing world seeks to strike the careful balance between its need for energy and the concerns over climate change.

²⁴ As noted in our *Corporate Citizenship Report*, our Operations Integrity Management System (OIMS) is the cornerstone to managing all safety, security, health, and environmental risks in all of our operations worldwide, including potential physical risks from climate change. Current scientific understanding provides limited guidance on the likelihood, magnitude, and timeframe of physical risks such as sea level rise, extreme weather events, temperature extremes, and precipitation changes. There is even more scientific uncertainty at the regional or local level in comparison to global averages. Nevertheless, our facilities are designed, constructed, and operated to withstand a variety of extreme conditions, with safety factors built in to cover various engineering uncertainties, including those associated with potential climate change impacts. We engage with major engineering societies, international organizations and industry groups to develop sound engineering perspectives on managing the risks of climate change.
Exhibit 17



Climate Change 2016 Information Request Exxon Mobil Corporation

Module: Introduction

Page: Introduction

CC0.1

Introduction

Please give a general description and introduction to your organization.

ExxonMobil is the world's largest publicly traded international oil and gas company. We hold an industry-leading inventory of global oil and gas resources. We are the world's largest integrated refiner and manufacturer of lube basestocks, a leading marketer of petroleum products and finished lubricants, and one of the largest chemical companies in the world. We are also a technology company, applying science and innovation to find better, safer and cleaner ways to deliver the energy the world needs.

Our Upstream business encompasses high-quality exploration opportunities across all resource types and geographies, an industry-leading resource base, a portfolio of world-class projects, and a diverse set of producing assets. We have an active exploration or production presence in 36 countries. We sell natural gas in almost all major and developing markets. Our total net oil and gas production available for sale in 2015 averaged 4.1 million oil-equivalent barrels per day.

ExxonMobil's Downstream business has a diverse global portfolio of refining and distribution facilities, lubricant plants, marketing operations, and brands, supported by a world-class research and engineering organization. We are one of the world's largest refiners and lube basestock manufacturers. ExxonMobil's operating results reflect 23 refineries with distillation capacity of more than 5 million barrels per day and lube basestock capacity of 136 thousand barrels per day. Our fuels and lubricants marketing businesses have a global reach, supported by world-renowned brands, including Exxon, Mobil, and Esso.

ExxonMobil Chemical Company is one of the largest chemical companies in the world. Our product portfolio is a unique combination of commodity and specially businesses that have been developed through proprietary technology. We are one of the largest producers of aromatics and olefins, the basic petrochemical building blocks, and polyolefins, including plastics such as polyethylene and polypropylene. Our world-scale, integrated facilities allow us to produce a diverse set of less cyclical specialty products that deliver advanced performance and value to our customers in a broad array of applications. In 2015, chemical prime product sales totaled 24.7 million metric tons

Note: The term 'project' as used in this report does not necessarily have the same meaning as under any government payment transparency reporting rules

CC0.2

Reporting Year

Please state the start and end date of the year for which you are reporting data.

The current reporting year is the latest/most recent 12-month period for which data is reported. Enter the dates of this year first.

We request data for more than one reporting period for some emission accounting questions. Please provide data for the three years prior to the current reporting year if you have not provided this information before, or if this is the first time you have answered a CDP information request. (This does not apply if you have been offered and selected the option of answering the shorter questionnaire). If you are going to provide additional years of data, please give the dates of those reporting periods here. Work backwards from the most recent reporting year.

Please enter dates in following format: day(DD)/month(MM)/year(YYYY) (i.e. 31/01/2001).

Enter Periods that will be disclosed Thu 01 Jan 2015 - Thu 31 Dec 2015

CC0.3

Country list configuration

Please select the countries for which you will be supplying data. If you are responding to the Electric Utilities module, this selection will be carried forward to assist you in completing your response.

Select country Rest of world

CC0.4

Currency selection

Please select the currency in which you would like to submit your response. All financial information contained in the response should be in this currency.

USD(S)

CC0.6

Modules

As part of the request for information on behalf of investors, electric utilities, companies with electric utility activities or assets, companies in the automobile or auto component manufacture sub-industries, companies in the oil and gas sub-industries, companies in the information technology and telecommunications sectors and companies in the food, beverage and tobacco industry group should complete supplementary questions in addition to the main questionnaire. If you are in these sector groupings (according to the Global Industry Classification Standard (GICS)), the corresponding sector modules will not appear below but will automatically appear in the navigation bar when you save this page. If you want to query your classification, please email respond@cdp.net. If you have not been presented with a sector module that you consider would be appropriate for your company to answer, please select the module below. If you wish to view the

questions first, please see https://www.cdp.net/en-US/Programmes/Pages/More-questionnaires.aspx.

Further Information

Module: Management

Page: CC1. Governance

CC1.1

Where is the highest level of direct responsibility for climate change within your organization?

Board or individual/sub-set of the Board or other committee appointed by the Board

CC1.1a

Please identify the position of the individual or name of the committee with this responsibility

The Board of Directors is comprised of twelve independent directors and two executive directors. The Board's Public Issues and Contributions Committee is responsible for the oversight of safety, health, and environmental performance, including issues associated with the risks of climate change. This committee reviews the effectiveness of the Corporation's policies, programs, and practices on safety, health and the environment, and social responsibility. The Committee nears reports relating to operating units' safety and environmental activities and also visits operating sites to observe and comment on current operating practices. All members of the Committee are independent within the meaning of the NYSE listing standards. The Committee's charter is available on the Corporate Governance section of our website. Corporate governance is managed with systems and standards for all aspects of our business. With regard to management, the Chairman of the Board and Chief Executive Officer, the President and the other members of the Management Committee use integly for climate change matters. Specific to environmental issues including climate change, there are timely interactions with members of the Management Committee are used as velides at least annually with the ExxonMobil Board of Directors and the Public Issues and Contributions Committee. On the subject of the risks of climate change, the full ExxonMobil Board of Directors receives in depth briefings at least annually that cover updates on public policy, scientific and technical research, as well as company positions and actions in this area. In addition, the Chairman of the Board and Chief Executive Officer, the President and the other members of the Management Committee are actively engaged in discussions relating to greenhouse gas emissions and the risks of climate change on an ongoing basis.

CC1.2

Do you provide incentives for the management of climate change issues, including the attainment of targets?

Yes

CC1.2a

Please provide further details on the incentives provided for the management of climate change issues

entitled to benefit from these incentives?	The type of incentives	Incentivized performance indicator	Comment
Other: Board Chairman, CEO, Management Committee, and all management, professional, and technical employees	Monetary reward	Other. See Comment	Environmental performance (including GHG emissions and energy efficiency) is assessed and recognized through the annual planning and budget process. During this process, key strategies and objectives are established for each business line for both the short and long term. Results are regularly stewarded against prior commitments. Each year the businesses and individual sites are assessed on how well they are executing the strategies outlined for their operating unit. They are assessed on the performance of the Corporation overall and each of the respective business lines for which they have responsibility, on both an absolute basis and relative to companies of comparable size and scope of business activities. Performance is assessed throughout the year during specific business reviews and other meetings that provide reports on strategy development; operating and financial results; safety, health, and environmental results, including GHG emissions and energy efficiency; business controls; and other areas pertinent to the general performance of the Company. In assessing the performance, weights are not assigned to the factors considered. Performance in environmental stewardship areas is used in our merit-driven employee development and compensation systems.

Further Information

Page: CC2. Strategy

CC2.1

Please select the option that best describes your risk management procedures with regard to climate change risks and opportunities

Integrated into multi-disciplinary company wide risk management processes

CC2.1a

Please provide further details on your risk management procedures with regard to climate change risks and opportunities

Frequency of monitoring	To whom are results reported?	Geographical areas considered	How far into the future are risks considered?	Comment
Annually	Board or individual/sub-set of the Board or committee appointed by the Board	We consider risks associated with climate change across our global operations	> 6 years	ExxonMobil reviews the risks of climate change with its full Board of Directors annually

CC2.1b

Please describe how your risk and opportunity identification processes are applied at both company and asset level

ExxonMobil is committed to conducting business in a manner that is compatible with the environmental and economic needs of the communities in which we operate, and that protects the safety, security, and health of our employees, those involved with our operations, our customers, and the public. These commitments are documented in our Safety, Health, Environment, and Product Safety policies. These policies are put into practice through a disciplined management framework called the Operations Integrity Management System (OIMS).

ExxonMobil's OIMS Framework establishes common worldwide expectations for addressing risks inherent in our business. The term Operations Integrity (OI) is used by ExxonMobil to address all aspects of its business that can impact personnel and process safety, security, health, and environmental performance, including energy efficiency and risks from climate change.

The OIMS Framework includes 11 Elements, Each Element contains an underlying principle and a set of Expectations. The OIMS Framework also includes the characteristics of, and processes for, evaluating and implementing OI Management Systems.

Application of the OIMS Framework is required across all of ExxonMobil, with particular emphasis on design, construction and operations. Management is responsible for ensuring that management systems satisfying the Framework are in place. The scope, priority and pace of management system implementation should be consistent with the risks associated with the business.

- The eleven elements of OIMS are:
- 1. Management, Leadership, and Accountability
- 2. Risk Assessment and Management
- 3. Facilities Design and Construction
- 4. Information/Documentation
- 5. Personnel and Training
- 6. Operations and Maintenance
- 7. Management of Change
- 8. Third-Party Services
- 9. Incident Investigation and Analysis
- 10. Community Awareness and Emergency Response
- 11. Operations Integrity Assessment and Improvement

ExxonMobil applies established OIMS systems and process to assess risks and opportunities, identify potential actions and prioritize the rate and pace of implementation.

CC2.2

Is climate change integrated into your business strategy?

Yes

CC2.2a

Please describe the process of how climate change is integrated into your business strategy and any outcomes of this process

Society continues to face the dual challenge of meeting energy demand to support the economic growth needed for improved living standards, while simultaneously addressing the risks posed by rising greenhouse gas emissions and climate change. While future temperature changes and the associated impacts are difficult to accurately predict, we believe the risks of climate change are real and warrant thoughtful action. ExxonMobil is committed to providing affordable energy to support human progress while advancing effective solutions to address the risks of climate change. Our climate change risk management strategy includes four components: engaging on climate change policy, developing future technology, mitigating greenhouse gas emissions in our operations and developing solutions that reduce greenhouse gas emissions for our customers.

Managing the risks of climate change will require increased innovation and collaboration. Therefore, ExxonMobil engages a variety of stakeholders — including policymakers, investors, consumers, non-governmental organizations (NGOs), academics and the public — on climate change issues of direct relevance to the company.

As society transitions to lower greenhouse gas emission energy solutions, technological advancements that change the way we produce and use energy will be instrumental in providing the global economy with the energy it needs while reducing greenhouse gas emissions. Recognizing the limitations associated with most existing low greenhouse gas emission energy technologies, particularly in delivering the necessary economy and scale, we are conducting fundamental research to develop low greenhouse gas emission energy solutions that have the potential to be economically feasible without subsidies, standards or mandates. ExxonMobil is pioneering scientific research to develop next-generation energy sources.

As we seek to increase production of oil and natural gas to meet growing global energy demand, we are committed to continuing to take actions to mitigate greenhouse gas emissions within our operations. In the near term, we are working to increase energy efficiency while reducing flaring, venting and fugitive emissions in our operations. In the medium term, we are deploying proven technologies such as cogeneration and carbon capture and sequestration where technically and economically feasible. Longer term, we are conducting and supporting research to develop breakthrough, game-changing technologies. Through our commitment to energy efficiency, application of structured processes and continued use of a bottom-up approach, we continue to yield industry-leading results. For example, in the 2010, 2012 and 2014 Refining Industry Surveys, ExxonMobil's global refining operations achieved first quartile energy efficiency performance. Since 2000, ExxonMobil has spent approximately \$7 billion to develop loweremission energy solutions.

While ExxonMobil strives to improve efficiency throughout our own operations, we are also delivering solutions that enable our customers to reduce their own emissions and improve their own energy efficiency as well as increase reliability, performance and longevity of the associated products. These solutions can be characterized as: 1) Expanding the supply of cleaner-burning natural gas to reduce emissions in power generation, 2) Developing premium, high-efficiency fuels and lubricants and 3) Creating innovative chemical materials that can be applied in a range of consumer products. One of the greatest opportunities for society to reduce greenhouse gas emissions is through the use of natural gas in power generation. Natural gas is a flexible, abundant and low emissions fuel that is available across the globe. On a life cycle basis, from extraction through electricity consumption, using natural gas emits up to 60 percent fewer greenhouse gas emissions than coal. It is also the ideal partner for intermittent renewable energy sources, such as solar or wind, as it can provide reliable power when these renewable sources are not available. As the world moves toward a lower greenhouse gas emissions-intensive energy mix over the coming decades, natural gas will be one of the most important fuels to enable reductions in greenhouse gas emissions.

CC2.2c

Does your company use an internal price of carbon?

Yes

CC2.2d

Please provide details and examples of how your company uses an internal price of carbon

ExxonMobil's long-range annual forecast, The Outlook for Energy, examines energy supply and demand trends for approximately 100 countries, 15 demand sectors and 20 different energy types. The Outlook forms the foundation for the company's business strategies and helps guide our investment decisions, in response to projected increases in global fuel and electricity demand, our 2016 Outlook estimates that global energy-related CO2 emissions will peak around 2030 and then begin to decline. A host of trends contribute to this downturn — including slowing population growth, maturing economies and a shift to cleaner fuels like natural gas and renewables — some voluntary and some the result of policy.

ExxonMobil addresses the potential for future climate change policy, including the potential for restrictions on emissions, by estimating a proxy cost of carbon. This cost, which in some geographies may approach \$80 per ton by 2040, has been included in our Outlook for several years. This approach seeks to reflect potential policies governments may employ related to the exploration, development, production, transportation or use of carbon-based fuels. We believe our view on the potential for future policy action is realistic and by no means represents a "business-as-usual" case. We require all of our business lines to include, where appropriate, an estimate of greenhouse gas-related emissions costs in their economics when seeking funding for capital investments.

CC2.3

Do you engage in activities that could either directly or indirectly influence public policy on climate change through any of the following? (tick all that apply)

Direct engagement with policy makers Trade associations

Funding research organizations

CC2.3a

On what issues have you been engaging directly with policy makers?

Focus of Corporate Details of legislation Position engagement

Proposed legislative solution

Support

Other:

Sound

Climate

Policy

ExxonMobil believes the long-term objective of effective policy is to reduce the risks posed by climate change at minimum societal cost, in balance with other societal priorities such as poverty eradication, education, health, security and affordable energy. We fundamentally believe that free markets, innovation and technology are essential to addressing the risks of climate change. Success in developing and deploying impactful technologies will highly depend on governments creating a policy landscape that enables innovation and competition. Policies need to be clear and guard against duplicative, overlapping and conflicting regulations, which send mixed signals to the market and impose unnecessary costs on consumers. We believe that effective policies are those that: Promote global participation; Let market prices drive the selection of solutions; Ensure a uniform and predictable cost of greenhouse gas emissions across the economy; Minimize complexity and administrative costs; Maximize transparency; and Provide flexibility for future adjustments to react to developments in climate science and the economic impacts of climate policies. Policies based on these principles minimize overall costs to society and allow markets to help determine the most effective and commercially viable solutions. Given the wide range of societal priorities and limited global resources, all policies, including climate change policy, must be as economically efficient as possible. ExxonMobil believes that market-based systems that impose a uniform, economy-wide cost on greenhouse gas emissions are more economically efficient policy options than mandates or standards. This is because market-based policies more effectively drive consumer behavior and technology innovation, while mandates and standards eliminate consumer choice and can perpetuale ineffective technologies. Since 2009, ExxonMobil has held the view that a properly designed, revenueneutral carbon tax is a more effective market-based option than a cap-and-trade approach. A carbon tax is more transparent, can be implemented in existing tax infrastructure, avoids the complexity of creating and regulating carbon markets where none exist and reduces greenhouse gas emissions price volatility, thus delivering a clearer, more consistent long-term market price signal.

CC2.3b

Are you on the Board of any trade associations or provide funding beyond membership?

ExxonMobil engages a variety of stakeholders — including

policymakers,

consumers, non-

governmental

organizations

academics and

the public - on

climate change

issues of direct

relevance to the

directly and with

around the world

company. We

stakeholders

associations

to encourage

sound policy solutions for addressing these risks.

engage

trade

investors.

(NGOs).

Yes

CC2.3c

Please enter the details of those trade associations that are likely to take a position on climate change legislation

Trade association	Is your position on climate change consistent with theirs?	Please explain the trade association's position	How have you, or are you attempting to, influence the position?
International Petroleum Industry Environmental Conservation Association (IPIECA)	Consistent	In June 2015, IPIECA published a series of position paper on climate change under the title: "The Paris Puzzle - The pathway to a low-emissions future. These papers are available on the IPIECA website. ExxonMobil's views are generally consistent with those expressed in these position papers, which express an industry consensus position.	ExxonMobil actively participates in multiple IPIECA work activities, including those related to crafting climate change policy positions
International Oil & Gas Producers (IOGP)	Consistent	In November 2014, an "IOGP position paper on climate change" was published and is available on the IOGP website. ExxonMobil's views are generally consistent with those expressed in this position paper, which express an industry consensus position.	ExxonMobil actively participates in multiple IOGP work activities, including those related to crafting climate change policy positions.

CC2.3d

Do you publicly disclose a list of all the research organizations that you fund?

Yes

CC2.3f

What processes do you have in place to ensure that all of your direct and indirect activities that influence policy are consistent with your overall climate change strategy?

In order to ensure that our corporate communications accurately reflect our internal policy positions, we employ a corporate-wide global climate change and greenhouse gas issue management learn. As issues arise at the local, state, national and regional levels, our global learn of experts evaluates and develops company position.

Further Information

Page: CC3. Targets and Initiatives

CC3.1

Did you have an emissions reduction or renewable energy consumption or production target that was active (ongoing or reached completion) in the reporting year?

Na

CC3.1f

Please explain (i) why you do not have a target; and (ii) forecast how your emissions will change over the next five years

As we seek to increase production of oil and natural gas to meet growing global energy demand, we are committed to continuing to take actions to mitigate greenhouse gas emissions within our operations. ExxonMobil has a robust set of processes designed to improve efficiency, reduce emissions and contribute to effective long-term solutions to manage climate change risks. These processes include, where appropriate, setting tailored objectives at the business, site and equipment levels, and then stewarding progress toward meeting those objectives. Based on decades of experience, ExxonMobil believes this rigorous bottom-up approach is a more effective and meaningful way to drive efficiency improvement and greenhouse gas emissions reduction than simply setting high-level corporate targets. We also believe that continuing to use this approach will yield further improvements in all sectors of our business.

In the near term, we are working to increase energy efficiency while reducing flaring, venting and fugitive emissions in our operations. In the medium term, we are deploying proven technologies such as cogeneration and carbon capture and sequestration where technically and economically feasible. Longer term, we are conducting and supporting research to develop breakthrough, game-changing technologies. Since 2000, ExxonMobil has spent approximately \$7 billion to develop lower-emission energy solutions. In 2015, greenhouse gas emissions avoided from ExxonMobil actions were 20.5 million metric tons, cumulative since 2006. This represents an additional reduction of 0.8 million metric tons compared with our 2014 performance.

In general, energy is required to produce and process oil and gas, so increases in production volumes that are needed to meet the world's rising need for energy will lead to increases in emissions from our operations and from end use by customers.

CC3.2

Do you classify any of your existing goods and/or services as low carbon products or do they enable a third party to avoid GHG emissions?

Yes

CC3.2a

Please provide details of your products and/or services that you classify as low carbon products or that enable a third party to avoid GHG emissions

Level of aggregation	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s In the reporting year	Comment
Product	Natural gas	Low carbon product	Other: Life Cycle Assessment	6%	Less than or equal to 10%	One of the greatest opportunities for society to reduce greenhouse gas emissions is through the use of natural gas in power generation. Natural gas is a flexible, abundant and low emissions fuel that is available across the globe. On a life cycle basis, from extraction through electricity consumption, using natural gas emits up to 60 percent fewer greenhouse gas emissions than coal. It is also the ideal partner for intermittent renewable energy sources, such as solar or wind, as it can provide reliable power when these renewable sources are not available. As the world moves toward a lower greenhouse gas emissions-intensive energy mix over the coming decades, natural gas will be one of the most important fuels to anable reductions in greenhouse gas
Product	Plastics	Low carbon product	Other: Life Cycle Assessment		Less than or equal to 10%	Materials developed by ExxonMobil provide manufacturers with quantifiable benefits in a multitude of consumer applications. These materials include resilient, lightweight plastics that are used by automotive manufacturers to reduce vehicle weight and deliver greater efficiency for drivers. Additionally, our next-generation plastic packaging reduces total product weight and allows more products per shipment, fewer trucks on the road, less gasoline and energy used, fewer greenhouse gas emissions and ultimately less material to be reused, recovered or recycled. ExxonMobil plastic products also contribute to safety within the food industry. Plastic packaging is lightweight, durable and flexible, which makes it ideal for preserving food. According to the Food and Agriculture Organization of the United Nations, one-third of the food produced in the world goes to waste each year. Plastic packaging can help reduce spoilage, increase access to food and improve food safety for consumers around the world.
Product	Lubricants	Low carbon product	Other: Life Cycle Assessment		Less than or equal to 10%	ExxonMobil produces fuels and lubricants that deliver higher vehicle efficiency and lower emissions. In addition, we continue working on research and development of new fuels and lubricants. Our extensive family of high performance lubricants includes synthetic lubricants that have sustainable customer benefits, such as longer drain intervals than conventional mineral oils, meaning they can be replaced with less frequency, therefore reducing the volume of used oil for disposal or recycle. In addition, extending lubrication service Intervals increases efficiency and lowers maintenance costs while reducing potential risks from worker and machine interactions. There are also specific application advantages for these products, including in wind urbine applications where machinery is several hundreds of feet in the air and exposed to weather. Mobil lubricants are used in more than 40,000 wind lurbines worldwide.

CC3.3 Did you have emissions reduction initiatives that were active within the reporting year (this can include those in the planning and/or implementation phases)

Yes

CC3.3a

Please identify the total number of projects at each stage of development, and for those in the implementation stages, the estimated CO2e savings

Stage of development	Number of projects	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation	7	900000
To be implemented*	0	
Implementation commenced*	2	200000
Implemented*	0	
Not to be implemented	2	100000

CC3.3b

For those initiatives implemented in the reporting year, please provide details in the table below

Activity type	Description of activity	Estimated annual CO2e savings (metric tonnes CO2e)	Scope	Voluntary/ Mandatory	Annual monetary savings (unit currency - as specified in CC0.4)	Investment required (unit currency - as specified in CC0.4)	Payback period	Estimated lifetime of the Initiative	Comment
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Energy efficiency: Processes Energy Efficiency: Since 2000, we have used our Global Energy Management System in the Downstream and Chemical businesses, and our Production Operations Energy Management System in our Upstream businesses to identify and act on energy savings opportunities.

Scope Voluntary

Scope

Voluntary

Energy pa efficiency: Ve Processes St

Fugitive

emissions

reductions

Flaring Reduction: ExxonMobil is a charter member of the Global Gas Flaring Reduction Partnership. In addition, we put in place our own parameters, the Upstream Flaring and Venting Reduction Environmental Standard for Projects, in 2005. Accordingly, our goal is to responsibly avoid routine flaring in new Upstream projects and reduce "legacy" flaring in our existing operations.

Venting and Fugilive Emissions Reduction: We continue to look for costeffective ways to reduce methane and other hydrocarbon emissions in our operations, such as replacing highbleed pneumatic devices with loweremission technology and conducting green well completions in targeted Upstream operations.

Scope Voluntary

In 2015, energy used in our operations totaled 1.7 billion gigajoules. Energy consumed in our operations generates more than 80 percent of our direct greenhouse gas emissions and is one of our largest operating costs. As such, we have focused on energy efficiency for several decades. Through our commitment to energy efficiency, application of structured processes and continued use of a bottomup approach, we continue to yield industry-leading results. For example, in the 2010, 2012 and 2014 Refining Industry Surveys ExxonMobil's global refining operations achieved first quartile energy efficiency performance. In 2015, flaring volume from our combined Upstream, Downstream and Chemical operations totaled 5.3 million metric tons. This represents an increase of 0.8 million metric tons compared with our 2014 performance. The increase in flaring in 2015 was primarily due to operations in Angola, where a thirdparty-operated liquefied natural gas (LNG) plant was not operating. These increases were partially offset by flaring reductions resulting from the completion of commissioning work at our Papua New Guinea LNG plant and operational improvements at the Usan production field in Nigeria. Our venting and fugitive emissions in 2015 totaled 6 million CO2-equivalent metric tons, which is essentially flat relative to our 2014 performance. While venting and fugitive emissions, most of which are methane, represent approximately 5 percent of our direct greenhouse gas emissions, we recognize the Importance of reducing these emissions, XTO Energy manages methane emissions as a matter of safety and environmental responsibility. Responsible methane containment practices are applied during drilling, completion and production operations to minimize methane emissions. We manage emissions through a mix of voluntary and regulatory actions, such as implementing leak detection and repair programs, reducing oil and gas completion emissions and

targeting replacement of high-bleed pneumatics with lower-emitting devices.

Ongoing

Ongoing

Ongoing

Cogeneration: We have interests in approximately 5,500 megawatts of Cogeneration capacity in more than 100 installations at more than 30 locations around the world. This capacity is equivalent to the annual energy needed

equivalent to the annual energy needed to power 2.5 million U.S. homes. Over the past decade, we have added more than 1,000 megawatts of cogeneration capacity and continue to develop additional investment opportunities.

Carbon Capture and Sequestration: With

a working interest in approximately one-

third of the world's total CCS capacity,

ExxonMobil is a leader in one of the

most important next-generation lowcarbon technologies. In 2015, we

for sequestration.

captured 6.9 million metric tons of CO2

Scope Voluntary

Scope

Voluntary

6000000

6900000

Cogeneration technology captures heat generated from the production of electricity for use in production, refining and chemical processing operations. Due to its inherent energy efficiency, the use of cogeneration leads to reduced greenhouse gas emissions. Our cogeneration facilities atone enable the avoidance of approximately 6 million metric tons per year of greenhouse gas emissions. CCS is the process by which CO2 gas that would otherwise be released into the atmosphere is captured, compressed and injected into underground geologic formations for permanent storage. ExxonMobil is conducting proprietary, fundamental research to develop breakthrough carbon capture technologies that have the potential to be economically feasible without government subsidies, standards or mandates.

Ongoing

Ongoing

CC3.3c

Energy

Other

efficiency:

Processes

What methods do you use to drive investment in emissions reduction activities?

Method	Comment
Other	Adherence to Internal standards and objectives: Our Operations Integrity Management System (OIMS) provides a systematic and disciplined approach to managing safety, security, health, environmental, and social risks. OIMS is consistent with the standard for environmental management systems established by the international Organization for Standardization (ISO14001:2004). Together, our Corporate Environment Policy and OIMS Framework set an expectation that all projects will be developed, constructed, maintained, and operated in compliance with all applicable environmental laws and regulations and with responsible standards where laws and regulations are not adequately protective. Our Protect Tomorrow Today initiative outlines our expectations for each business to deliver superior environmental performance, drive environmental incidents with real impact to zero, and achieve industry-leading performance in focus areas of importance to each business. Progress toward these goals is managed through our Environmental Business Planning (EBP) process, which integrates environmental improvement into overall business plans and strategies. The businesses use EBP to identify key environmental drivers, set targets in high-priority focus areas, and identify actions to achieve these targets.
Internal price of carbon	ExxonMobil addresses the potential for future climate change policy, including the potential for restrictions on emissions, by estimating a proxy cost of carbon. This cost, which in some geographies may approach \$80 per ton by 2040, has been included in our Outlook for several years. This approach seeks to reflect potential policies governments may employ related to the exploration, development, production, transportation or use of carbon-based fuels. We believe our view on the potential for future policy action is realistic and by no means represents a "business-as-usual" case. We require all of our business tines to include, where appropriate, an estimate of greenhouse gas-related emissions costs in their economics when seeking funding for capital investments. We evaluate potential investments and projects using a wide range of economic conditions and commodity prices. We apply prudent and substantial margins in our planning assumptions to help ensure competitive returns over a wide range of market conditions. We also financially stress test our investment opportunities, which provides an added margin against uncertainties, such as those related to technology development, costs, geopolitics, availability of required materials, services and labor. Stress testing further enables us to consider a wide range of market environments in our planning and investment process.

Further Information

For Question 3.3a, only our cogeneration projects are represented. These projects are developed based on financial return, but also result in significant GHG emission reductions.

Page: CC4. Communication

CC4.1

Have you published Information about your organization's response to climate change and GHG emissions performance for this reporting year in places other than in your CDP response? If so, please attach the publication(s)

Publication	Status	Page/Section reference	Attach the document	Comment
In mainstream reports (including an Integrated report) but have not used the CDSB Framework	Complete	Pages: 37 & 38	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC4.1/2015_Summary_Annual_Report.pdf	2015 Summary Annual Report
In mainstream reports (including an integrated report) but have not used the CDSB Framework	Complete	Pages: 8, 9, 21	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC4.1/2015_Financial_Statements.pdf	2015 Financial Statements and Supplemental Information
In other regulatory filings	Complete	Pages: 3, 4, 41, 42, 54	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC4.1/ExxonMobilCorp_02242016_10-K.pdf	2015 FORM 10-K
In mainstream reports (Including an Integrated report) but have not used the CDSB Framework	Complete	Pages: 2, 3, 7, 8, 10, 12, 29- 41, 85, 89-94	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC4.1/2015_corporate_citizenship_report_full_approved- pdf.pdf	2015 Corporate Citizenship Report

Publication	Status	Page/Section reference	Attach the document	Comment
In mainstream reports (including an Integrated report) but have not used the CDSB Framework	Complete	Pages: 3, 6, 9, 41-44, 47-53, 55-57 & 77	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC4.1/2016-outlook-for-energy.pdf	2016 The Outlook for Energy: A View to 2040
In voluntary communications	Complete	Pages: 1-30	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC4.1/2014_Exxonmobil Report - Energy and Carbon - Managing the Risks.pdf	2014 Energy and Carbon Managing the Risks
In voluntary communications	Complete	Pages: 1-21		2014 Energy and Climate

Further Information

Module: Risks and Opportunities

Page: CC5. Climate Change Risks

CC5,1 Have you identified any inherent climate change risks that have the potential to generate a substantive change in your business operations, revenue or expenditure? Tick all that apply

Risks driven by changes in regulation Risks driven by changes in physical climate parameters Risks driven by changes in other climate-related developments

CC5,1a Please describe your inherent risks that are driven by changes in regulation

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
International agreements	The climate policy debate has shifted from a focus primarily on targets to limit near-term emissions to also include consideration of long-term emissions pathways that ultimately stabilize GHG concentrations. As well, international and national attention has turned to focus on adaptation as a strategy to mitigate risk. There has been extensive international focus on the costs and benefits of policies to reduce GHG emissions and address the risk of climate change. Throughout the world, national and regional policymakers are considering a variety of legislative and regulatory options to mitigate GHG emissions and to develop capacity to adapt to potential impacts.	Increased operational cost	1 to 3 years	Direct	Unknown	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration, developing energy- efficient products, flaring / venting reduction, and production of lower carbon resources all contribute to preparing for these risks.
Carbon taxes	If policy makers choose to address the risks of climate change, ExxonMobil believes that a properly designed, revenue-neutral carbon tax is more effective policy option to impose a cost on carbon to reduce GHG emissions than an emissions Cap and Trade scheme or regulations, mandates and standards.	Increased operational cost	Up to 1 year	Direct	Likely	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration developing energy- efficient products, flaring / venting reduction, and production of lower carbon resources all contribute to preparing for these risks.

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Cap and trade schemes	Cap-and-trade systems inevitably introduce unnecessary cost and complexity, as well as unpredictable price volatility, as evidenced recently by the EU ETS. It is important to remember that a cap-and-trade system requires a new market infrastructure for traders to trade emissions allowances.	Increased operational cost	Up to 1 year	Direct	Very likely	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and	Our investments in energy efficiency, cogeneration, developing energy- efficient products, flaring / venting reduction, and production of lower carbon resources all contribute to preparing for
Emission reporting obligations	Current and pending greenhouse gas regulations may increase our compliance costs, such as monitoring and reporting. These requirements could make our products more expensive and reduce demand for hydrocarbons, as well as shifting hydrocarbon demand toward relatively lower-carbon sources such as natural gas.	Increased operational cost	Up to 1 year	Direct	Very likely	Low	Implications. Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial implications.	development. ExxonMobil will respond to these and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration, developing energy- efficient products, flaring / venting reduction, and production of lower carbon resources all contribute to preparing for these risks.
Product efficiency regulations and standards	Efficiency or specific product regulations or standards (e.g. CAFE, LCFS, RPS, RFS), may exceed the technological or economic limitations of specific processes or products thereby increasing costs to consumers or reducing supplies in the marketplace. Standards or mandates generally result in higher cost emission reductions versus establishing a price on emissions and allowing the market to select the solutions.	Increased operational cost	Up to 1 year	Direct	More likely than not	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial implications.	ExconMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration developing energy- efficient products, flaring / venting reduction, and production of lower carbon resources all contribute to preparing for these risks.
Uncertainty surrounding new regulation	ExxonMobil's financial and operating results are subject to a variety of risks inherent in the global oil and gas business. Many of these risk factors are not within the Company's control and could adversely affect our business, our financial and operating results or our financial condition. Due to concern over the potential risk of climate change, a number of countries have adopted, or are considering the adoption of, regulatory frameworks to reduce greenhouse gas emissions. These include adoption of cap and trade efficiency standards, and incentives or mandates for renewable energy. These requirements could make our products more expensive and reduce demand for hydrocarbon demand toward relatively lower-carbon sources such as natural gas. Current and pending greenhouse gas regulations may also increase our compliance costs, such as monitoring or sequestering emissions.	Increased operational cost	Up to 1 year	Direct	More likely than not	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration developing energy- efficient products, flaring / venting reduction, and production of lower carbon resources all contribute to preparing for these risks.

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
General environmental regulations, including planning	Throughout the world, national and regional policymakers are considering a variety of legislative and regulatory options to mitigate GHG emissions and to develop capacity to adapt to potential impacts. Policy options and their overall effect upon the Corporation vary greatly from country to country and are not predictable. These requirements could make our products more expensive and reduce demand for hydrocarbons, as well as shifting hydrocarbon demand toward relatively lower-carbon sources such as natural gas.	Increased operational cost	1 to 3 years	Direct	More likely than not	Unknown	Tachnological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration, developing energy- efficient products, flaring / venting reduction, and production, and production of lower carbon resources all contribute to preparing for these risks.
Renewable energy regulation	Several jurisdictions have implemented or are considering regulations that require a designated amount of electricity to come from renewable sources. Similarly, several jurisdictions are requiring designated amounts of biofuels in transport fuel, or low carbon fuel standards. Other mechanisms for similar ends are subsidies, feed-in-tariffs, etc. These regulations force higher cost GHG mitigation solutions, thus costing society more for fewer emission reductions. Market-based mechanisms can be far more effective in achieving the greatest emission reductions at the least cost and maintaining a level playing field. When evaluating the benefits of various renewable energy sources, policymakers should ensure full lifecycle analyses are used to evaluate the benefits, including indirect land use change effects.	Reduced demand for goods/services	Up to 1 year	Direct	Very likely	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with these regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration, developing energy- efficient products, flaring / venting reduction, and production, of lower carbon resources all contribute to preparing for these risks.

CC5.1b Please describe your inherent risks that are driven by changes in physical climate parameters

	Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Ui of ris	ncertainty physical ks	Current scientific understanding provides limited guidance on the likelihood, magnitude, and timeframe of physical risks such as sea level rise, extreme weather events, temperature extremes, and precipitation. While these potential climate change impacts are slow-evolving, they could impact our operations. There is more uncertainty at the regional or local level versus global averages. In addition to potential production disruptions, these impacts can lead to increased costs.	Reduction/disruption in production capacity	>6 years	Direct	Unknown	Unknown	ExxonMobil's operations around the world include both onshore adivities that can experience weather extremes and storms, large sea level variations and wave height, and temperature and precipitation extremes. We design, construct and operate our facilities to withstand a variety of extreme weather conditions, including much of the range of potential outcomes.	At ExxonMobil, risks are mitigated with appropriate contingency planning and the application of a comprehensive risk management system, Known risks are mitigated first of all by factoring them into equipment and facility design, construction and operations. Business continuity planning and emergency preparedness are two essential elements to manage risks of business disruption, so that we can continue supplying fuels for transportation and electrical power as well as chemicals for consumer products.	Regular updates to our engineering standards and operating practices incorporate new knowledge on extreme conditions and events, which can impact capital and operating costs.

Please describe your inherent risks that are driven by changes in other climate-related developments

driver	Description	impact	Timeframe	Direct/ Indirect	Likelihood	of impact	financial	Management method	Cost of management
Reputation	Effective management of business and operational risks, including risks related to greenhouse gas emissions, is essential to promoting and maintaining a good corporate reputation. A reputation for effective, responsible and ethical management, in turn, is an important component of the corporation's dealings with governments, business partners, employees and shareholders. Any lack of effective management can negatively impact reputation.	Other: Increased regulatory, capital and other costs.	>6 years	Direct	Unknown	Unknown	ExxonMobil believes that our ability to consistently deliver strong returns to shareholders is a direct result of our ability to effectively manage risk. Risk cannot be eliminated, but it can be managed.	ExconMobil manages risk through a capable and committed workforce with clear accountability, well- developed and clearly defined policies and procedures, high standards of design, rigorously applied management systems, employee and contractor training, and a systematic approach to assessing performance that drives continuous improvement. ExconMobil employs our Operations Integrity Management System (OIMS). OIMS is the cornerstone of our commitment to managing risks to safety, security, health, and the environment. It guides the activities of each of our employaes and contractors around the world. OIMS is a rigorous, 11- element system designed to identify hazards and manage risks. It covers: design, construction and maintenance of facilities; preparation of employees and communities for natural disaster or other incidents; and thorough investigations into accidents and safety incidents	The costs associated with our management systems are not considered to be incremental, but instead inherent costs of running the business.

Page: CC6. Climate Change Opportunities

CC6.1 Have you identified any inherent climate change opportunities that have the potential to generate a substantive change in your business operations, revenue or expenditure? Tick all that apply

Opportunities driven by changes in regulation Opportunities driven by changes in other climate-related developments

CC6.1a Please describe your inherent opportunities that are driven by changes in regulation

Opportunity driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management	
General environmental regulations, including planning	ExxonMobil's strength in management systems provides us an ongoing opportunity to comply with emerging regulations in a manner that is more efficient and provides an economic advantage with respect to competitors. Examples include our leadership in energy efficiency through the Global Energy Management System.	Other: Improved competitive position	Up to 1 year	Direct	Unknown	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with the physical and regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, risk management, financial strength, efficient and reliable operations, and research and development.	Our investments in energy efficiency, cogeneration, developing energy- efficient products, flaring / venting reduction, and production of lower carbon resources all contribute to preparing for these opportunities,	

driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	financial implications	Management method	Cost of manageme
Emission reporting obligations	ExxonMobil's strength in management systems provides us an ongoing opportunity to comply with emerging regulations in a manner that is more efficient and provides an economic advantage with respect to competitors.	Other: Improved competitive position	Up to 1 year	Direct	Unknown	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with the physical and regulatory risks impede	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, risk management, financial strength, efficient and reliable	Our investmen in energy efficiency, cogenerati developing efficient products, flaring / venting reduction, and production lower carbo resources contribute
							potential financial implications.	operations, and research and	preparing these opportunit
Product efficiency regulations and standards	Innovations in the chemicals industry play an important role in meeting the world's energy and environmental challenges. Through lightweight plastics and other products that enable consumers to use energy more efficiently, ExxonMobil is helping reduce emissions associated with energy use. In fact, a recent study – industry-commissioned and independently validated – concluded that for every unit of greenhouse gas (GHG) emitted by the chemical industry during production, more than two units of GHGs are saved by society through the use of products and technologies enabled by our industry. As a leader in the global petrochemical industry ExxonMobil is focused on providing value and improving the efficiency of our oustomers throughout the supply chain.	New products/business services	1 to 3 years	Indirect (Client)	Unknown	Unknown	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with the physical and regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, risk management, financial strength, efficient and reliable operations, and research and development.	Our investmen in energy efficiency, cogenerat developiny energy- efficient products, flaring / venting reduction, and productior lower carb resources contribute preparing these opportunit
Other regulatory drivers	The adoption of climate policies by countries or regions could shift hydrocarbon demand toward relatively lower- carbon sources such as natural gas. ExxonMobil is the largest producer of natural gas in the U.S. and one of the largest in the world.	Increased demand for existing products/services	≻6 years	Direct	Likely	Medium- high	Technological, political, and regulatory risks have been inherent in the oil and gas industry since its earliest beginnings. The uncertainties associated with the physical and regulatory risks impede assessment of potential financial implications.	ExxonMobil will respond to these uncertainties and developments using our traditional approach: disciplined planning and investment, financial strength, efficient and reliable operations; and research and development.	Our investment in energy efficiency, cogenerat developint energy- efficient products, flaring / venting reduction, and production iower carb resources contribute preparing these opportunit

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management	
							with the second state			

To develop new technologies, ExxonMobil was the founding sponsor of the Global Climate and Energy Project (GCEP) at Stanford University. We have since contributed over threequarters of our \$100 Meeting the million commitment challenge of to the supplying the program. This pioneering research program is focused on identifying breakthrough energy technologies that reduce impact on the GHG environment emissions and that could be technologies. developed on a large scale within a 10-to-50-year timeframe. GCEP has sponsored more than 40 research programs in Australia Europe, Japan, and the United States. In addition, ExxonMobil

researchers are active in technology development.

dual

world the

energy it

needs to

support

economic

growth and

raise living

standards,

minimizing

will require

while

new

ExxonMobil's commitment to invest in technology enables us to develop innovative solutions to improve safety, minimize environmental impact, and maximize resource levels. We have invested approximately \$8 billion in research and development during the past 10 years. and almost \$2 billion on technologies related to safety and the environment.

The risk associated with major energy projects and the day-to-day operations we undertake are considerable. The importance of risk management has been brought back into the market spotlight as a variety of sectors in the global economy have experienced significant challenges stemming from the failure to assess and manage risk effectively ExxonMobil is experienced in managing the financial, technological, market, and operational risks that are inherent to our industry. Long-term planning is fundamental to our approach to risk management. Our long-term view also guides our commitment to technology. Technology gives us the confidence in our ability to deliver new solutions, to invest in unconventional resources, and to continue to deliver operational

excellence. Technology also enables

us to operate with less impact on the

environment.

Reputation

Other: Improved reputation

>6 years Direct Unknown Unknown

To develop new technologies, ExxonMobil was the founding sponsor of the Global Climate and Energy Project (GCEP) at Stanford University. We have ExxonMobil's since contributed commitment to invest in over threetechnology quarters of our \$100 enables us to Meeting the million develop dual commitment innovative challenge of to the solutions to supplying the program. improve world the This safety, energy it pioneering minimize needs to research environmental support program is impact, and economic focused on maximize Up to 1 Direct. Unknown growth and identifying resource Unknown vear raise living breakthrough levels. We products/services energy technologies standards, have invested while approximately minimizing that reduce \$8 billion in impact on the GHG research and environment emissions development will require and that during the new could be past 10 years technologies. developed and almost \$2 on a large billion on scale within a technologies 10-to-50-year related to timeframe. safety and the GCEP has environment. sponsored more than 40 research programs in Australia, Europe, Japan, and the United States. In addition, ExxonMobil researchers are active in

technology development.

Changing consumer behaviour

CC6.1e

Please explain why you do not consider your company to be exposed to inherent opportunities driven by physical climate parameters that have the potential to generate a substantive change in your business operations, revenue or expenditure

We view potential changes to physical climate parameters as risks to be managed, similar to multiple other risks we successfully manage.

Increased

existing

demand for

Further Information

Module: GHG Emissions Accounting, Energy and Fuel Use, and Trading

Perhaps the most obvious opportunity

created by the concern over climate

change lies in the enhanced use of

growth in electric power generation.

As the leading private equity holder of

gas reserves and a leader in LNG and

tight gas technologies, ExxonMobil is

well positioned to play a leading role

in meeting rising demand for natural

developing countries where about 2.5

traditional biomass fuels for heating

and cooking. We are well positioned

technologies and products that meet

to respond to this opportunity and

challenge to develop and utilize

efficient and clean energy

growing demand.

gas. Global demand for energy will

continue to rise especially in

billion people who still rely on

natural gas to reduce emissions

Page: CC7. Emissions Methodology

CC7.1

Please provide your base year and base year emissions (Scopes 1 and 2)

Scope	Base year	Base year emissions (metric tonnes CO2e)
Scope 1	Sun 01 Jan 2006 - Sun 31 Dec 2006	143000000
Scope 2 (location-based)	Sun 01 Jan 2006 - Sun 31 Dec 2006	10000000
Scope 2 (market-based)		

CC7.2

Please give the name of the standard, protocol or methodology you have used to collect activity data and calculate Scope 1 and Scope 2 emissions

Please select the published methodologies that you use IPIECA's Petroleum Industry Guidelines for reporting GHG emissions, 2nd edition, 2011

American Petroleum Institute Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry, 2009

CC7.2a

If you have selected "Other" in CC7.2 please provide details of the standard, protocol or methodology you have used to collect activity data and calculate Scope 1 and Scope 2 emissions

CC7,3

Please give the source for the global warming potentials you have used

Gas Reference

CO2	IPCC Fourth Assessment Report (AR4 - 100 year)
CH4	IPCC Fourth Assessment Report (AR4 - 100 year)
Other: N2O	IPCC Fourth Assessment Report (AR4 - 100 year)

CC7.4

Please give the emissions factors you have applied and their origin; alternatively, please attach an Excel spreadsheet with this data at the bottom of this page

Fuel/Material/Energy	Emission Factor	Unit	Reference
Natural gas	130.07	Ib CO2e per million BTU	API GHG Compendium, 2009
Refinery gas	133.82	Ib CO2e per million BTU	API GHG Compendium, 2009
Petroleum coke	237	Ib CO2e per million BTU	API GHG Compendium, 2009
Distillate fuel oil No 4	176.81	Ib CO2e per million BTU	API GHG Compendium, 2009
Residual fuel oil	182.76	Ib CO2e per million BTU	API GHG Compandium, 2009
Other: Low BTU Gas	278	Ib CO2e per million BTU	API GHG Compendium, 2009

Further Information

CC7.4 - The Fuel/Material/Energy categories listed comprise over 95% of our energy sources. Our operations utilize the most accurate emission factors available to them beginning with the API GHG Compendium emission factors, then applying locally regulated emission factors where required, and finally, by applying site specific emission factors, if determined to be more accurate than API.

Page: CC8. Emissions Data - (1 Jan 2015 - 31 Dec 2015)

CC8.1

Please select the boundary you are using for your Scope 1 and 2 greenhouse gas inventory

Equity share

CC8.2

Please provide your gross global Scope 1 emissions figures in metric tonnes CO2e

118000000

CC8.3

Does your company have any operations in markets providing product or supplier specific data in the form of contractual instruments?

Yes

CC8.3a

Please provide your gross global Scope 2 emissions figures in metric tonnes CO2e

Scope 2, location-based Scope 2, market-based (if applicable) Comment 8000000

CC8.4

Are there are any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1 and Scope 2 emissions that are within your selected reporting boundary which are not included in your disclosure?

No

CC8.5

Please estimate the level of uncertainty of the total gross global Scope 1 and 2 emissions figures that you have supplied and specify the sources of uncertainty in your data gathering, handling and calculations

Scope	Uncertainty range	Main sources of uncertainty	Please expand on the uncertainty in your data
Scope 1	More than 5% but less than or equal to 10%	Metering/ Measurement Constraints Other: Published Emissions Factors	ExxonMobil has conducted a rigorous analysis of our GHG reporting uncertainty. The study showed that our reported Scope 1 emissions have an uncertainty of 5-10%. The degree of uncertainty varies by type, age, and location of facility.
Scope 2 (location- based)	More than 30% but less than or equal to 40%	Assumptions Other: Unknown due to global power sector variations	ExxonMobil has not undertaken an analysis of Scope 2 uncertainty. However, recent studies on electric power generation grid factor uncertainty, such as the one described in the paper by Christopher Weber, et al. from Carnegie Mellon University in 2009, indicate that uncertainty across the U.S. grid CO2 emission factors maybe in the range of 40%.
Scope 2 (market- based)		Other: Not applicable	Notapplicable

CC8.6

Please indicate the verification/assurance status that applies to your reported Scope 1 emissions

Third party verification or assurance process in place

CC8.6a

Please provide further details of the verification/assurance undertaken for your Scope 1 emissions, and attach the relevant statements

Verification or assurance cycle în place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/section reference	Relevant standard	of reported Scope 1 emissions verified (%)	
Annual	Complete	Reasonable assurance	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC8.6a/EXX150015_2015_CCR_FullReport_05102016.pdf	Page 90-94	ISAE3000	100	

CC8.7

Please indicate the verification/assurance status that applies to at least one of your reported Scope 2 emissions figures

Third party verification or assurance process in place

CC8.7a

Please provide further details of the verification/assurance undertaken for your location-based and/or market-based Scope 2 emissions, and attach the relevant statements

Location- based or market- based figure?	Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/Section reference	Relevant standard	Proportion of reported Scope 2 emissions verified (%)
Location- based	Annual process	Complete	Reasonable assurance	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC8.7a/EXX150015_2015_CCR_FullReport_05102016.pdf	Page 90-94	ISAE3000	100

CC8.8

Please identify if any data points have been verified as part of the third party verification work undertaken, other than the verification of emissions figures reported in CC8.6, CC8.7 and CC14.2

Additional data points verified Comment

No additional data verified

CC8.9

Are carbon dioxide emissions from biologically sequestered carbon relevant to your organization?

Na

Further Information

CC8.2: -3 percent of ExxonMobil's Scope 1 emissions (4 million metric tonnes) are associated with electricity generated in company owned power plants or cogeneration facilities that is exported to others. Therefore, from a net emissions perspective, ExxonMobil's Scope 1 + Scope 2 emissions (less the Scope 1 emissions associated with export power) = 118 + 8 - 4 = 122 million metric tonnes. We believe net emissions are a more appropriate measure of a company's or facility's GHG emissions performance. Net emissions are reported in our Corporate Clitzenship Report.

Page: CC9. Scope 1 Emissions Breakdown - (1 Jan 2015 - 31 Dec 2015)

CC9.1

Do you have Scope 1 emissions sources in more than one country?

Yes

CC9.1a

Please break down your total gross global Scope 1 emissions by country/region

Country/Region	Scope 1 metric tonnes CO2e				
Americas	62000000				
Europe, Middle East and Africa (EMEA)	43000000				
Asia Pacific (or JAPA)	13000000				

CC9.2

Please indicate which other Scope 1 emissions breakdowns you are able to provide (tick all that apply)

```
By business division
By GHG type
```

CC9.2a

Please break down your total gross global Scope 1 emissions by business division

Business division	Scope 1 emissions (metric tonnes CO2e)
Upstream	54000000
Downstream	45000000
Chemicals	19000000

CC9.2c

Please break down your total gross global Scope 1 emissions by GHG type

GHG type	Scope 1 emissions (metric tonnes CO2e)
CO2	111000000
CH4	6000000
Other: Other GHG Combined	1000000

Page: CC10. Scope 2 Emissions Breakdown - (1 Jan 2015 - 31 Dec 2015)

CC10.1

Do you have Scope 2 emissions sources in more than one country?

Yes

CC10.1a

Please break down your total gross global Scope 2 emissions and energy consumption by country/region

Country/Region	Scope 2, location- based (metric tonnes CO2e)	Scope 2, market- based (metric tonnes CO2e)	Purchased and consumed electricity, heat, steam or cooling (MWh)	Purchased and consumed low carbon electricity, heat, steam or cooling accounted in market-based approach (MWh)
Americas	5000000		27388000	0
Europe, the Middle East, Africa and Russia (EMEAR)	2000000		11343000	0
Asia Pacific (or JAPA)	1000000		5064000	0

CC10.2

Please indicate which other Scope 2 emissions breakdowns you are able to provide (tick all that apply)

By business division

CC10.2a

Please break down your total gross global Scope 2 emissions by business division

Business divisio	n Scope 2 emissions, location based (metric tonnes CO2e)	Scope 2 emissions, market-based (metric tonnes CO2e)
Upstream	3000000	
Downstream	2000000	
Chemicals	3000000	

Further Information

Page: CC11. Energy

CC11.1

What percentage of your total operational spend in the reporting year was on energy?

More than 0% but less than or equal to 5%

CC11.2

Please state how much heat, steam, and cooling in MWh your organization has purchased and consumed during the reporting year

Energy type	Energy purchased and consumed (MWh)
Heat	0
Steam	0
Cooling	0

CC11.3

Please state how much fuel in MWh your organization has consumed (for energy purposes) during the reporting year

363000000

CC11.3a

Please complete the table by breaking down the total "Fuel" figure entered above by fuel type

Fuels	MWh
Other: Blended mix of own produced and purchased fuel	363000000

CC11.4

Please provide details of the electricity, heat, steam or cooling amounts that were accounted at a low carbon emission factor in the market-based Scope 2 figure reported in CC8.3a

Basis for applying a low carbon emission factor MWh consumed associated with low carbon electricity, heat, No purchases or generation of low carbon electricity, heat, steam or cooling accounted with a 0

CC11.5

Please report how much electricity you produce in MWh, and how much electricity you consume in MWh

Total electricity consumed (MWh)	purchased (MWh)	Total electricity produced (MWh)	Total renewable electricity produced (MWh)	Consumed renewable electricity that is produced by company (MWh)	Comment
	72427520		0	0	

Further Information

For question CC11.1, total operational spend includes "Costs of goods sold" per CDP definition

low carbon emissions factor

CC12.1

How do your gross global emissions (Scope 1 and 2 combined) for the reporting year compare to the previous year?

Decreased

CC12.1a

Please identify the reasons for any change in your gross global emissions (Scope 1 and 2 combined) and for each of them specify how your emissions compare to the previous year

Reason	Emissions value (percentage)	Direction of change	Please explain and include calculation
Emissions reduction activities	2	Decrease	Improved energy efficiency through projects and operational optimizations in our Refining business
Divestment	3	Decrease	Full year effect of Hong Kong Power divestment
Acquisitions	0	No change	a the period of the date of the second
Mergers	0	No change	
Change in output	0	No change	
Change in methodology	0	No change	
Change in boundary	0	No change	
Change in physical operating conditions	1	Increase	Flaring increase in Angola, where a third-party-operated liquefied natural gas plant was not operating
Unidentified	0	No change	
Other	- (f):	Increase	Mix of upstream production resources more energy-intensive

CC12.1b

Is your emissions performance calculations in CC12.1 and CC12.1a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?

Location-based

CC12.2

Please describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tonnes CO2e per unit currency total revenue

Intensity figure =	Metric numerator (Gross global combined Scope 1 and 2 emissions)	Métric denominator: Unit total revenue	Scope 2 figure used	% change from previous year	Direction of change from previous year	Reason for change
00047	metric tonnes CO2e	268882000000	Location- based	48	Decrease	Reported emissions decreased by 3% while revenue decreased by 35%. Revenue can vary significantly with the cyclic nature of the oil and gas industry. Emissions/Revenue is not a useful intensity measure for our industry.

CC12.3

Please provide any additional intensity (normalized) metrics that are appropriate to your business operations

Intensity figure =	Metric numerator (Gross global combined Scope 1 and 2 emissions)	Metric denominator	Metric denominator: Unit total	Scope 2 figure used	% change from previous year	Direction of change from previous year	Reason for change
24.3	metric tonnes CO2e	Other: 100 Metric tons of throughput (Refining) or production (Upstream / Chemicals)	5180000	Location- based	3	Decrease	Full year effect of asset divestment with emission (numerator effect), but no throughput (denominator effect) – Hong Kong Power

Further Information

Page: CC13. Emissions Trading

CC13.1

Do you participate in any emissions trading schemes?

Yes

CC13.1a

Please complete the following table for each of the emission trading schemes in which you participate

Scheme name	Period for which data is supplied	Allowances allocated	Allowances purchased	Verified emissions in metric tonnes CO2e	Details of ownership
California's Greenhouse Gas Cap and Trade Program	Thu 01 Jan 2015 - Thu 31 Dec 2015	2462490	9360109	9207583	Facilities we own and operate
European Union ETS	Thu 01 Jan 2015 - Thu 31 Dec 2015	13548000	3939000	17487000	Facilities we own and operate
New Zealand ETS	Thu 01 Jan 2015 - Thu 31 Dec 2015	٥	2000000	3700000	Other: Products Sold
Other: Quebec Cap and Trade Program	Thu 01 Jan 2015 - Thu 31 Dec 2015	Ø	652000	177393	Other: Products Sold

CC13.1b

What is your strategy for complying with the schemes in which you participate or anticipate participating?

ExxonMobil's strategy is to manage compliance obligations of our regulated facilities through comprehensive measurement and reporting, ongoing assessment and implementation of cost effective energy efficiency and environmental improvements and ratable purchase and sale of allowances. ExxonMobil has traded allowances in regulated emissions trading schemes when cost-effective for compliance and expects to continue to do so in the future.

We comply with all applicable laws and regulations, including the existing programs in the European Union, New Zealand, California and Canada.

CC13.2

Has your organization originated any project-based carbon credits or purchased any within the reporting period?

Yes

CC13.2a

Please provide details on the project-based carbon credits originated or purchased by your organization in the reporting period

Cred

Credit orlgination or credit purchase	Project type	Project identification	Verified to which standard	Number of credits (metric tonnes of CO2e)	Number of credits (metric tonnes CO2e): Risk adjusted volume	Credits cancelled	Purpose, e.g. compliance
Credit purchase	Other: Various wind, biogas, fuel switching projects	UNFCCC Reference Numbers: 2215, 3470, 3704, 5405, 4281, 4490, 1320	CDM (Clean Development Mechanism)	162000	162000	No	Compliance

Further Information

Page: CC14. Scope 3 Emissions

CC14.1

Please account for your organization's Scope 3 emissions, disclosing and explaining any exclusions

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Purchased goods and services Capital					
goods Fuel-and- energy- related activities (not included in Scope 1 or 2)					
Upstream transportation and distribution					
Waste generated in operations Business travel					
Employee commuting Upstream					
Downstream transportation and					
Processing of sold products					
(Inc. effected	Datamat		New Zealand GHG Regulation, U.S. EPA GHG		NOTE: THIS IS NOT TOTAL CORPORATION DATA - ONLY U.S., NEW ZEALAND AND QUEBEC SCOPE 3 EMISSIONS SUBMITTED UNDER REGULATORY REPORTING
products	calculated	253907000	Mandatory Reporting Rule, Quebec GHG Regulation	0%	REQUIREMENT. According to the International Energy Agency, approximately 90 percent of petroleum-related GHG emissions are generated when customers use our products and the remaining 10 percent are generated by industry operations.
End of life treatment of sold products			va • Selavi		
Downstream leased assets					
Investments					
(upstream) Other (downstream)					

CC14.2

Please indicate the verification/assurance status that applies to your reported Scope 3 emissions

Third party verification or assurance process in place

CC14.2a

Please provide further details of the verification/assurance undertaken, and attach the relevant statements

Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/Section reference	Relevant standard	Proportion of reported Scope 3 emissions verified (%)	
Annual process	Underway but not complete for reporting year - previous statement of process attached	Third party verification/assurance underway	https://www.cdp.net/sites/2016/36/6136/Climate Change 2016/Shared Documents/Attachments/CC14.2a/2014 AB32 ExxonMobil Fuel Supplier Verification Report.pdf	1-21	California Mandatory GHG Reporting Regulations (CARB)	5	

CC14.3

Are you able to compare your Scope 3 emissions for the reporting year with those for the previous year for any sources?

Yes

CC14.3a

Please identify the reasons for any change in your Scope 3 emissions and for each of them specify how your emissions compare to the previous year

Sources of Scope 3 emissions	Reason for change	Emissions value (percentage)	Direction of change	Comment
Use of sold products	Change in output	13	Decrease	Lower refinery throughput and product sales

CC14.4

Do you engage with any of the elements of your value chain on GHG emissions and climate change strategies? (Tick all that apply)

Yes, our suppliers Yes, our customers

CC14.4a

Please give details of methods of engagement, your strategy for prioritizing engagement and measures of success

In our oil & gas operations, the vast majority of our emissions are not in our supply chain, and therefore we choose to focus our GHG reduction efforts on our own internal operations vs suppliers and customers. In our lubricants and chemical businesses, we focus our efforts on customers that can benefit from the energy-saving/GHG reducing properties of our chemical and lubricant products.

CC14.4b

To give a sense of scale of this engagement, please give the number of suppliers with whom you are engaging and the proportion of your total spend that they represent

Number of suppliers % of total spend (direct and indirect) Comment

CC14.4c

If you have data on your suppliers' GHG emissions and climate change strategies, please explain how you make use of that data

How you make use of the data Please give details

Further Information

According to the International Energy Agency, approximately 90 percent of petroleum-related GHG emissions are generated when customers use our products and the remaining 10 percent are generated by industry operations. Only Scope 3 emissions that have been reported under mandatory reporting regulations where consistent definitions are assured are included in this submission. U.S. EPA Scope 3 reporting rules include products that go into non-emissive uses such as asphalt and plastics. We report here consistent with those EPA reporting rules.

Module: Sign Off

Page: CC15. Sign Off

CC15.1

Please provide the following information for the person that has signed off (approved) your CDP climate change response

Name	Job title	Corresponding job category
Mr. Rex W. Tillerson	Chairman of the Board and Chief Executive Officer Exxon Mobil Corporation	Board chairman

Further Information

Module: Oil & Gas

Page: OG0. Reference information

OG0.1

Please identify the significant petroleum industry components of your business within your reporting boundary (select all that apply)

Exploration, production & gas processing Storage, transportation & distribution Specialty operations Refining Retail & marketing

Further Information

Page: OG1. Production & reserves by hydrocarbon type - (1 Jan 2015 - 31 Dec 2015)

OG1,1

Is your organization involved with oil & gas production or reserves?

Yes

OG1.2

Please provide values for annual gross and net production by hydrocarbon type (in units of BOE) for the reporting year in the following table. The values required are aggregate values for the reporting organization

Product	Gross production (BOE)	Net production (BOE)	Production consolidation boundary
Natural gas condensate Natural gas liquids (NGL) Liquefied Petroleum Gas (LPG) Lightoil Modium cil			
Heavy oil Extraheavy oil Bitumen (oil sands) Shale oil Synthetic oil Tight oil		855925000	Equity share
Conventional non-associated natural gas Associated natural gas Shale gas Tight gas		639663000	Equity share

OG1.3

Please provide values for reserves by hydrocarbon type (in units of BOE) for the reporting year. Please indicate if the figures are for reserves that are proved, probable or both proved and probable. The values required are aggregate values for the reporting organization

Product	Country/region	Reserves (BOE)	Date of assessment	Proved/Probable/Proved+Probable
Natural gas condensate Natural gas liquids (NGL) Light oil Medium oil Heavy oil Extraheavy oil	Rest of world	9583000000	Thu 31 Dec 2015	Proved
Shale oil Tight oil				
Bitumen (oil sands) Synthetic oil	Rest of world	5141000000	Thu 31 Dec 2015	Proved
Conventional non-associated natural gas Associated natural gas Shale gas Tight gas	Rest of world	10035000000	Thu 31 Dec 2015	

OG1.4

Please explain which listing requirements or other methodologies you have used to provide reserves data in OG1.3. If your organization cannot provide data due to legal restrictions on reporting reserves figures in certain countries, please explain this

Proved reserves in this submission are based on current SEC definitions.

OG1.5

Please provide the average breakeven cost of current production used in estimation of proven reserves

Hydrocarbon/project Breakeven cost/BOE Comment

OG1.6

In your economic assessment of hydrocarbon reserves, resources or assets, do you conduct scenario analysis and/or portfolio stress testing consistent with a low-carbon energy transition?

Yes, other

OG1.6a

Please describe your scenario analysis and/or portfolio stress testing, the inputs used and the implications for your capital expenditure plans and investment decisions

ExxonMobil's long-range annual forecast, The Outlook for Energy, examines energy supply and demand trends for approximately 100 countries, 15 demand sectors and 20 different energy types. The Outlook forms the foundation for the company's business strategies and helps guide our investment decisions. In response to projected increases in global fuel and electricity demand, our 2016 Outlook estimates that global energy-related CO2 emissions will peak around 2030 and then begin to decline. A host of trends contribute to this downturm — including slowing population growth, maturing economies and a shift to cleaner fuels like natural gas and renewables — some voluntary and some the result of policy.

ExconMobil addresses the potential for future climate change policy, including the potential for restrictions on emissions, by estimating a proxy cost of carbon. This cost, which in some geographies may approach \$80 per ton by 2040, has been included in our Outlook for several years. This approach seeks to reflect potential policies governments may employ related to the exploration, development, production, transportation or use of carbon-based fuels. We believe our view on the potential for future policy action is realistic and by no means represents a "business-as-usual" case. We require all of our business lines to include, where appropriate, an estimate of greenhouse gas-related emissions costs in their economics when seeking funding for capital investments.

We evaluate potential investments and projects using a wide range of economic conditions and commodity prices. We apply prudent and substantial margins in our planning assumptions to help ensure competitive returns over a wide range of market conditions. We also financially stress test our investment opportunities, which provides an added margin against uncertainties, such as those related to technology development, costs, geopolitics, availability of required materials, services and labor. Stress testing further enables us to consider a wide range of market environments in our planning and investment process.

Further Information

Anti-trust laws in the United States and other jurisdictions require that companies avoid providing information about levels of future business activity which could be competitively sensitive.

Page: OG2. Emissions by segment in the O&G value chain - (1 Jan 2015 - 31 Dec 2015)

Please indicate the consolidation basis (financial control, operational control, equity share) used to report the Scope 1 and Scope 2 emissions by segment in the O&G value chain. Further information can be provided in the text box in OG2.2

Segment	Consolidation basis for reporting Scope 1 emissions	Consolidation basis for reporting Scope 2 emissions
Exploration, production & gas processing	Equity Share	Equity Share
Refining	Equity Share	Equity Share
Specialty operations	Equity Share	Equity Share

OG2.2

Please provide clarification for cases in which different consolidation bases have been used and the level/focus of disclosure. For example, a reporting organization whose business is solely in storage, transportation and distribution (STD) may use the text box to explain why only the STD row has been completed

ExxonMobil consolidates GHG emissions information by business unit (Upstream, Downstream and Chemicals) for the oil and gas sectors with the specific activities of storage, transportation and distribution integrated into the respective business unit. Therefore, our submission includes Upstream activities listed under "Exploration, production & gas processing", Downstream activities (including Retail & Marketing) listed under "refining" and chemicals activities under "Specialty operations".

OG2.3

Please provide masses of gross Scope 1 carbon dioxide and methane emissions in units of metric tonnes CO2 and CH4, respectively, for the organization's owned/controlled operations broken down by value chain segment

Segment	Gross Scope 1 carbon dioxide emissions (metric tonnes CO2)	Gross Scope 1 methane emissions (metric tonnes CH4)
Exploration, production & gas processing	48000000	252000
Refining	44000000	5000
Specialty operations	19000000	1000

OG2.4

Please provide masses of gross Scope 2 GHG emissions in units of metric tonnes CO2e for the organization's owned/controlled operations broken down by value chain segment

Segment	Gross Scope 2 emissions (metric tonnes CO2e)	Comment
Exploration, production & gas processing	3000000	
Refining	2000000	
Specialty operations	3000000	

Further Information

Page: OG3. Scope 1 emissions by emissions category - (1 Jan 2015 - 31 Dec 2015)

OG3.1

Please confirm the consolidation basis (financial control, operational control, equity share) used to report Scope 1 emissions by emissions category

Segment	Consolidation basis for reporting Scope 1 emissions by emissions category
Exploration, production & gas processing	Equity Share
Refining	Equity Share
Specially operations	Equity Share

OG3.2

Please provide clarification for cases in which different consolidation bases have been used to report by emissions categories (combustion, flaring, process emissions, vented emissions, fugitive emissions) in the various segments

Equity share is applied for our GHG emissions; no further clarification required.

OG3.3

Please provide masses of gross Scope 1 carbon dioxide and methane emissions released into the atmosphere in units of metric tonnes CO2 and CH4, respectively, for the whole organization broken down by emissions category

Emissions category	Gross Scope 1 carbon dioxide emissions (metric tonnes CO2)	Gross Scope 1 methane emissions (metric tonnes CH4
Combustion	119000000	and the second of the second
Flaring		
Process emissions		
Vented emissions		
Fugitive emissions		240000
		(DIIID)

OG3.4

Please describe your organization's efforts to reduce flaring, including any flaring reduction targets set and/or its involvement in voluntary flaring reduction programs, if flaring is relevant to your operations

ExxonMobil is a charter member of the Global Gas Flaring Reduction Partnership. In addition, we put in place our own parameters, the Upstream Flaring and Venting Reduction Environmental Standard for Projects, in 2005. Accordingly, our goal is to responsibly avoid routine flaring in new Upstream projects and reduce "legacy" flaring in our existing operations. For example, our joint venture operations in Catar have recently begun using a jetty boil-off gas (JBOG) recovery facility to recover the natural gas that was previously flared during LNG vessel loading at the marine berths located at the Ras Laffan Port. Approximately 1 percent of the LNG loaded onto the ships evaporates due to the difference in temperature between the LNG and the ship tank. The JBOG recovery facility collects the boil-off gas and returns it to the LNG plants to be used as fuel or converted back into LNG. During one year of operation, the JBOG facility has recovered more than 500,000 metric tons of gas and reduced LNG vessel loading-related flaring by around 90 percent.

Further Information

For question OG3.3, CO2 emission from "Flaring" and "Process emissions" are included in "Combustion". Similarly, methane emissions from "Vented emissions" are included in "Fugitive emissions".

Page: OG4. Transfers & sequestration of CO2 emissions - (1 Jan 2015 - 31 Dec 2015)

OG4.1

Is your organization involved in the transfer or sequestration of CO2?

Yes

OG4.2

Please indicate the consolidation basis (financial control, operational control, equity share) used to report transfers and sequestration of CO2 emissions

Activity	Consolidation basis	
Transfers	Equity Share	
Sequestration of CO2 emissions	Equity Share	

OG4.3

Please provide clarification for cases in which different consolidation bases have been used (e.g. for a given activity, capture, injection or storage pathway)

Equity share is applied for our GHG emissions; no further clarification required.

OG4.4

Using the units of metric tonnes of CO2, please provide gross masses of CO2 transferred in and out of the reporting organization (as defined by the consolidation basis). Please note that questions of ownership of the CO2 are addressed in OG4.6

Transfer direction	CO2 transferred - Reporting year
CO2 transferred in	0
CO2 transferred out	12088000

OG4.5

Please provide clarification on whether any oil reservoirs and/or sequestration system (geological or oceanic) have been included within the boundary of the reporting organization. Provide details, including degrees to which reservoirs are shared with other entities

Saline reservoir for CO2 injection from Sleipner field in Norway is included within our boundary in this report. In 2015, we had a 32% equity interest in Sleipner, which is operated by Statoil. Our equity share of oil reservoirs in Texas and New Mexico where CO2 is injected for Enhanced Oil Recovery (EOR) is included within our boundary. Also included within our boundary is the acid gas injection well at our Labarge, Wyoming facility where we are the 100% owner and operator. CO2 transferred noted in Question OG4.4 represents CO2 purchased from 3rd parties to use in our own EOR operations. The 3rd party source is not included within our boundary, but our EOR operations are, CO2 transferred out in Question OG4.4 represents CO2 purchased from 3rd parties to use in our own EOR operations. The 3rd party source is not included within our boundary, but our EOR operations are, CO2 transferred out in Question OG4.4 represents CO2 from our facilities that is sold to others, primarily for Enhanced Oil Recovery (EOR). Their EOR storage is not included within our boundary in this report.

OG4.6

Please explain who (e.g. the reporting organization) owns the transferred emissions and what potential liabilities are attached. In the case of sequestered emissions, please clarify whether the reporting organization or one or more third parties owns the sequestered emissions and who has potential liability for them

The CO2 that is sold (transferred out) from our facilities and any associated responsibilities are owned by the purchasers. We retain our 32% equity ownership of the CO2 sequestered at Sleipner and 100% ownership of the CO2 sequestered via acid gas injection at Labarge, as well as our varying equity interests in the Texas and New Mexico EOR fields.

OG4.7

Please provide masses in metric tonnes of gross CO2 captured for purposes of carbon capture and sequestration (CCS) during the reporting year according to capture pathway. For each pathway, please provide a breakdown of the percentage of the gross captured CO2 that was transferred into the reporting organization and the percentage that was transferred out of the organization (to be stored)

Capture pathway in CCS	Captured CO2 (metric tonnes CO2)	Percentage transferred in	Percentage transferred out	
Gas stream separation from natural gas purification	6900000	9%	91%	

OG4.8

Please provide masses in metric tonnes of gross CO2 injected and stored for purposes of CCS during the reporting year according to injection and storage pathway

Injection and storage pathway	Injected CO2 (metric tonnes CO2)	Percentage of injected CO2 intended for long-term (>100 year) storage	Year in which injection began	Cumulative CO2 Injected and stored (metric tonnes CO2)
CO2 injected into a geological formation or saline formation for long-term storage	228000	100%	1996	5100000
Acid gas injection (CO2 and H2S co-injected into a production reservoir)	368000	100%	2005	3300000
CO2 used for enhanced oil recovery (EOR) or enhanced gas recovery (EGR)	2272000	100%	1980	

OG4.9

Please provide details of risk management performed by the reporting organization and/or third party in relation to its CCS activities. This should cover pre-operational evaluation of the storage (e.g. site characterisation), operational monitoring, closure monitoring, remediation for CO2 leakage, and results of third party verification

Our Operations Integrity Management System (OIMS) is the cornerstone to managing the safety, security, health and environmental risks in our operations and achieving excellence in performance. As such, OIMS is rigorously applied in our CCS activities. The Sleipner project involved extensive storage site characterization prior to injection. Operational monitoring is extensive using 2-D, 3-D and 4-D seismic, time-lapse, and gravity monitoring. Monitoring has been and continues to be supported by various consortia including SACS, CO2STORE and CO2REMOVE, and the results are shared broadly to promote learning, and advance technology and best practices. Extensive dispersion modeling and reservoir characterization was used to select the injection site for the Labarge, Wyoming acid gas injection facilities. Rigorous state agency permitting requirements were met. Extensive pressure monitoring and continuous air monitoring with alarms have been applied throughout the operation. Comprehensive personnel training has been applied and refresher training is on-going. Rigorous mechanical integrity testing is conducted annually.

Further Information

F

Page: OG5. Sales and emissions intensity - (1 Jan 2015 - 31 Dec 2015)

OG5,1

Please provide values for annual sales of hydrocarbon types (in units of BOE) for the reporting year in the following table. The values required are aggregate values for the reporting organization

Product	Sales (BOE)
Refined products	2100210000
Other: Natural Gas Available for Sale	

OG5.2

Please provide estimated emissions intensities (Scope 1 + Scope 2) associated with current production and operations

Year ending	Segment	Hydrocarbon/product	Emissions intensity (metric tonnes CO2e per thousand BOE)	% change from previous year	Direction of change from previous year	Reason for change
2010	Refining	Refined products	20.8	1	Decrease	
2011	Refining	Refined products	20.0	4	Decrease	
2012	Refining	Refined products	19.6	2	Decrease	
2013	Refining	Refined products	19.7	1	Increase	
2014	Refining	Refined products	19.2	3	Decrease	
2015	Refining	Refined products	18.9	2	Decrease	

OG5.3

Please clarify how each of the emissions intensities has been derived and supply information on the methodology used where this differs from information already given in answer to the methodology questions in the main information request

Emissions intensities are based on greenhouse gas emissions (net equity, CO2-equivalent emissions) normalized to 100 metric tons of throughput (Refining)

Further Information

Page: OG6. Development strategy - (1 Jan 2015 - 31 Dec 2015)

OG6.1

For each relevant strategic development area, please provide financial information for the reporting year

Strategic development area Describe how this relates to your business strategy Sales generated EBITDA Net assets CAPEX OPEX Comment

OG6.2

Please describe your future capital expenditure plans for different strategic development areas

Strategic development area CAPEX Total return expected from CAPEX investments Comment

OG6.3

Please describe your current expenses in research and development (R&D) and future R&D expenditure plans for different strategic development areas

Strategic development area R&D expenses - Reporting year R&D expenses - Future plans Comment

Further Information

Society continues to face the dual challenge of meeting energy demand to support the economic growth needed for improved living standards, while simultaneously addressing the risks posed by rising greenhouse gas emissions and climate change. While future temperature changes and the associated impacts are difficult to accurately predict, we believe the risks of climate change are real and warrant thoughtful action. ExxonMobil is committed to providing affordable energy to support human progress while advancing effective solutions to address the risks of climate change. Our climate change risk management strategy includes four components: engaging on climate change policy, developing future technology, mitigating greenhouse gas emissions in our operations and developing solutions that reduce greenhouse gas emissions for our customers. ExxonMobil actively advocates for responsible policies that would be effective in addressing the risks of climate change. When we encounter proposals, we offer informed data and policy analysis and engage in thoughtful debate. We have had hundreds of meetings with policymakers in the United States, the European Union and Canada to share our views on carbon pricing policy. We will continue to meet with policymakers and other stakeholders to discuss effective approaches to reduce greenhouse gas emissions. ExxonMobil's Emerging Technologies program brings together executives, scientists and engineers from across ExxonMobil's businesses to identify and evaluate technology research opportunities with a long-term strategic focus. The Emerging Technologies team seeks to understand a wide range of technology options and how they may impact the global energy system in the near term and as far as 50 years into the future. Our evaluation extends well beyond our base business and near-term focus. If a technology could have a material effect on the future of energy, we insist on knowing about it and understanding the related science. Understanding the fundamental science serves as a basis for our broader research efforts and may lead to further technology development aimed at practical application, such as our work on biofuels. Additionally, this awareness informs our internal analysis of the global energy landscape as reflected and encapsulated in our annual Outlook for Energy. As we seek to increase production of oil and natural gas to meet growing global energy demand, we are committed to continuing to take actions to miligate greenhouse gas emissions within our operations, ExxonMobil has a robust set of processes designed to improve efficiency, reduce emissions and contribute to effective long-term solutions to manage climate change risks. These processes include, where appropriate, setting tailored objectives at the business, site and equipment levels, and then stewarding progress toward meeting those objectives. In the near term, we are working to increase energy efficiency while reducing flaring, venting and fugitive emissions in our operations. In the medium term, we are deploying proven technologies such as cogeneration and carbon capture and sequestration where technically and economically feasible. Longer term, we are conducting and supporting research to develop breakthrough, game-changing technologies. Since 2000, ExxonMobil has spent approximately \$7 billion to develop lower-emission energy solutions. While ExxonMobil strives to improve efficiency throughout our own operations, we are also delivering solutions that enable our customers to reduce their own emissions and improve their own energy efficiency as well as increase reliability, performance and longevity of the associated products. These solutions can be characterized as: 1) Expanding the supply of cleaner-burning natural gas to reduce emissions in power generation, 2) Developing premium, high-efficiency fuels and lubricants and 3) Creating innovative chemical materials that can be applied in a range of consumer products. One of the greatest opportunities for society to reduce greenhouse gas emissions is through the use of natural gas in power generation. Natural gas is a flexible, abundant and low emissions fuel that is available across the globe. On a life cycle basis, from extraction through electricity consumption, using natural gas emits up to 60 percent fewer greenhouse gas emissions than coal. It is also the ideal partner for intermittent renewable energy sources, such as solar or wind, as it can provide reliable power when these renewable sources are not available. As the world moves toward a lower greenhouse gas emissions-intensive energy mix over the coming decades, natural gas will be one of the most important fuels to enable reductions in greenhouse gas emissions.

Page: OG7. Methane from the natural gas value chain

OG7.1

Please indicate the consolidation basis (financial control, operational control, equity share) used to prepare data to answer the questions in OG7

Segment	Consolidation bas	
oration, production & gas processing	Equity Share	

OG7.2

Please provide clarification for cases in which different consolidation bases have been used

The reported information only describes XTO Energy operations.

OG7.3

Does your organization conduct leak detection and repair (LDAR), or use other methods to find and fix fugitive methane emissions?

Yes

Exp

Please describe the protocol through which methane leak detection and repair, or other leak detection methods, are conducted, including predominant frequency of inspections, estimates of assets covered, and methodologies employed

A 'find and fix' initiative is employed. The effort is performed due to federal and state regulations as well as a voluntary effort. Company personnal or contractors perform inspections at variable frequencies but typically on a semi-annual to annual basis. The tools and methods used are mainly audio, visual, olfactory (AVO), optical gas imaging cameras (infrared) that can detect leaks and in some cases, EPA Method 21 is employed as required at certain facilities. When leaks are encountered, they are corrected by inspection personnel or maintenance orders are issued. Plans are in place to acquire more cameras, train personnel, and to expand the program.

OG7.4

Please indicate the proportion of your organization's methane emissions inventory estimated using the following methodologies (+/- 5%)

	Methodology		Proportion of total methane emissions estimat methodology	ed with	What area of your operations does this answer relate to?
Direct o	etection and measuremen	t	>0% to <5%		Other: XTO Energy
Engine	ering calculations		10% to <25%		Other: XTO Energy
Source 3)	-specific emission factors (I	PCC Tier	>75%		Other: XTO Energy
IPCC Tier 1 and/or Tier 2 emission factors		factors	0% Other: XTO E		Other: XTO Energy
1,5 use use the	following table to report y	our metha	ane emissions rate		alimate total mathems emitted averages ad as % of total
ending	Segment	Esuma	as production or throughput at given segment	h	ydrocarbon production or throughput at given segment
2015	Exploration, production & gas processing	0.62%		0.4%	

OG7.6

OG Plei

Does your organization participate in voluntary methane emissions reduction programs?

No

OG7.7

Were methane emissions incorporated in targets reported in CC3?

No

OG7.7b

Please explain: (i) why you do not incorporate methane into your targets; and (ii) forecast how your methane emissions will change over the next five years

As we seek to increase production of oil and natural gas to meet growing global energy demand, we are committed to continuing to take actions to mitigate greenhouse gas emissions within our operations. ExxonMobil has a robust set of processes designed to improve efficiency, reduce emissions and contribute to effective long-term solutions to manage climate change risks. These processes include, where appropriate, setting tailored objectives at the business, site and equipment levels, and then stewarding progress toward meeting those objectives. Based on decades of experience, ExxonMobil believes this rigorous bottom-up approach is a more effective and meaningful way to drive efficiency improvement and greenhouse gas emissions reduction than simply setting high-level corporate targets. We also believe that continuing to use this approach will yield further improvements in all sectors of our business.

Further Information

CDP: [WII--][AQ][Pu][E2]

Exhibit 18

2017 Sustainability Report Highlights

Kelsey Mc Neely

ExonMobil

E‰onMobil

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Statements of future events or conditions in this report are forward-looking statements. Actual future results, including future energy supply, demand and mix; the future effectiveness of safety, health, environmental and other sustainability risk and impact management processes; efficiency gains; and the impact of future technologies could differ materially due to factors including changes in supply and demand for oil and gas and other factors affecting long-term oil and gas prices; political and regulatory factors including the impact of international accords and treaties; changes in consumer preferences; actions of competitors including the development of competing technologies; the outcome of current and future research efforts; technical and operating factors; and other factors discussed under the heading Factors Affecting Future Results available through the Investors page of our website.

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Chairman's letter

I'm pleased to share with you ExxonMobil's 2017 Sustainability Report.

For more than 135 years, ExxonMobil has strived to meet society's evolving needs. We work to meet growing demands for energy and chemical products while advancing other priorities such as economic growth, environmental protection, education, poverty reduction, health, security and human rights.

I'm proud of the role we play in raising living standards. Millions of people have escaped extreme poverty in the last two decades due in part to increased access to energy.

The energy we produce is important. So is the way we produce it.

The men and women of ExxonMobil are focused on meeting society's dual challenge – meeting energy needs while also minimizing the environmental impacts of energy use, including the risks of climate change. It's one of society's largest and most complex challenges and requires thoughtful engagement at all levels, focusing on practical and affordable solutions that work at the necessary scale.

At ExxonMobil, we work extensively to reduce emissions and other environmental impacts of energy use in our operations and through the products we sell. We're also a leader in researching and developing energy technologies, like algae biofuels and carbon capture, utilization and storage, that could potentially play a role in helping mitigate the risks of climate change.

Another key sustainability focus is health. We directly impact this through our commitment to the safety of our

workers and members of communities where we work. We continue to make good progress toward our goal of *Nobody Gets Hurt*. In 2017, we had the fewest recordable injuries in our company's history.

In the communities where we operate, we routinely dialogue with local officials responsible for emergency response, health, safety and environmental protection.

Our commitment to communities extends well beyond health and safety. We work to enhance economic development by hiring and training qualified local workers and making local investments.

At ExxonMobil we are committed to creating long-term shareholder value by making a positive contribution to society. I hope you find this report helpful in understanding our approach. We welcome your feedback at **exxonmobil.com/ sustainabilityreport**.

Darren Woods Chairman and CEO



ExxonMobil and sustainability

ExxonMobil's primary responsibility is to produce the energy and products the world needs in a responsible manner. Our approach to sustainability focuses on six key areas:

- Corporate governance
- Safety, health and the workplace
- Managing the risks of climate change
- Environmental performance
- Community engagement and human rights
- Local development and supply chain management

For an in-depth analysis of our financial performance and investment decisions, see our **2017 Digital Annual Report**. For information on ExxonMobil's view of global energy demand and supply through 2040, visit the **Outlook for Energy**.



Global operations

Upstream: We are one of the largest producers of oil and gas, with an active oil and gas presence in 38 countries where we explore, develop, produce and market hydrocarbons.

Downstream: We are one of the largest integrated refiners and manufacturers of fuels and lube basestocks, as well as a leading manufacturer of petroleum products and finished lubricants. We have refining and lubricant blending facilities in 25 countries. **Chemical:** ExxonMobil is one of the world's largest chemical companies, and has operations in 16 countries and a unique portfolio of high-performance products.



¹ Natural gas converted to oil-equivalent barrels using 6 million cubic feet per 1,000 barrels.

 $^{\rm 2}$ Sales data reported net of purchases/sales contracts with the same counterparty.

External Sustainability Advisory Panel statement

For the last 10 years, the External Sustainability Advisory Panel has commented on ExxonMobil's sustainability reporting and transparency. In that time, the company has acted on many of our recommendations and we are encouraged by the progress. This year, the company has transitioned from a corporate citizenship report to a sustainability report, which connotes a greater sense of connectedness to global issues and deeper integration with corporate strategy. During our engagement period in 2017-2018, we had the opportunity to observe increased executive engagement in sustainability. Through meetings with the Chairman and CEO, and other senior business leaders in executive, operational and functional roles, we were able to engage the company on transparency, policy and strategy.

This letter represents our individual and collective views on the quality and progress made in ExxonMobil's sustainability reporting and transparency. In recognition of our efforts, ExxonMobil provided a donation on behalf of the panelists to nonprofit organizations of our choice and reimbursed relevant travel expenses. This letter is not an official endorsement of ExxonMobil's sustainability report, the corporation, or its policies and strategies.

For past panel feedback statements, visit: exxonmobil.com/sustainabilityreport

Linking sustainability to corporate strategy

Climate change, sustainable development and human rights are among the most pressing challenges facing society. Companies are responding by aligning their core business strategy around global initiatives that seek to address these trends – the Paris Agreement, the United Nations Sustainable Development Goals (SDGs) and the United Nations Guiding Principles for Business and Human Rights (UNGPs). We recognize ExxonMobil's progress in responding to these international issues and goals. We hope that the company will take further steps to demonstrate how climate change, the SDGs, human rights and other sustainability-related challenges link directly with corporate investments and programs central to its long-term business strategy. We also recommend that the sustainability report include more information on how the company is aligning its long-term business strategy and sustainability strategy, along with the risks and opportunities created by these issues.

Communicating the urgency of climate change

We commend ExxonMobil for the significant steps the company has taken over the past year to address climate change. Publication of the *Energy and Carbon Summary* in early 2018 is a crucial step demonstrating the company's progress in managing climate risk and responding to shareholder concerns. Continued investment in emerging energy technology research as well as dedicated efforts to reduce methane emissions are other areas of notable progress, alongside the company's decision to participate in collective action platforms such as the Climate Leadership Council and global Methane Guiding Principles, and its public support for the Paris Agreement. The company's recent announcement of efforts to further reduce greenhouse gas emissions from flaring and methane emissions through quantified reductions of 25 percent and 15 percent respectively, by 2020, is a significant step forward.

Due to the possible negative impacts climate change poses to business operations, human rights and economic development around the world, we urge further integration of climate change into the core of ExxonMobil's business strategy. This includes through continued operational upgrades and nearand long-term research and product development programs.

Perhaps most important, we encourage ExxonMobil to lead by example and be bold in its interaction with governments, industry, academic institutions and civil society organizations in the development of public policies that reduce the threat of climate change.

Measuring performance and impact

Disclosure of future targets in addition to current performance data is becoming standard practice in corporate sustainability reporting. There is a growing movement where companies are publicly articulating "science-based targets" that align with current climate science. ExxonMobil's report thoroughly discloses current and past performance data. As mentioned, we value the recent announcement of forward-looking greenhouse gas reduction measures and would suggest a similar approach for other material issues. Disclosure of the company's most material and salient internal goals provides opportunity for external stakeholders to independently assess the company's strategy and future performance.

Stronger statements can also be added on the outcomes or impacts arising from the company's programs. Corporate investments and other performance data should be coupled directly with tangible impacts and outcomes that demonstrate ExxonMobil's impact on society. For example, the report discusses the amount of capital invested in developing energy solutions with lower emissions. Emphasis could be added on the actual or potential impact of these investments for society. Describing a specific successful technology that resulted, or could result, from this investment could be more compelling than disclosing financial investment data alone. Incorporating these outcomes creates a more engaging report that demonstrates the types of impacts the company is creating for the environment, people and industry.

With respect to human rights, we recommend that the company be bold in stating its objective of no harm. Through many rigorous due diligence processes, ExxonMobil's approach to human rights, for example, closely aligns with the UNGPs. Greater specificity about practices and performance in this area would help the company align its reporting more effectively with societal and industry expectations of best practices. Measuring the impact on human rights quantitatively is difficult. Nevertheless, the company is already assessing impacts on staff and on communities in its areas of operation. We encourage it to expand efforts through further identification of potential adverse impacts, explaining processes used to identify these, and describing steps taken to mitigate them.

Engaging strategically with stakeholders

Companies like ExxonMobil have to understand and balance the needs of numerous individual and institutional stakeholders across different value chains and a wide range of cultures, regulations and operating environments. Some relationships are indirect and simple, while others are very complex. ExxonMobil's current disclosure around stakeholder engagement is not sufficiently specific, which can create the perception that the company is not fully disclosing engagement activities. We recommend that ExxonMobil describe its stakeholders and their priorities more explicitly, and how the company has addressed their concerns. We also recommend that ExxonMobil describe limitations encountered with stakeholder interactions in countries where open consultation is difficult.

We appreciate that the company publishes a list of its political contributions and philanthropic giving to non-lobbying and nonprofit organizations. In the future, we would like to see more about the relationship between its contributions and its specific sustainability goals and/or programs.

Concluding remarks

We recognize the progress that ExxonMobil has made over the past year in publicly addressing complex sustainability issues and call on the company to drive this agenda forward, both through business activities and value chains, as well as through strategic partnerships with others. We encourage the company and its executives to be even more bold and transparent in all aspects of sustainability performance. ExxonMobil is a global leader that others follow in many areas of the energy industry. We believe that taking an increasingly ambitious, evidencebased and technologically innovative position on sustainability issues will provide the company with the opportunity to champion more substantial sustainability efforts worldwide, and to enhance long-term shareholder value.

Sincerely,

Craig Benson, Mark Cohen, Frank Loy, Jane Nelson, Salil Tripathi

June 2018

External Sustainability Advisory Panel

ExxonMobil's External Sustainability Advisory Panel is composed of academics, nongovernmental organization representatives and former government employees who have expertise in a variety of environmental, social and governance topics.

Craig Benson Dean, School of Engineering and Applied Science University of Virginia

Mark Cohen Professor of Management and Law Vanderbilt University Owen Graduate School of Management

Frank Loy Former Under Secretary of State for Global Affairs U.S. Department of State

Jane Nelson Director of Corporate Responsibility Initiative Harvard University Kennedy School of Government

Salil Tripathi Senior Adviser, Global Issues Institute for Human Rights and Business



The External Sustainability Advisory Panel met with Chairman and CEO Darren Woods at ExxonMobil headquarters in Irving, Texas in May 2018. From the left: Frank Loy, Salil Tripathi, Jane Nelson, Darren Woods, Craig Benson and Mark Cohen.



Addressing the United Nations Sustainable Development Goals

The United Nations Sustainable Development Goals

(SDGs) aim to make significant progress on global economic, social and environmental challenges by 2030. While ExxonMobil contributes to certain aspects of all 17 SDGs, the following eight represent those most relevant to ExxonMobil's sustainability focus areas.

Learn more about how ExxonMobil contributes to the UN SDGs at **exxonmobil.com/sustainabilityreport**.

SDG Goal 1: End poverty in all its forms everywhere

United Nations data shows a strong correlation between energy use and improved standards of living. ExxonMobil is working to help lift people out of poverty around the world by expanding access to affordable and versatile energy supplies. In addition, ExxonMobil collaborates with host governments and other local stakeholders to implement community investments that improve health and education, and help build and sustain local economic growth.

SDG Goal 3: Ensure healthy lives and promote well-being for all at all ages

ExxonMobil supports the health, safety and well-being of our employees while also making investments to support community health systems and programs. For example, since 2001, we have funded antimalarial programs that have reached more than 125 million people. Another example is our U.S.-based *Culture of Health* program that provides health education, nutrition and fitness programs that support the well-being of our employees. We are expanding the program to other countries as well.

SDG Goal 4: Ensure inclusive and quality education for all and promote lifelong learning opportunities for all

We invest in education and teacher development programs, placing a specific emphasis on encouraging students to pursue careers in the science, technology, engineering and mathematics fields. Since 2000, we have contributed more than \$1.25 billion to education programs around the world.

SDG Goal 5: Achieve gender equality and empower all women and girls

Since 2005, ExxonMobil has invested \$111 million in programs that develop female entrepreneurs and business leaders and improve women's ability to advance. Internally, ExxonMobil promotes leadership development for women during all aspects of their careers, including through training and mentoring.



SDG Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

ExxonMobil delivers reliable and affordable energy that helps fuel economic activity and improve standards of living. Natural gas, for example, supplies 22 percent of the world's energy and has a lower carbon footprint than other traditional energy sources. In addition, ExxonMobil is researching loweremission technologies, such as algae biofuels and advanced carbon capture. We have invested more than \$9 billion since 2000 on lower-emission energy solutions.



When working in a community, we add economic and social value by creating local jobs, supporting local supplier development and providing opportunities through training and investments. We employ nearly 70,000 people around the world.



SDG Goal 12: Ensure sustainable consumption and production patterns

ExxonMobil is working to make our operations more efficient while also helping our customers to reduce their emissions. These solutions include creating advanced plastics and other materials that can be used in a range of consumer products to reduce weight and improve fuel efficiency, and by developing premium, high-efficiency fuels and lubricants.



SDG Goal 13: Take urgent action to combat climate change and its impacts

Meeting the world's growing energy demand while simultaneously reducing environmental impacts, including the risks of climate change, is one of society's most pressing challenges. We are focused on mitigating emissions in our operations, developing technology solutions, providing solutions that reduce emissions for our customers and engaging on climate change policy. We are a founding member of the Climate Leadership Council, which advocates for a revenue-neutral carbon tax and aligns closely with our long-standing principles. In 2018, we joined the Oil and Gas Climate Initiative, a voluntary initiative representing 13 of the world's largest oil and gas producers working towards solutions to mitigate the risks of climate change.



Corporate governance

ExxonMobil has a long-standing commitment to high ethical standards. Good corporate governance creates a business environment conducive to long-term growth. All our directors are required to stand for election each year at our annual meeting of shareholders. Independent directors also chair key board committees — audit, compensation, board affairs and public issues and contributions — that consist entirely of independent directors.

"ExxonMobil's board of directors provides a key oversight role, including review of risk management efforts and long-term strategic plans. Ensuring that we have diversity of background, experiences and thought represented on the board remains critical to succeeding in a global market."



Neil A. Hansen Vice president, investor relations and corporate secretary, Exxon Mobil Corporation

Above: The ExxonMobil board of directors. Top row from the left: Michael Boskin, Angela Braly, Steven Kandarian, Samuel Palmisano, Darren Woods, Kenneth Frazier, Douglas Oberhelman and Ursula Burns. Bottom row from the left: Steven Reinemund, Susan Avery and William Weldon.
Board leadership

ExxonMobil's board affairs committee, supported by an independent executive search firm, looks for highly qualified, non-employee candidates with demonstrated leadership, competency and a commitment to represent the interests of all shareholders. To help keep the process collaborative and inclusive, the board affairs committee considers recommendations from shareholders, directors and others on director candidates. At year-end 2017, 40 percent of the board's independent directors were female and/or an ethnic minority.

Sustainability topics are routinely reviewed at board meetings and typically fall under the purview of the public issues and contributions committee, the board affairs committee and the compensation committee. While risk oversight is the responsibility of the entire board, committees help the board focus on risk aspects relevant to each committee. For example, the public issues and contributions committee is charged with reviewing the effectiveness of the company's policies, programs and practices with respect to the environment, among other duties. The committee hears reports from operating units on environmental activities and also visits operating sites to observe and comment on current practices. The entire board receives briefings by internal experts on environmental stewardship and climate change.

Shareholder relations

ExxonMobil values the dialogue we have with our shareholders — and the insight provided — throughout the year. The board has established procedures for shareholders and other interested parties to communicate with board members. In 2017, we held 68 shareholder engagements on environmental, social and governance issues with institutional investors, pension funds, labor, religious and nongovernmental organizations, representing an estimated 50 percent of outstanding stock held by institutional investors and about 30 percent of total shares outstanding. These engagements have frequently enabled us to reach common ground with our shareholders, in some cases avoiding the need for more formal shareholder proposals at the annual shareholders meeting.

Consistent with ExxonMobil's Corporate Governance Guidelines, the board of directors reconsidered a proposal requesting a report on impacts of climate change policies (Item 12) submitted by the New York State Common Retirement Fund, which received a majority of votes cast during the 2017 annual shareholders meeting. In reconsidering the proposal, the company sought input from a number of parties, such as the proponents and major shareholders. The board decided to further enhance the company's disclosures consistent with the proposal and issued these disclosures in February 2018 in ExxonMobil's *Energy and Carbon Summary* and the *Outlook for Energy*. These enhancements include energy demand sensitivities, implications of 2 degree Celsius scenarios and positioning for a lower-carbon future.

Business conduct

Operating ethically and responsibly is ingrained in our business culture and is monitored, enforced and improved through our globally deployed Standards of Business Conduct. In 2017, nearly 18,000 employees and contractors participated in anti-corruption training.

ExxonMobil encourages employees and contractors to ask questions, voice concerns and report any suspected violations of company policies. In addition to our open-door communication procedures, ExxonMobil has several confidential mechanisms for reporting, including a 24-hour "hotline" phone number and a mailing address.



Bert Vos, a section head at the ExxonMobil Rotterdam refinery, provides an overview of facility operations to Chairman and CEO Darren Woods and board members Douglas Oberhelman and Susan Avery.

Transparency

ExxonMobil's involvement with transparency initiatives is a natural extension of our commitment to ethical behavior. We appreciate the need for relevant public and private company government payment disclosures to confirm the values of total government revenues and to help citizens hold their governments accountable for the use of those revenues.

We believe the most successful transparency initiatives are those that apply to all foreign, domestic and state-owned companies, protect proprietary information to promote commercial competitiveness, comply with international trade conventions and treaties and do not violate host government laws or contractual obligations. We monitor and participate in transparency initiatives and we will continue to work with governments developing new reporting rules to support transparency objectives in countries where we operate.

Since its inception, we have been an active participant in the Extractive Industries Transparency Initiative (EITI) - a global organization that promotes the open and accountable management of oil, gas and mineral resources. We work with several governments that are EITI members, as well as others considering membership.

Policy engagement

ExxonMobil engages with governments to provide information and insight on policies that can affect our business. In 2017, ExxonMobil reported lobbying expenses in the United States totaling \$11.4 million in our public Lobby Disclosures Act filings. The board of directors has authorized ExxonMobil to make political contributions to candidate committees and other political organizations as permitted by applicable laws in the United States and Canada. In 2017, we contributed over \$210,000 to state candidates and caucuses in 10 U.S. states. Corporate political contributions are subject to an internal review process that requires approval from the chairman.



In 2017, the public issues and contributions committee visited the ExxonMobil research and engineering laboratory facilities in Clinton, New Jersey. Front row from the left, board of directors Steven Reinemund, Susan Avery, Michael Boskin, Angela Braly and Henrietta Fore. Back row from the left, Robert Luettgen, manager of the office of the secretary, Vijay Swarup, vice president of research and development, Michael Dolan, senior vice president, Jeffrey Woodbury, vice president of investor relations and corporate secretary, and Bart Cahir, executive advisor to the chairman.

Explore more

Board engagement in ExxonMobil operations

exxonmobil.com/boardengagement

ExxonMobil's position on key issues

2017 Proxy Statement



Safety, health and the workplace

Safety is a core value at ExxonMobil. The health and safety policies set by ExxonMobil and adopted by our affiliates reflect our company's commitment to high operational standards and the well-being of our employees. We strive for an incident-free workplace and a culture that complies with our clear and simple objective: *Nobody Gets Hurt*. We build our culture of safety and health by attracting, developing and retaining individuals who share our commitment to operational excellence.

"In 2017 ExxonMobil achieved our lowest ever recordable injury rate as we continue working to eliminate all serious injuries. These improvements are supported by enhanced safety standards, strengthened safety leadership skills and human performance improvement programs. All of which are worked under our Operational Integrity Management System framework."



Jerry Wascom

Vice president, operational excellence, safety, security, health and environment, Exxon Mobil Corporation

Above: Philip Ceary, a technical start-up lead, assessing equipment at the Antwerp refinery in Belgium.

Safety and health

ExxonMobil's commitment to operational excellence starts at the top, is driven throughout our businesses and is consistent everywhere we operate. Our global health and safety goal is zero injuries and illnesses.

Since 2000, we have reduced our workforce lost-time incident rate by more than 80 percent. While this number is declining, safety incidents do occur. We deeply regret that two contract workers were fatally injured in separate incidents related to ExxonMobil operations in 2017. One incident occurred at an onshore drilling site and the other happened at a refinery during construction activities. We thoroughly investigated the causes and contributing factors associated with the incidents to prevent similar events in the future and to globally disseminate findings.

ExxonMobil's Operations Integrity Management System (OIMS) establishes a framework for addressing risk across all aspects of our operations. OIMS, which is built around 11 key elements of risk, is embedded into everyday work processes in each of the following areas of safety at ExxonMobil:

Process safety: Process safety is about managing the integrity of our facilities by applying good design principles, engineering and operating practices. ExxonMobil incorporates rigorous safety standards and procedures in our facilities' design, construction and operating activities. We classify and track incidents by severity from Tier 1 through Tier 4, with Tier 1 referring to events of greater consequence. In 2017, we experienced 63 Tier 1 process safety events, which is approximately 1.6 percent lower than 2016.

Product stewardship: Product stewardship refers to a series of interconnected work processes for the safe and effective management of a product, focusing on the health, safety and environmental impacts at each phase of a product's lifecycle. We regularly use lifecycle assessments to consider impacts during the development, manufacturing, use and disposal of our products.

Product transportation: ExxonMobil implements rigorous safety and environmental standards while transporting our products, including by marine, pipeline and rail. We carefully maintain and monitor our infrastructure worldwide to identify and prevent corrosion, third-party damage or illegal intrusions onto our rights of way.

Emergency preparedness and response: We establish emergency support groups and incident management teams around the world to develop and practice emergency response

strategies. In 2017, we conducted 37 drills, including in Guyana where we have discovered an estimated recoverable resource of over four billion oil equivalent barrels.

OIMS also establishes a framework for addressing risk across our supply chain. Contractors are an integral part of the ExxonMobil team; it is essential that they conduct work in accordance with our policies and business objectives. Since 2000, we have conducted safety leadership forums with contractors working on our major projects. This promotes a strong safety partnership with contract workers to improve our safety performance and positively influence the industry.

The success of ExxonMobil's operations depends on a healthy and competent workforce. We have corporate-wide expectations for identifying, evaluating and managing health risks related to our operations that can potentially affect our employees, contractors or the public.

In each country, we develop workplace health programs that take into consideration local health care systems, health needs and available resources. ExxonMobil's U.S.-based *Culture of Health*

Lost-time incident rate*



In 2017, our workforce lost-time incident rate per 200,000 work hours was 0.029, consistent with the previous year. Since 2000, we have reduced this rate by 80 percent. When compared with the American Petroleum Institute U.S. petroleum industry workforce benchmark, ExxonMobil continues to outperform industry peers in safety performance.

*Incidents include injuries and illnesses. Safety data are based on information available at the time of publication. Workforce includes employees and contractors. Depending on the reporting year, around 2 to 13 percent of the incidents are illness-related. program supports the well-being of our employees and reduces health plan costs. We continue to look for new opportunities to expand the reach of our *Culture of Health* program. In 2017, we expanded the program to our affiliates in Brazil and Mexico.

Workforce engagement

We value the exceptional qualities and diverse perspectives of our employees and strive to promote the inclusion of thought, skill, knowledge and culture across our operations. As demand for workers in the fields of science, technology, engineering and mathematics continues to increase, we support immigration policies that will help U.S. companies fill their needs for highly skilled workers.

We support voluntary, employee-led networks that foster a culture of diversity and inclusion by offering development programs, community service opportunities and mentoring. Our local employee resource groups include:

- Asian Connection for Excellence (ACE)
- Black Employee Success Team (BEST)
- Global Organization for the Advancement of Latinos (GOAL)
- Organization for New Employees (ONE)
- People for Respect, Inclusion and Diversity of Employees (PRIDE)
- Veteran Advocacy and Support Team (VAST)
- Women's Interest Network (WIN)

We strive to foster innovation and progress across our operations by helping our employees reach their full potential. We offer robust corporate and technical training programs and encourage employee engagement through a variety of channels, including mentorship programs and networking opportunities. In 2017, more than 4,500 employees at various levels of the company participated in ExxonMobil's leadership development training programs, of which 34 percent were women and 54 percent were employees from outside the United States.

Our Global Diversity Framework and Standards of Business Conduct govern all aspects of our employment and support our commitment to provide equal employment opportunities, prohibit harassment and discrimination in the workplace and align with applicable laws and regulations in the countries where we operate.

2017 female and minority career development



We consider diversity through all stages of the employment relationship, including recruitment, training and development of our future leaders.

*The number of leadership training courses and participation varies by year.

We send an annual letter to senior managers emphasizing their responsibility to maintain work environments free from harassment and discrimination. ExxonMobil employs a series of webbased trainings and tools to help our employees understand cultural sensitivities across a diverse workforce. Every employee is subject to disciplinary action, up to and including termination, for any act of harassment.



Derrek Lathon, marine dock supervisor, communicating equipment observations with his team at the ExxonMobil Baton Rouge refinery.

Explore more

Drones enhance safety inspections across the company

exxonmobil.com/dronesafetyinspection

Working toward continuous improvement of process safety exxonmobil.com/safetyimprovement Emergency preparedness and response in Guyana

exxonmobil.com/

guyanaemergencypreparedness

ExxonMobil's Houston campus reaches sustainability milestone

exxonmobil.com/



Managing the risks of climate change

We are committed to providing affordable energy to empower human progress and improve standards of living while advancing effective solutions to address climate change. ExxonMobil believes the risks of climate change warrant action.

Our climate change risk management strategy consists of four pillars: mitigating emissions in our operations, developing scalable technology solutions, providing customer solutions that reduce their greenhouse gas emissions and engaging on climate change policy.

"Climate change is a complex issue requiring global participation and solutions. In my role, I apply my technical, operational and regulatory background to evaluate strategies and partnerships to progress new solutions, an important factor in improving our emissions performance."



Sufang Zhao Environmental policy and planning analyst, Exxon Mobil Corporation

Above: Sona Joseph, a research analyst, running computer models at the Upstream Research Company lab in Spring, Texas.

Mitigating emissions from our operations

We are working to increase energy efficiency and reduce flaring, venting and other emissions in our operations. We expect our greenhouse gas reduction measures to lead to a 15 percent decrease in methane emissions and a 25 percent reduction in flaring by 2020. We also expect to further improve our industry-leading efficiency in refining and chemical manufacturing facilities.

In 2017, ExxonMobil and our subsidiary XTO Energy established a methane management program that exceeds applicable regulations. The program prioritizes actions at the highest-volume production and midstream sites and includes efforts to develop and deploy new, more efficient technologies to detect and reduce facility emissions.

Along with several industry peers, we issued **Guiding Principles**, which provide a framework for continually reducing methane emissions, improving accuracy of methane emissions data and advocating sound policies and regulations.

Other ways we are reducing emissions include deploying proven technologies such as cogeneration and carbon capture and storage. Longer term, we are conducting and supporting research to further develop breakthrough technologies. For information on how ExxonMobil manages the business risks of climate change, including energy demand sensitivities, implications of 2 degree Celsius scenarios and positioning for a lower-carbon future, please see ExxonMobil's *Energy and Carbon Summary*.

Developing technology solutions

Technological advancements will be instrumental to meet rising global energy demand while also lowering greenhouse gas emissions. We are conducting scientific research to enhance existing and develop next-generation energy sources. ExxonMobil has spent more than \$9 billion on lower-emission energy solutions since 2000.

At the center of our research is ExxonMobil's Corporate Strategic Research laboratory, a fundamental research institution with approximately 170 PhD scientists and engineers focused on addressing the company's long-range science needs. We support a diverse portfolio of in-house research projects, including next-generation biofuels, carbon capture and storage, alternative energy and climate science. ExxonMobil is partnering with approximately 80 universities around the world to explore new energy technologies.

Greenhouse gas emissions avoided from ExxonMobil actions*

Net equity, CO₂-equivalent emissions Millions of metric tons



*In 2017, greenhouse gas emissions avoided from ExxonMobil actions were 23.4 million metric tons. Since 2008, we have avoided 168 million metric tons of greenhouse gas emissions as a result of ExxonMobil actions. Our calculations are based on the guidance provided in American Petroleum Institute's Compendium of Greenhouse Gas Emission Estimation Methodologies for the Oil and Gas Industry and IPIECA's Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions. We report greenhouse gas emissions on a net equity basis for our business operations, demonstrating a share of emissions from any facility or operation in which ExxonMobil holds a financial interest, with the share reflecting the equity interest.

In carbon capture, we are conducting research to find ways to improve existing technologies. One project, with FuelCell Energy, is focused on reducing the cost of capturing carbon by using carbonate fuel cells that generate power while capturing carbon. We are identifying potential locations for pilot testing.

ExxonMobil has extensive experience in carbon capture and has a working interest in more than one-fifth of the world's total carbon capture and storage capacity. In 2017, we captured approximately 6.6 million metric tons of carbon dioxide for storage.

We are also conducting extensive research on biofuels. In 2017, ExxonMobil and Synthetic Genomics, Inc. announced breakthrough research involving a modified algae strain that more than doubled its oil content without significantly inhibiting growth, a key challenge along the path to commercial scalability. We recently announced a new research phase of this project that could lead to the production of 10,000 barrels of algae biofuel per day by 2025. The new phase of research includes an outdoor field study that will grow naturally occurring algae in several ponds in California.

Emissions reduction



Providing solutions for customers

In addition to developing and deploying technologies to reduce emissions from our own operations, we are working to help our customers reduce their emissions. Our goal is to develop solutions that are economically competitive and affordable, including:

Expanding the supply of cleaner-burning natural gas to reduce emissions in power

generation: The use of natural gas in power generation represents one of the greatest opportunities for society to reduce emissions and transition to a lower greenhouse gasintensive energy system. ExxonMobil is one of the largest natural gas producers in the world and is a leader in liquefied natural gas technology.

Creating lightweight plastics and other materials for a range of consumer products:

ExxonMobil's next-generation plastic packaging reduces total product weight and enables more products per shipment, fewer trucks on the road, less fuel and energy used, fewer greenhouse gas emissions and ultimately less material to be reused, recovered or recycled. For example, for every 10 percent drop in vehicle weight, fuel economy improves by an estimated 7 percent. We recognize plastic waste is an issue for societies, and ExxonMobil is engaged with diverse industries in helping to identify solutions.

Developing premium, high-efficiency fuels and lubricants: Our family of high-performance lubricants includes synthetic lubricants like *Mobil 1™ Annual Protection* that need to be replaced less frequently than conventional motor oils, therefore reducing the volume of used oil for disposal or recycling. Our lubricants and greases are also used in more than 40,000 wind turbines worldwide.

Engaging on climate change policy

Climate change is a global issue that requires the collaboration of governments, companies, consumers and other stakeholders. We engage a variety of stakeholders on climate change issues — including policymakers, investors, consumers, nongovernmental organizations, academics and the public — to advocate for responsible policies that would be effective in addressing the risks of climate change.

ExxonMobil supports the Paris Agreement as an important framework for addressing the risks of climate change. We welcomed the Paris Agreement when it was announced in December 2015, and again when it came into effect in November 2016. We have reiterated our support to government officials, nongovernmental organizations and the broader public.

Free markets, innovation and technology are essential in addressing the risks of climate change. Success in developing and deploying technologies will be highly dependent on governments creating a policy environment that enables innovation and competition. Policies should be clear and guard against duplicative, overlapping and conflicting regulations, which may distort markets and impose unnecessary costs on consumers. We believe an effective policy response to climate change requires a thorough understanding of the climate system. Our scientists have been involved in climate change research and related policy analysis for more than 35 years, resulting in hundreds of publicly available documents on climate-related topics, including more than **50 peer-reviewed publications**.

We believe that effective policies are those that:

- Promote global participation;
- Let market prices drive the selection of solutions;
- Ensure a uniform and predictable cost of greenhouse gas emissions across the economy;
- Minimize complexity and administrative costs;
- Maximize transparency; and
- Provide flexibility to react to developments in technology, climate science and policy.

ExxonMobil is a founding member of the Climate Leadership Council. The Council was created by former U.S. Secretaries of State George P. Shultz and James A. Baker, III to advocate for a carbon tax that would implement a gradually increasing price on carbon. The revenues generated by the plan would be returned to American energy consumers. In 2018, we joined the Oil and Gas Climate Initiative, a voluntary initiative representing 13 of the world's largest oil and gas producers working collaboratively toward solutions to mitigate the risks of climate change.

Climate risk oversight

ExxonMobil's board of directors is responsible for risk oversight, including the risks of climate change. The board routinely reviews and considers these risks, including briefings on public policy, scientific and technical research, as well as company and external positions and actions in this area. Climate-related matters are also considered by the board throughout the year in various other contexts, including reviews of the **Outlook for Energy**, the company's safety, health and environmental performance, the annual corporate planning process, shareholder proposals and regulatory filings such as the 10-K.



Synthetic Genomics, Inc. and ExxonMobil are working together to turn algae into a low-emission transportation fuel.

Explore more

2018 ExxonMobil Energy and Carbon Summary Partnering with Singapore universities to innovate lower-emission technologies exxonmobil.com/singaporeuniversities Taking action to manage methane emissions exxonmobil.com/ managemethaneemissions



Environmental performance

Our diverse portfolio of projects requires us to work in remote and sensitive environments including Arctic, deepwater and biodiverse locations. ExxonMobil considers a full range of potential environmental and social risks associated with the lifecycle of our operations and products. In doing so, we gain a holistic understanding of our impacts from initial exploration activities to decommissioning.

"ExxonMobil is committed to excellence in environmental performance. It takes every single one of us, every day. It's simply how we work."



Kylie Bishop Environmental engineer, ExxonMobil Chemical Scotland

Above: ExxonMobil is working to help protect the Scheepmaker's Crowned Pigeon, a threatened species native to Papua New Guinea.

Managing environmental performance

We comply with all applicable regulatory requirements and, where there are none on a particular issue, we follow relevant risk-based standards that protect the environment. Our facilities are designed, operated and managed with the goal of mitigating adverse environmental impacts. Our management approach is guided by an in-depth scientific understanding of the environmental impacts of our operations and a commitment to develop, maintain and operate projects and decommission assets using appropriate standards. We work to continually improve our performance and look to new and existing technologies to enhance our operations.

In 2017, we maintained strong performance across our key environmental focus areas:

Biodiversity

In 2017, ExxonMobil contributed approximately \$3 million to organizations focused on biodiversity protection and land conservation. To protect particular species and sensitive habitats, we take steps such as modifying engineering design and enhancing wildlife habitats at our properties.

Water management

Our net freshwater consumption at our operations was 300 million cubic meters in 2017. This represents about a 20 percent decline since 2011, in part due to the development and implementation of local water management strategies.

In our Upstream onshore operations, water consumption is primarily associated with hydraulic fracturing, which uses water pressure to create small cracks or fissures in rocks deep underground so that oil or natural gas can flow to the well. The industry has more than 60 years of experience with the technique.

We continuously work to improve our understanding of our water consumption, including when, where and how much. Using the latest version of a water tool developed by IPIECA, the global oil and gas industry association for environmental and social issues, we identified that almost 37 percent of our major operating sites are in areas with the potential for water scarcity. Therefore, we pursue site-specific management strategies such as the deployment of water conservation technologies, the use of alternative water sources, recycling of municipal and industrial wastewater, substitution with lower-quality water sources and harvesting of rainwater.

Environmental management process



Spill performance and prevention

ExxonMobil is committed to the prevention and elimination of spills from our operations. We have the industry's only dedicated, in-house oil spill response research program. If a spill does occur, we ensure a rapid, comprehensive response to minimize impact on communities and the environment.

We reported our best-ever performance for number of spills in 2017. We had 7 percent fewer than 2016. Since 2011, ExxonMobil has reduced the absolute number of spills greater than 1 barrel by more than 55 percent across our global operations. The total volume of hydrocarbons spilled on soil and water was 6,900 barrels in 2017, and more than 65 percent was recovered at the spill sites. The majority of these spills did not affect third parties or nearby communities.

Air emissions

ExxonMobil is committed to doing our part to contribute to cleaner air in the communities where we operate. Our combined emissions of volatile organic compounds, sulfur dioxide

and nitrogen oxides have decreased by almost 31 percent over the past 10 years across all our businesses. New air measurement technologies are making it easier to monitor ambient air at our Downstream facilities in the United States and Canada. Data collected around the perimeter of our facilities is publicly available to local communities.

Decommissioning and rehabilitation

We are committed to sustainably managing our surplus properties. In 2017, ExxonMobil Environmental Services monitored about 4,000 active remediation sites in more than 30 countries.

A significant number of our Upstream locations are located offshore. To effectively manage offshore operations, we use a systematic decommissioning process that varies depending on the type of structure and unique characteristics of a specific site. ExxonMobil created an offshore decommissioning center of expertise in 2015 that is responsible for planning and managing the safe decommissioning of our assets.

Seismicity

ExxonMobil has a comprehensive risk management approach in place to limit induced seismicity from our operations by evaluating the relative risks associated with the specific geological and geographic context of a site.

We work with academic and government researchers and regulatory agencies to share our knowledge and advanced approaches. For example, ExxonMobil and Stanford University jointly developed a software modeling tool to assess the potential risk of induced seismicity and made it freely available to government and industry. The tool is being used by regulatory agencies and energy companies to help reduce the risk of human-induced seismicity.



Karen Power, a production engineer, in front of ExxonMobil's Hebron offshore platform off the coast of Newfoundland and Labrador, Canada.

Explore more

Protecting the endangered western gray whale

exxonmobil.com/westerngraywhale

Reducing nitrate flow to the Mississippi River exxonmobil.com/nitrateflowmississippi Decommissioning the Sable offshore energy project exxonmobil.com/sableoffshoreenergyp



Community engagement and human rights

ExxonMobil works in communities all over the world, each with its own unique cultures, needs and sensitivities. Identifying and mitigating potential negative social impacts is integral to developing long-term, positive relationships with these communities. At ExxonMobil, we aim to promote and respect human rights in all areas where we work.

"In Angola, our key initiatives in women's empowerment and malaria support the priorities of the government and local communities. Through strategic partnerships, a shared responsibility to sustainability and an aligned vision, we have a positive impact on communities where we operate."



Fernando Pegado Public and government affairs manager, ExxonMobil Angola

Above: In 2017, ExxonMobil partnered with the Youth Empowerment and Development Initiative to organize community events to raise awareness about malaria in Lagos, Nigeria as part of World Malaria Day.

Community relations

Understanding and addressing the interests of communities where we operate is critical to maintaining a sustainable business. We engage with local communities through a variety of communication channels — including open houses, community discussions and individual meetings — to provide opportunities for dialogue with interested stakeholders. ExxonMobil creates grievance reporting mechanisms that provide opportunities for local citizens and communities to raise concerns.

Respecting human rights

We believe our business presence can and should have a positive influence on the people in the communities in which we operate. ExxonMobil is committed to respecting human rights as a fundamental principle in our operations, implemented through training and the application of our internal policies and practices. The company's practices and operations reflect the spirit and intent of the United Nations **Universal Declaration of Human Rights**.

In 2017, ExxonMobil's **supplier**, **vendor and contractor expectations** became part of an annual letter we send to our suppliers. These expectations include references to key international human rights frameworks such as the United Nations Guiding Principles on Business and Human Rights and the International Labor Organization Declaration on Fundamental Principles and Rights at Work.

We participate in the Voluntary Principles on Security and Human Rights, an initiative that provides guidance to extractive companies on human rights risk assessments relating to the safeguarding of company operations or facilities. Engaging and training host government and private security on the Voluntary Principles is key to reducing human rights risks in certain communities. In 2017, more than 5,000 host government security and ExxonMobil-contracted security personnel were trained on the Voluntary Principles across 12 higher-risk countries.

Investing in our communities

ExxonMobil collaborates with governments and other stakeholders to invest in community development programs where we operate. We work with local stakeholders to ensure that our efforts are tailored to address community and business needs, such as access to skills training and health care, support for disaster relief, education initiatives and economic development. In 2017, we contributed \$204 million to communities around the world.



The ExxonMobil Foundation collaborated with Mercy Corps, Technoserve and the Center for Global Development to measure the effect of mobile banking in empowering women economically.

2017 community investments

ExxonMobil provides investments to benefit many communities around the world.

By focus area*



By geographic region*



*Total contributions include donations from Exxon Mobil Corporation, our divisions and affiliates, and the ExxonMobil Foundation, as well as employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs. Investments do not include environmental capital and operating expenditures.

Explore more

Managing community grievances in Indonesia

exxonmobil.com/

indonesiacommunitygrievances

Empowering women through access to mobile savings exxonmobil.com/ Supporting the Educate A Child initiative

Helping communities combat malaria

exxonmobil.com/combatmalaria



Local development and supply chain management

Local content — the added economic and social value created by direct and indirect employment of local people through activities of the oil and gas industry — provides value to ExxonMobil and to communities. We aim to develop mutually beneficial relationships with local businesses throughout our supply chain.

"It is critical that ExxonMobil be a valued contributor to the Guyanese economy and trusted member of the community. Helping establish ExxonMobil as a responsible partner and supporting capacity building of Guyanese suppliers for decades to come are important priorities as we continue our work."



Rod Henson Lead country manager, Exxon Mobil Guyana

Local development

A successful local development program requires a long-term perspective with clearly defined and consistently applied management processes. Our approach focuses on three key areas: employing and training a local workforce, supporting local suppliers and improving livelihoods of community members through local community investments.

We provide locally hired individuals with opportunities to develop technical and leadership skills that will benefit them throughout their careers with ExxonMobil, and with future employers. With about 60 percent of our employees located outside the United States, local hiring ensures that our workforce remains culturally diverse and representative of the countries where we operate. As illustrated to the right, we continued to make progress in local hiring and training in 2017.

Supply chain management

We work to source goods from local suppliers. In 2017, ExxonMobil made payments to more than 100,000 suppliers of goods and services worldwide.

We have developed a set of best practices to help ensure our company consistently engages with local and diverse suppliers. These practices include supplier forums, local supplier databases and local enterprise centers for business development and training. For example, we have established a Centre for Local Business Development and supplier registration portal to support identification and training of Guyanese suppliers for our new development in Guyana. A similar example, in Papua New Guinea, has supported nearly 19,000 local entrepreneurs.

In addition, we cultivate long-lasting and mutually beneficial relationships with diverse suppliers to contribute to the economic development of historically underrepresented groups. In 2017, we exceeded our target with a total of \$1.9 billion in spending with diverse suppliers in the United States.

Our supplier diversity program continues to expand internationally. In 2017, we spent \$186 million with women-owned and indigenous-owned businesses outside the United States. We continue to work with the nonprofit WEConnect International, a global network that connects women-owned businesses to qualified buyers, to increase the participation of women-owned businesses in our supply chain. In addition to compiling an international database of women-owned businesses used by ExxonMobil, WEConnect identifies, educates

2017 local hiring statistics



*Historic data since 2013 is not available for Chad. ExxonMobil began tracking local hiring in this country in 2014.

and certifies women's business enterprises based outside of the United States that are at least 51 percent owned, managed and controlled by one or more women. In 2017, WEConnect International named ExxonMobil its Corporation of the Year in recognition of the company's diverse supplier program.

ExxonMobil's vendors must agree to meet our robust safety, technical, environmental and human rights expectations and requirements. For existing agreements, a select number of suppliers are audited each year for contract compliance. Audit components include pricing, safety, and drug and alcohol policy compliance. A contractor who does not meet our expectations may be subject to supplemental training and contractual remedies, including termination.

ExxonMobil spending with U.S. diverse suppliers*





In 2017, we spent a total of \$1.9 billion with diverse suppliers in the United States, an increase of more than 30 percent from 2016.

*Includes direct ExxonMobil spending and that of our suppliers (Tier 2 spending). Total spending includes suppliers classified as minority-owned businesses; women-owned businesses; small businesses; lesbian-, gay-, bisexual- and transgender-owned businesses; veteran-owned businesses; service-disabled veteran-owned businesses; and businesses owned by people with disabilities.

Explore more

ExxonMobil begins production on new polyethylene line at Mont Belvieu plastics plant

exxonmobil.com/montbelvieuplasticsplant

Promoting sustainability throughout our supply chain exxonmobil.com/sustainabilitysupplycha ExxonMobil supplier, vendor and contractor expectations

suppliervendorcontractorexpectations



Case study: ExxonMobil's response to Hurricane Harvey

On August 25, 2017, Hurricane Harvey made landfall in Texas as a Category 4 storm, bringing destructive winds and flooding to the Gulf Coast. The storm caused an estimated \$125 billion in damages, and rebuilding efforts continue. ExxonMobil acted swiftly to ensure the safety of our employees and support affected communities.

Supporting our communities and our people

We started our response to Hurricane Harvey before it even arrived — by making a financial contribution to community disaster relief efforts and by beginning to safely shut down our operations and make plans to bring in fuel from unaffected locations to aid in response and recovery.

At our Baytown and Beaumont refineries, we worked to minimize environmental impacts from our operations that were caused by the storm and resulting power loss, and reported impacts to appropriate authorities.

We helped our employees — many of whom spent day and night on the job to help safely shut down and then quickly restart our operations — clean up and repair their own homes, when they were flooded by the storm.

In the days and weeks following the storm, ExxonMobil contributed more than \$7 million to assist with recovery efforts, and provided supplies and volunteers to assist with community recovery.

For example, our employees helped the city of Beaumont restore its municipal water system, when Harvey left more than 100,000 people without running water. And we transported more

than 60,000 pounds of cargo via helicopter to stranded personnel and community members throughout the area.

As rebuilding along the Gulf Coast continues, we are thankful for the incredible dedication of our employees and the resilience of our neighbors and the communities we serve.

Emergency response operations

The ability to respond promptly during a disaster — regardless of where it strikes — is critical. ExxonMobil conducts extensive training and drills to prepare for such situations. We design our facilities to withstand a variety of extreme conditions.

Regardless of the size, severity or cause of an event, each ExxonMobil facility and business unit has access to trained responders and resources. We practice emergency response strategies and routinely test our emergency response teams in accordance with regulatory requirements and our own Operations Integrity Management System.

Above: Relief supplies for Hurricane Harvey victims being loaded into a helicopter by ExxonMobil employees in Texas.

About the Sustainability Report Highlights

The *Highlights* summarize ExxonMobil's approach to managing our operations, and explains the measures we employ to operate in a variety of environments. It describes how we address the dual challenge of meeting the world's demand for energy while managing the risks of climate change. For more information on ExxonMobil's efforts to manage performance across our six focus areas of sustainability, visit our full online **2017** *Sustainability Report*.

We developed this year's *Sustainability Report* in accordance with the reporting guidelines and indicators of IPIECA (the global oil and gas industry association for environmental and social issues), the International Association of Oil and Gas Producers and the American Petroleum Institute. Note that many of the standards and metrics used in preparing this report continue to evolve and are based on management assumptions believed to be reasonable at the time of preparation, but should not be considered guarantees.

ExxonMobil corporate responsibility recognition

ExxonMobil was ranked in the top 50 of Corporate Responsibility Magazine's Best Corporate Citizens in both 2017 and 2018 in recognition of the company's commitment to corporate responsibility and sustainability. The ranking is based on publicly available records from company websites, annual reports, shareholder calls, media interviews, NGOs and government documents. The analysis includes 260 data points on environmental performance, climate change, human rights, employee relations, corporate governance, philanthropy and financial performance.

2017 material issues

Since 2006, ExxonMobil has conducted an annual materiality assessment to identify the issues that, in the view of the company's management and its external stakeholders, have the potential to significantly affect sustainability performance. For this *2017 Sustainability Report*, we evaluated key metrics within the sustainability issues for our business and stakeholders using a review of IPIECA reporting guidance, feedback from external stakeholders, sessions with ExxonMobil business support representatives, a benchmark of peer company reports and a media review.

Safety, health and the workplace

- Emergency preparedness and response
- Employee benefits and practices
- Personnel and process safety
- Product safety and responsibility
- Product transportation safety
- Workforce engagement
- Workplace security
- Worksite health and wellness

Managing the risks of climate change

- Developing technology solutions
- Engaging on climate change policy
- Mitigating emissions
- Providing solutions for customers

Environmental performance

- Air emissions
- Biodiversity and ecosystem services
- Decommissioning and rehabilitation of the environment
- Environmental compliance
- Environmental management approach
- Spill performance
- Water management

Community engagement and human rights

- Community relations
- External stakeholder engagement
- Human rights
- Indigenous peoples

Local development and supply chain management

- Local economic growth and
 development
- Supply chain management

Corporate governance

- Board leadership
- Ethics and integrity
- Executive compensation and strategic advantage
- Political advocacy and contributions
- Shareholder relations
- Transparency

Business operations (included throughout report)

- Energy future and portfolio
 management
- Management systems
- Operating in sensitive environments

Performance data

We assess our performance at many levels of the organization, from individual operational sites to the business lines, to support continual improvement in all areas of sustainability. Starting in 2011, performance data include XTO Energy information. As part of our commitment to transparently communicate our performance, in 2014 we started reporting our data over a 10-year period to demonstrate performance trends over time. Data included in the performance table is guided by the reporting guidelines and indicators of IPIECA's *Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (2015)*.

For additional information on our sustainability reporting, please see the **IPIECA/GRI/SDG index**.

Performance data table

Safety, health and the workplace*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fatalities – employees	0	4	0	0	1	0	0	0	0	0
Fatalities – contractors	5	4	3	9	4	6	3	2	3	2
¹ Fatal accident rate — total workforce (per 1,000,000 work hours)	0.011	0.017	0.006	0.017	0.010	0.011	0.006	0.004	0.008	0.005
Fatal incident rate — total workforce (per 1,000,000 work hours)	0.011	0.012	0.006	0.017	0.010	0.009	0.006	0.004	0.008	0.005
² Lost-time incident rate — employees (per 200,000 work hours)	0.054	0.043	0.048	0.064	0.043	0.051	0.032	0.044	0.027	0.034
² Lost-time incident rate — contractors (per 200,000 work hours)	0.049	0.040	0.031	0.086	0.050	0.041	0.030	0.029	0.030	0.026
² Lost-time incident rate — total workforce (per 200,000 work hours)	0.051	0.041	0.038	0.077	0.047	0.044	0.031	0.035	0.029	0.029
² Total recordable incident rate — employees (per 200,000 work hours)	0.37	0.32	0.25	0.30	0.25	0.22	0.19	0.21	0.16	0.14
² Total recordable incident rate — contractors (per 200,000 work hours)	0.49	0.39	0.34	0.41	0.37	0.32	0.29	0.26	0.23	0.22
² Total recordable incident rate — total workforce (per 200,000 work hours)	0.43	0.36	0.30	0.37	0.33	0.29	0.26	0.24	0.20	0.19
Process Safety Tier 1 Events (API RP 754 guidance)	N/A	69	62	70	63	62	65	74	64	63
^{3,4} Number of regular employees at year end, thousands	80	81	84	82	77	75	75	73	71	70
⁴ Percent of workforce — outside the United States	63	63	60	61	59	59	58	59	59	60
⁴ Percent women — global workforce	25	26	26	26	28	28	28	28	28	28
Percent management and professional new hires — women (campus and experienced)	39	38	40	44	39	39	40	41	44	41
Percent management and professional new hires — outside the United States (campus and experienced)	69	63	70	79	68	66	61	61	74	67
Number of non-unique employee participants in corporate and technical training, thousands	48	52	61	65	76	87	79	85	83	98
Total corporate and technical training expenditures, millions of dollars	69	71	77	80	88	96	117	124	108	94

Managing the risks of climate change*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
5 Greenhouse gas emissions, absolute (net equity, CO $_2$ -equivalent emissions), millions of metric tons	126	123	126	128	126	127	123	122	123	122
⁶ Direct (excluding emissions from exported power and heat)	117	114	117	119	118	119	115	114	115	114
⁷ Emissions associated with imported power	9	9	9	9	8	8	8	8	8	8
$\rm CO_{_2}$ (excluding emissions from exported power and heat)	122	119	122	124	120	119	116	115	116	115
Methane (CO ₂ -equivalent)	3	3	3	3	5	7	6	6	7	7
Other gases (CO ₂ -equivalent)	1	1	1	1	1	1	1	1	<1	<1
Emissions from exported power and heat	13	14	13	15	15	16	7	4	3	3
By-region greenhouse gas emissions (net equity, CO_2 -equivalent emissions), millions of metric tons										
Africa/Europe/Middle East	45	43	45	45	44	44	43	44	44	43
Americas	62	62	64	66	68	70	66	65	63	63
Asia Pacific	19	18	17	17	14	13	14	13	16	16
By-division greenhouse gas emissions (net equity, CO_2 -equivalent emissions), millions of metric tons										
Upstream	49	47	50	54	56	58	56	56	57	58
Downstream	57	56	55	54	51	49	47	45	45	43
Chemical	20	20	21	20	19	20	20	21	21	21
⁵ Greenhouse gas emissions, normalized (net equity, CO ₂ -equivalent emissions), metric tons per 100 metric tons of throughput or production										
Upstream	21.0	20.1	20.5	20.7	22.3	23.2	23.9	23.9	24.3	24.6
Downstream	21.0	21.0	20.8	20.0	19.6	19.7	19.2	18.9	19.5	18.6
Chemical	59.8	60.7	57.9	57.2	56.3	57.0	53.4	53.6	52.2	53.3
Energy use (billion gigajoules)	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.5	1.5	1.5
Upstream (gigajoules per metric tons production)	1.7	1.9	2.0	2.0	2.0	2.1	2.3	2.4	2.4	2.5
Refining (gigajoules per metric tons throughput)	3.0	3.0	3.0	3.0	3.0	3.0	2.9	2.9	3.0	2.9
Chemical (gigajoules per metric tons product)	10.1	9.8	9.5	11.4	12.0	10.9	10.7	10.9	10.6	10.5
Hydrocarbon flaring (worldwide activities), millions of metric tons	5.7	4.4	3.6	4.0	3.5	3.7	4.5	5.3	5.0	3.8
⁸ Cogeneration capacity in which we have interest, gigawatts	4.6	4.9	4.9	5.0	5.2	5.3	5.5	5.5	5.3	5.4

Environmental performance*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
° Number of acres of managed wildlife habitat	370	380	6,400	6,900	7,000	7,000	7,200	7,100	7,200	7,200
Freshwater withdrawn, millions of cubic meters	N/A	N/A	N/A	540	520	420	420	450	440	450
Freshwater consumption, millions of cubic meters	350	340	330	370	330	280	270	300	290	300
Freshwater intensity, metric tons of water consumed per metric tons of throughput or production										
Upstream	0.1	0.1	0.1	0.3	0.3	0.2	0.2	0.4	0.3	0.4
Downstream	0.9	0.9	0.9	0.9	0.8	0.7	0.7	0.7	0.8	0.8
Chemical	2.6	2.5	2.4	2.6	2.4	2.0	1.8	1.8	1.7	1.7
Marine vessel spills (owned and long-term leased), number of hydrocarbon spills > 1 barrel	0	0	0	0	0	0	0	0	0	0
Spills (not from marine vessels), number of oil, chemical and drilling fluid spills > 1 barrel	211	242	210	484	356	331	334	319	220	205
Hydrocarbons spilled (oil spilled), thousands of barrels	20.3	17.4	7.7	17.8	8.5	9.3	9.1	10.8	4.7	6.9
Other spills, thousands of barrels	0.4	0.5	40.4	2.0	1.6	0.9	4.1	0.4	3.7	1.8
Controlled hydrocarbon discharges to water, thousands of metric tons	1.8	1.4	1.3	1.3	1.2	1.1	1.3	1.1	1.1	1.7
Upstream	1.3	1.1	1.1	1.1	1.0	1.0	1.2	1.0	1.0	1.6
Downstream	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Sulfur dioxide (SO ₂) emitted, millions of metric tons	0.19	0.16	0.14	0.13	0.13	0.12	0.10	0.11	0.11	0.10
Nitrogen oxides (NOx) emitted, millions of metric tons	0.15	0.13	0.12	0.15	0.14	0.14	0.14	0.14	0.13	0.13
Volatile organic compounds (VOCs) emitted, millions of metric tons	0.20	0.18	0.18	0.18	0.15	0.15	0.16	0.16	0.15	0.14
Environmental expenditures, billions of dollars	5.2	5.1	4.5	4.9	5.5	6.0	6.2	5.7	4.9	4.7
Total dollars spent on environmental penalties, fines and settlements, billions of dollars	0.011	0.002	0.011	0.003	0.004	0.002	0.018	0.015	0.006	0.001
Total hazardous waste disposed from remediation, millions of metric tons	0.2	1.2	0.6	1.3	1.7	1.1	1.0	1.4	1.4	1.5
°Total hazardous waste disposed from operations, millions of metric tons	0.4	0.8	1.3	1.9	2.0	0.3	0.3	0.2	0.1	0.2
Community engagement and human rights										

¹⁰Community investments, millions of dollars 225.2 235.0 237.1 278.4 255.6 269.5 279.5 272.3 241.5 204.0 United States 144.6 143.0 154.8 156.5 156.3 150.2 145.5 131.1 125.3 161.3 Rest of world 80.6 92.0 99.1 129.3 126.8 110.4 76.7 82.3 117.1 113.2

Local development and supply chain management	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
¹¹ ExxonMobil spending with U.S. diverse suppliers, millions of dollars	615	887	841	1,068	1,001	1,024	1,108	1,064	1,442	1,902
Corporate governance										
¹² Number of Extractive Industries Transparency Initiative (EITI) participating countries	8	8	7	7	7	9	10	11	15	18
Percent of shares represented at Corporation's Annual Meeting	84.8	82.9	80.7	81.9	83.0	82.3	82.9	83.9	85.1	85.7
Corporate political contributions — U.S. state campaigns and national 527s, millions of dollars	0.45	0.49	1.10	0.51	1.03	0.70	1.17	0.58	0.52	0.51

Notes on performance table:

¹ Workforce includes employees and contractors. Accidents or incidents include both injuries and illnesses. From 2008 through 2017 all fatalities were injury-related.

 $^{\rm 2}$ Incidents include injuries and illnesses. Safety data are based on information at the time of publication. Workforce includes employees and contractors.

³ Reduction from 2011 primarily due to divestment and restructuring activity in the Downstream business.

⁴ Regular employees are defined as active executive, management, professional, technical and wage employees who work full-time or part-time for ExxonMobil and are covered by ExxonMobil's benefit plans and programs. Employees at our company-operated retail stores are not included.

⁵ The net equity greenhouse gas emissions metric was introduced in 2011 as a replacement for the direct equity greenhouse gas metric. Information has been restated back to 2005 according to the new metric. The net equity greenhouse gas metric includes direct and imported greenhouse gas emissions and excludes emissions from exports (including Hong Kong Power through mid-2014). ExxonMobil reports greenhouse gas emissions on a net equity basis for all our business operations, reflecting our percent ownership in an asset.

⁶ The addition of direct emissions and emissions associated with exported power and heat is equivalent to World Resources Institute (WRI) Scope 1.

⁷ These emissions are equivalent to WRI Scope 2.

⁸ Cumulative figure.

 $^\circ$ The value for hazardous waste from ongoing operations includes produced water classified as hazardous waste by one local authority, which is approximately 70 to 95 percent of the reported figure in 2008-2012.

¹⁰ Total contributions include ExxonMobil corporate and foundation donations, and employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs.

¹¹ Beginning in 2015, our spending encompassed an expanded set of diverse classifications that includes: minorityowned businesses, women-owned businesses, small business-owned, lesbian-, gay-, bisexual- and transgender-owned businesses, veteran-owned businesses, service-disabled veteran-owned businesses and businesses owned by peoples with disabilities. Prior to 2014, spending included minority- and women-owned businesses.

¹² In countries where ExxonMobil has an Upstream business presence.

* Some uncertainty exists in performance data, depending on measurement methods. Data in the report and performance data table represent best available information at the time of publication. Performance data are reported for our affiliates and those operations under direct ExxonMobil management and operational control. Includes XTO Energy performance beginning in 2011. N/A is used to indicate that data are not available.

Explore our complete 2017 Sustainability Report at exxonmobil.com/sustainabilityreport



On the cover

ExxonMobil scientist Kelsey McNeely researching algae strains.



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Exhibit 19

ExonMobil

2018 Outlook for Energy: A View to 2040

2018 Outlook for Energy:

A View to 2040

The *Outlook for Energy* is ExxonMobil's view of energy demand and supply through 2040. We use the *Outlook* to help inform our long-term business strategies and investment plans.

A significant energy transition is underway, and many factors will shape the world's energy future. These include government ambitions and policies that seek to promote prosperity while also addressing the risks of climate change. The recent Paris Agreement¹ on climate change provided significant insights on governments' intentions to reduce greenhouse gas (GHG) emissions through the inclusion in the agreement of nationally determined contributions (NDCs). Policies adopted to support NDCs will likely affect supply and use of energy across society.

To support economic progress and make substantial progress on the climate goals identified in the Paris Agreement, well-designed and transparent policy approaches that carefully weigh costs and benefits are needed. Such policies are likely to help manage the risks of climate change while also enabling societies to pursue other high-priority goals – including clean air and water, access to reliable, affordable energy and economic progress for all people.

Technology will also be vital to improve living standards while addressing climate risks. Advances continue to reshape the energy playing field. Many technologies not prevalent five to 10 years ago have a more significant role today, and their impacts will continue to expand. Examples include wind and solar power, unconventional oil and gas development, and electric cars. Meeting the dual challenge of mitigating the risks of climate change while boosting standards of living will require additional technology advances.

While policies and technologies help shape living standards and the evolution of energy, they also disrupt the status quo and can cause uncertainty and unexpected consequences. Accordingly, as part of the *Outlook* development process, we develop and use sensitivities to help our understanding of possible energy outcomes.

This year's *Outlook* includes several sensitivities on specific areas of interest to provide greater perspective on how changes to our base *Outlook* assumptions could affect the energy landscape.

This year's *Outlook* also includes a new section, "Pursuing a 2°C Pathway." This section utilizes work coordinated by the Energy Modeling Forum at Stanford University.² It provides a view of potential pathways toward a 2°C climate goal, and the implications such pathways might have in terms of global energy intensity, carbon intensity of the world's energy mix and global demand for various energy sources. The section concludes with a discussion of the need to pursue practical, cost-effective solutions to address multiple goals simultaneously.

The *Outlook* anticipates significant changes through 2040 across the world to boost living standards, reshape the use of energy, broaden access to abundant energy supplies, and accelerate decarbonization of the world's energy system to address the risks of climate change.

A role for everyone

Seven billion people shape the world's energy system and have a direct impact on the fundamental drivers of energy demand. Energy impacts the economy as well as security and environmental goals. Energy solutions can vary over time and circumstances. Think about how access to energy affects your own life, and how that translates to billions of other people around the world. Compare your own conclusions on the energy future with those in the *Outlook*.

Energy is fundamental to modern life, and as the world's population approaches 9 billion people in 2040, we are challenged to improve living standards everywhere. We expect that progress will be powered by human ingenuity and the energy that helps make better lives possible.

Key takeaways

At a glance

Key trends that will play a defining role in our global energy landscape through 2040.



Energy powers modern economies and living standards By 2030, the world's economic middle class will likely expand from 3 billion to more than 5 billion people. This growth will coincide with vastly improved living standards, resulting in rising energy use in many developing countries as people develop modern businesses and gain access to cars, appliances and air-conditioned homes.



Global energy needs rise about 25%, led by non-OECD nations Despite efficiency gains, global energy demand will likely increase nearly 25 percent. Nearly all growth will be in non-OECD countries (e.g. China, India), where demand will likely increase about 40 percent, or about the same amount of energy used in the Americas today.



Electricity demand nearly doubles in non-OECD nations Human activity continues to be dependent on reliable supplies of electricity. Global electricity demand will rise by 60 percent between 2016 and 2040, led by a near doubling of power demand in non-OECD countries.



Electricity from solar and wind increases about 400%

Among the most rapidly expanding energy supplies will be electricity from solar and wind, together growing about 400 percent. The combined share of solar and wind to global electricity supplies is likely to triple by 2040, helping the CO₂ intensity of delivered electricity to fall more than 30 percent.



Natural gas expands role to meet a wide variety of needs

The abundance and versatility of natural gas make it a valuable energy source to meet a wide variety of needs while also helping the world shift to less carbon-intensive sources of energy. Natural gas use is likely to increase more than any other energy source, with about half its growth for electricity generation.



Oil plays a leading role to aid mobility and modern products More electric cars and efficiency improvements in conventional engines will likely lead to a peak in liquid fuels use by the world's light-duty vehicle fleet by 2030. However, oil will continue to play a leading role in the world's energy mix, with growing demand driven by commercial transportation and the chemical industry.

45%

Decarbonization of the world's energy system will accelerate As the world's economy nearly doubles by 2040, energy efficiency gains and a shift to less carbon-intensive sources of energy will contribute to a nearly 45 percent decline in the carbon intensity of global GDP. Global energy-related CO_2 emissions will likely peak by 2040 at about 10 percent above the 2016 level.





2018 Outlook for Energy

3	Key Takeaways
5	Fundamentals
1	Demand
4	Transportation
8	Residential and commercial
1	Industrial
5	Electricity and power generation
9	Emissions
2	Supply
4	Liquids
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4	Pursuing a 2°C pathway
4	Energy matters
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ExconMobil Energy lives here

Behind the scenes

How we forecast to 2040

ExxonMobil uses a data-driven, bottom-up approach to produce a most-likely view of future energy demand and supply.



We create a starting point for our projections using International Energy Agency (IEA) annual data, along with third-party data and recent energy trends.

Economic growth

Since population and living standards drive energy demand, we forecast demographic and economic trends for about 100 regions covering the world.

Demand for services

These drivers, along with consumer preferences, help us determine demand for energy across 15 sectors, covering needs for personal mobility, electricity in buildings, production of steel, cement and chemicals, plus many others.

Energy sources

We then match the demand for energy services with about 20 types of energy (e.g., diesel), taking into account potential evolution of technology, policies, infrastructure and more.

Policy/tech changes

We actively monitor changes in technology and policies and compare our views of the *Outlook* to a variety of third-party estimates.

Test uncertainty

We also run sensitivities (i.e., changes to our base assumptions) to assess the impact on our forecast if things were to play out differently.



2018 Outlook for Energy Fundamentals

What will the world's energy picture look like in the future?

To answer this question, we need to start by analyzing the world's long-term demographic and economic trends.

By 2040, world population is expected to reach 9.2 billion people, up from 7.4 billion today. Over that same period, global GDP will likely double. As a result, per capita GDP is projected to rise significantly, particularly in the non-member countries of the Organisation for Economic Co-operation and Development (OECD). Billions of people are expected to join the global middle class.

Rising living standards for expanding populations worldwide mean a dependence on reliable modern energy. Combined, they are expected to help drive up global energy demand by about 25 percent by the year 2040. That is roughly equivalent to adding another North America and Latin America to the world's current energy demand.

The world will need to pursue all economic energy sources to keep up with this considerable demand growth.



Fundamentals

Global fundamentals – projections

Energy supports living standards

2016 Electricity demand per capita Kilowatt-hour (kWh) per person



- Energy plays a critical role in supporting rising modern living standards around the world
- Electricity use per capita is one important measure of energy consumption
- A country's electricity use per capita is well-aligned with its income level
- About half of the global population resides in countries where average electricity demand per person is less than the annual consumption of basic household appliances
- · About 1 billion people still lack access to electricity

World demographics continue to shift Billions of people



Source: World Bank, ExxonMobil estimates

- Global population grows from 7.4 billion today to 9.2 billion people in 2040
- Africa's population increases at the fastest rate across major regions; it also has the largest working-age population across regions by 2040
- India likely to replace China as the most populous nation by 2025, with a significant increase in working-age population
- China's population will gradually trend down post 2030; its working-age population has already peaked, and its share of population age 65+ increases rapidly
- OECD working-age population flattens while the 65+ group continues to grow

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2018 Outlook for Energy

Fundamentals

Global fundamentals – projections

Non-OECD leads economic expansion

GDP growth



- Economic output (GDP) growth consists of both income (measured by GDP per capita) and population growth
- Projected OECD GDP growth trend reflects declining population growth and steady rise of income
- Non-OECD GDP growth to 2025 expected to rise above historical average, reflecting higher income growth and slower population growth
- Non-OECD GDP growth post-2025 projected to moderate as population growth slows further, while income growth is largely maintained



- World GDP likely to double from 2016 to 2040, with non-OECD GDP increasing about 165 percent, and OECD GDP growing about 60 percent
- Non-OECD share of global GDP will rise to about 50 percent by 2040, up from about 35 percent in 2016
- China is likely to be the largest contributor to GDP gains, with growth similar to that of Europe OECD and the United States combined
- India will grow strongly, with its share of global GDP doubling

Fundamentals

Global fundamentals – projections

Purchasing power expands



GDP per capita – thousands of purchasing power parity dollars

- All regions show significant gains in income by 2040
- GDP per capita in OECD nations currently averages about four times that of non-OECD economies
- China GDP per capita is likely to triple to more than \$40,000 by 2040, similar to Europe OECD levels of purchasing power in 2030
- India GDP per capita is also expected to triple, but will be less than half of China's level by 2040
- Africa GDP per capita is expected to increase by 50 percent, still trailing other emerging markets significantly

Unprecedented middle-class growth Global middle class – billions of people

liobal middle class – billions of people



Source: The Brookings Institution

- Middle class to expand globally, growing about 80 percent by 2030 to reach more than 5 billion people; most of the growth comes from non-OECD countries
- The rising middle class means billions of people with longer, healthier and better lives
- Asia Pacific represents the largest increase, with India and China each reaching more than 1 billion middle-class citizens
- Africa/Middle East and Latin America are also expected to increase, while
 North America and Europe hold their middle-class population steady

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Fundamentals

Global fundamentals – projections

Technology helps us do more with less





- Global energy demand grows more slowly than world GDP, implying falling energy intensity (amount of energy used to produce a unit of GDP)
- From 2000 to 2016, energy intensity declined about 1 percent per year, the rate of improvement from 2016 to 2040 is likely to approach 2 percent per year
- Meanwhile, the carbon intensity of energy (CO₂ content per unit of energy used) has been fairly flat; the pace of improvement is likely to pick up from 2016 to 2040
- The combined effect is reflected in decreasing carbon intensity of the world economy (tonnes CO_2 per unit of GDP), which is expected to be nearly 45 percent lower by 2040 as global energy demand rises about 25 percent

Global efficiency limits demand growth Energy demand – quadrillion British thermal units (BTUs)



- Despite growing population, global energy demand is expected to increase about 25 percent from 2016 to 2040, reflecting large savings due to efficiency improvements
- Without energy savings enabled by gains in energy efficiency of the world's economy global energy demand could nearly double by 2040
- Demand growth will come from non-OECD nations, led by China and India, where energy use is expected to rise about 40 percent
- Demand in other Asia Pacific nations, Africa/Middle East and Latin America is similarly projected to grow strongly

)

Demand

Global energy demand will continue to rise through 2040, reflecting its fundamental link to growing prosperity and better living standards for an increasing population worldwide.

Energy efficiency improvements will help curb the growth in global energy demand to about 25 percent over the period to 2040, while global economic output nearly doubles. To put this in perspective, if world energy demand grew as fast as estimated GDP, energy demand growth could be about four times the projected amount.

Emerging markets in non-OECD nations will account for essentially all energy demand growth, led by the expanding economies in the Asia Pacific region.

Continuing urbanization and a significant expansion of the middle class, particularly in China and India, will help drive this trend, highlighted by greater access to modern energy in homes, rising industrial demand, and significant increases in personal and commercial transportation needs.

Electrification and gradual decarbonization continue as significant global trends. Energy demand for power generation accounts for about 50 percent of global demand growth. Energy sources shift toward cleaner fuels such as natural gas, renewables and nuclear.



Demand

Demand – projections

Global energy demand varies by sector Primary energy* ⁽³⁾ – quadrillion BTUs



*Includes consumed energy as fuel and feedstocks

- Energy used in each sector reflects economic supply options and their general fitness for purpose
- Electricity generation is the largest and fastest-growing demand sector, reflecting strong growth in global electricity demand
- A wide variety of energy types will support electricity generation, with natural gas, renewables and nuclear increasing their share
- · Natural gas demand increases significantly and gains share in all sectors
- Oil demand grows to support commercial transportation and chemical needs

Energy demand shifts toward non-OECD Percent of primary energy (%)



- Global demand reaches 680 quadrillion British thermal units in 2040, up nearly 25 percent
- Non-OECD share of global energy demand reaches about 70 percent in 2040, as efficiency gains and slowing economic growth in the United States and OECD nations help keep energy demand relatively flat
- China and India contribute about 45 percent of world energy demand growth
- The combined share of energy used in the United States and in European OECD nations will decline from about 30 percent in 2016 to close to 20 percent in 2040, similar to China's share of world energy demand

2

Demand

Demand – projections

Global energy mix shifts to lower-carbon fuels Percent of primary energy (%)



- Renewables and nuclear see strong growth, contributing close to 40 percent of incremental energy supplies to meet demand growth
- Natural gas grows the most of any energy type, reaching a quarter of all demand
- Oil will continue to play a leading role in the world's energy mix, with growing demand driven by commercial transportation needs and feedstock requirements for the chemicals industry
- Coal use remains significant in parts of the world, but loses substantial share as the world transitions toward energy sources with lower emissions

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Transportation

Advancements in transportation have shrunk our world, while opening up new vistas and possibilities. One consequence of billions of people joining the global middle class in the next quarter century is that it will lead to greater travel, additional cars on the road and increased commercial activity.

Global transportation-related energy demand is projected to increase by close to 30 percent. At the same time, total miles traveled per year by cars, sport utility vehicles (SUVs) and light trucks will increase about 60 percent, reaching about 14 trillion in 2040. As personal mobility increases, average new-car fuel economy (including SUVs and light trucks) will improve as well, rising from about 30 miles per gallon now to close to 50 miles per gallon in 2040.

The growth in transportation energy demand is expected to account for about 60 percent of the growth in liquids fuel demand. Liquids demand for light-duty vehicles is expected to be relatively flat to 2040, reflecting better fleet fuel economy and significant growth in electric cars.

Transportation – projections

Transportation energy demand growth driven by commerce Global sector demand – million oil-equivalent barrels per day (MBDOE)



Global transportation-related energy demand grows close to 30 percent from 2016 to 2040

- Personal mobility demands continue to increase, but higher efficiency and more electric vehicles lead to a peak and decline in light-duty vehicle energy demand
- Growth in economic activity and personal income drives increasing trade of goods and services, leading to higher energy demand in the commercial transportation sector
- Heavy-duty vehicle growth is the largest sector by volume, but aviation grows the largest by percentage

Demand

Transportation – projections

Global transportation energy demand relative to GDP Index, 1990=100



- Growth in personal mobility (vehicle miles traveled) and commercial transportation services (ton-miles of freight, passenger-miles of air travel) has tracked with GDP
- Continued economic growth, particularly in non-OECD countries, will result in increased demand for all transportation services
- Recent trends show a decoupling of economic growth and transportation energy demand, reflecting growing efficiency
- Significant increases in future fuel economy across all transportation modes will lead to a further decoupling of transportation services and energy demand

Commercial transportation grows in all aspects Commercial transportation energy demand – MBDOE



- Economic and population growth is concentrated in non-OECD countries, which leads to the biggest growth in commercial transportation services in these regions
- · Asia Pacific leads growth, rising to 40 percent of total sector's energy demand
- Efficiency gains resulting from improvements in fuels, engine design, aerodynamics, body design and logistics across commercial modes of travel lead to significant reductions in the rate of energy demand growth
- Electrification in most commercial transportation grows slowly due to upfront costs range limitations, payload requirements, and infrastructure development

5

Demand

Transportation – projections

Access to personal mobility increases Vehicles per thousand people



- As incomes rise, individuals want more personal mobility, so demand for cars and motorcycles increases
- Motorcycles offer a lower-cost entry point to personal mobility, with ownership particularly high in Asia Pacific
- Car ownership significantly increases in non-OECD countries, with Asia Pacific leading the growth
- In the OECD, while total vehicle ownership increases significantly, the number of cars per 1,000 people increases only about 10 percent

Efficiency mitigates light-duty demand growth Global light-duty vehicle transportation demand – MBDOE



- Increasing access to vehicles drives a worldwide increase in personal mobility-related energy demand growth
- Assuming the current fleet mix and fuel efficiency, there would be a significant increase in energy demand for personal mobility
- However, major gains in the fuel efficiency of conventional vehicles leads to a major reduction in the energy needed
- Changes in the fleet mix (e.g., increasing hybrids and electric vehicles) play a much smaller role in limiting energy demand for light-duty vehicles

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Demand

Transportation – projections

Electric vehicles grow rapidly



- Currently there are approximately 2 million electric vehicles in the global fleet, or about 0.2 percent of the total
- Recently, some car manufacturers and governments have announced plans to limit future vehicle sales to those with an electric motor, including hybrids, plug-in hybrids and battery electric vehicles
- The electric vehicle fleet will see strong growth driven by decreasing battery costs, increasing model availability and continued support from government policies
- Future battery costs and government policies are uncertain, hence there is a wide range of perspectives on future electric vehicle growth, with third-party estimates for 2040 ranging from a factor of three higher and lower than the *Outlook*

Liquids demand trajectory uncertain but resilient World - MBDOE



Shaded ranges are indicative of potential shifts in demand relative to base Outlook

- Sensitivities help assess potential impacts to light-duty liquids demand using alternate assumptions around electric vehicle penetration, changes in fuel efficiency or broader mobility trends
- For every additional 100 million electric vehicles on the road in 2040, liquids demand could fall by ~1.2 million barrels per day; if the entire light-duty fleet is electrified in 2040, total liquids demand could be approximately the same as in 2013 (see page 42)
- Alternatively, recent consumer preferences have slowed the increase in fuel
 efficiency of new vehicle sales in both the OECD and non-OECD
- While the *Outlook* forecasts new car fuel efficiency trends will be well aligned with government policies, a continuation of recent trends in consumer preferences could add more than 2 million barrels per day of liquids demand by 2040

Residential and commercial

As populations grow and prosperity rises around the world, we will need more energy to power homes, offices, schools, shopping centers and hospitals. Combined residential and commercial energy demand is projected to rise by more than 20 percent through 2040. About 90 percent of this demand growth will be met by electricity. Led by the growing economies of non-OECD nations, average worldwide household electricity use will rise about 30 percent between 2016 and 2040.

Energy efficiency plays a big role within the residential and commercial sectors as modern appliances, advanced materials and policies shape the future.

Residential and commercial – projections

Residential and commercial demand shifts to non-OECD Demand by region – BTUs



- Growth in households, rising prosperity and expanding commercial activity will spur demand for lighting, heat and power in homes and offices
- Residential and commercial energy demand will rise over 20 percent by 2040, consistent with overall population growth
- Essentially all growth will be in non-OECD nations, where demand will rise close to 40 percent
- Africa and China will each account for about 30 percent of the increase in residential and commercial energy demand

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Demand

Residential and commercial – projections

Residential energy use reflects efficiency gains Million BTUs per household per year



- Household energy use continues to improve, reflecting more efficient buildings appliances and consumer products
- Demand for electricity is growing across all regions
- People in Africa and Asia Pacific still rely on biomass products to a large degree; more than 2.5 billion people worldwide lack access to modern energy for cooking, and about 1 billion people lack access to electricity



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Demand

Residential and commercial – projections

Electricity demand surges

Residential and commercial energy demand World – quadrillion BTUs



- Energy shifts reflect rising living standards and increasing urbanization through 2040
- Electricity use increases 70 percent, accounting for nearly all the growth in total energy demand from 2016 to 2040; electricity reaches a share of 40 percent in 2040
- Natural gas use grows about 20 percent, keeping its share around 20 percent through 2040
- Oil demand decreases, though usage of liquefied petroleum gas increases as a cooking fuel replacing biomass
- Biomass demand peaks, aided by growing access to modern energy in non-OECD nations

Household electricity up in non-OECD Residential electricity intensity Megawatt hours per household per year



- Residential electricity use will rise about 75 percent by 2040, driven by a nearly 150 percent increase in non-OECD nations
- Electricity use per household will rise about 30 percent globally, as household use in non-OECD countries rises about 70 percent
- Electricity use per household in OECD nations will be flat-to-down as efficiencies help limit electricity requirements
- Residential electricity use in Africa and India is likely to increase about 250 percent, though both areas will continue to lag in terms of electricity per household

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Industrial

Energy and industry have a long history together, and their future remains intertwined. Energy fuels industries of all kinds, from microchip manufacturing to skyscraper construction, food processing to pharmaceuticals, agriculture to zero-emission vehicle production. Consumer demand for the many and varied products that industries offer has provided the impetus to unlock new sources of energy supply from the industrial revolution to the shale revolution.

As global prosperity continues to expand, industrial energy demand will increase. Most of the growth occurs in emerging markets. The chemicals industry is the industrial sub-sector with the highest rate of growth, as demand for plastics and other petrochemical products outpaces GDP in many regions.

Industrial energy demand growth would be much higher if not for the persistent pursuit of energy efficiency improvements. The *Outlook* anticipates technology advances, as well as the increasing shift toward cleaner-burning fuels such as electricity and natural gas.

Industrial - projections

Industry undergirds global economic expansion World – quadrillion BTUs



- The industrial sector includes the energy used to build cities, power factories, refine fuels and produce food
- Manufacturing jobs contribute to rising prosperity, while also making products to meet consumer preferences for cars, clothing, cosmetics and computers
- Almost half of the world's energy is used for industrial activity
- Overall, industrial energy demand rises about 20 percent from 2016 to 2040; the chemicals sector grows 40 percent
- Improving industrial energy efficiency conserves fuel and reduces emissions

Demand

Industrial - projections

Oil, gas and electricity fuel industrial growth $_{\rm World\,-\,quadrillion\,BTUs}$



• Industry uses energy both as a fuel and as a feedstock for chemicals, asphalt lubricants, waxes and other specialty products

- Industrial fuel powers boilers, motors, compressors, robots, forklifts and cranes
- Oil, natural gas and electricity each contribute about one-third of industrial energy growth; oil growth is mostly due to its use as a chemical feedstock
- Use of coal and oil as industrial fuels declines in favor of natural gas and electricity, as companies strive to reduce their direct emissions
- Coal continues to play a role in steel and cement manufacturing

Heavy industry migrates to emerging markets Quadrillion BTUs



*Mature Regions include North America, Europe, Russia/Caspian and OECD Asia Pacific

- Steel, cement and manufacturing are essential to urban infrastructure development
- Heavy industry demand rises steadily in emerging markets in Asia, Africa, the Middle East and Latin America
- China's path forward mirrors the mature regions, as its economy transitions to higher value manufacturing and services after a decade of soaring, energy-intensive growth
- Demand grows by 75 percent in the emerging markets, but is essentially flat in the mature regions and China

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Demand

Industrial - projections

Heavy industry energy evolves toward cleaner fuels Growth in quadrillion BTUs



*Mature Regions include North America, Europe, Russia/Caspian and OECD Asia Pacific

- New industry is attracted to regions with access to abundant, affordable energy, an able workforce and balanced policies
- Electricity and natural gas are manufacturers' fuels of choice because of their convenience, versatility and lower direct emissions
- Climate policies boost natural gas demand in mature markets; air quality management spurs switching from coal to natural gas in China
- Abundant natural gas supplies give manufacturers a competitive edge in Africa, the Middle East and parts of Latin America
- · Coal's use declines in China but doubles in coal-producing India and emerging Asia

Consumer demand propels chemicals growth World – index, 2000=100



- Consumer demand for plastics, fertilizer and other chemical products increases
 with rising incomes
- Olefins and aromatics are basic building blocks for plastics, adhesives and other consumer products; consumer demand outpaces GDP growth
- Manufacturers see plastics as light-weight, durable materials that can improve the performance of their products, from packaging to auto parts to medical devices
- The chemicals sector uses energy both as a fuel and as a feedstock
- Chemicals energy demand grows by 40 percent from 2016 to 2040

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Demand

Industrial - projections

Rising prosperity lifts chemicals energy demand Quadrillion BTUs



- Since chemicals production is energy-intensive, there is usually a competitive advantage for manufacturers to locate plants near low-cost feedstock and fuel sources
- The U.S. chemicals industry expands using abundant, low-cost natural gas liquids which are largely a byproduct of unconventional oil and natural gas production
- Asia Pacific's petrochemical production grows as rising incomes stoke consumer demand
- Affordable energy (feedstock and fuel) supplies prompt investment in the Middle East Africa and Latin America; chemicals industry energy use more than doubles in each region
- Mature regions remain important contributors to global chemicals production

Chemicals production relies on oil and natural gas World – quadrillion BTUs



- · Feedstock comprises about two-thirds of chemicals energy demand; fuel one-third
- Oil and natural gas account for about 75 percent of chemicals energy demand today, and nearly all of the growth from 2016 to 2040
- Naphtha and natural gas liquids are primarily used as feedstock; natural gas is used as both a feedstock (notably for fertilizer) and a fuel
- Natural gas liquids consumption about doubles from 2016 to 2040, as unconventional oil and natural gas production in the United States expands supply
- Naphtha remains the dominant feedstock in Asia; the Middle East relies on natural gas liquids and natural gas

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Electricity and power generation

Demand for electricity continues to rise as it is the energy used in powering wide applications ranging from lighting to home appliances to global e-commerce and digital services. Power generation uses the broadest array of fuels: coal, natural gas, nuclear and renewables such as hydroelectricity, solar and wind.

As electricity use rises, the types of fuels used to generate electricity will shift, globally and regionally. Policies seeking to address climate change and air quality will influence the choice of sources, with wind and solar, natural gas, and nuclear fueling growth in power generation.

Electricity and power generation – projections

Electricity sources shift World – thousand TWh (net delivered)



- Global electricity demand grows by 60 percent from 2016 to 2040, driven by demand in the residential and commercial, industrial and transportation sectors
- Industrial share of demand reduces as China's economy shifts from heavy industry to services and lighter manufacturing; transportation's share doubles to 2 percent in 2040
- The world shifts to lower carbon sources for electricity generation, led by natural gas, renewables such as wind and solar, and nuclear
- Coal provides less than 30 percent of the world's electricity in 2040, down from about 40 percent in 2016

Demand

Electricity and power generation – projections

Natural gas and renewables dominate growth Global growth 2016-2040 – thousand TWh (net delivered)



- Wind and solar grow significantly, supported by policies to reduce CO₂ emissions as well as cost reductions, and lead growth as sources for electricity generation
- Natural gas grows significantly, with growing demand from OECD countries, China and countries where natural gas is domestically available
- Nuclear demand grows, with more than 50 percent of this growth coming from China
- Hydropower growth makes up more than 80 percent of growth in the other renewables category
- Coal-fired generation grows in many Asia Pacific countries due to electricity demand
 growth as well as favorable economics and supportive policy environments

Renewables penetration increases across all regions

Wind/solar share of delivered electricity percent – share of TWh



- Globally, wind and solar's share of delivered electricity grows significantly from about 5 percent in 2016 to about 17 percent in 2040
- Wind and solar see strong growth in North America and Europe, and provide more than 20 percent of delivered electricity in 2040
- · Renewables growth in Asia Pacific supports local air quality and energy diversity goals
- The Middle East and Africa see growth in solar due to reduced costs and favorable solar resource
- While capacity utilization improves over time, intermittency still limits worldwide wind and solar utilization to about 30 percent and 20 percent respectively in 2040

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Demand

Electricity and power generation – projections

Electricity generation highlights regional diversity Net delivered electricity – thousand TWh



- About 60 percent of the growth in electricity demand will come from Asia Pacific
- Mix of electricity generation sources will vary significantly by region
- The United States and Europe lead shift away from coal, with significant gains in natural gas, wind and solar
- China's coal share of electricity generation falls with nuclear, renewables and natural gas meeting close to all electricity demand growth
- The Middle East, Africa and the rest of world draw on natural gas where domestically available
- Favorable economics drive coal-fired electricity in Asia Pacific; India's use of coal for electricity more than doubles from 2016 to 2040

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Demand

Electricity and power generation – projections

Natural gas is a key fuel for reliable electricity generation Natural gas demand for electricity generation – billion cubic feet per day (BCFD)



Different policy or technology choices can impact outcome Global natural gas demand for electricity generation sensitivity – BCFD

Shaded ranges are indicative of potential shifts in demand relative to base Outlook

- Natural gas is reliable and efficient for baseload electricity generation; its flexibility also makes it well suited to meet peak demand and back-up intermittent renewables
- The role of natural gas in the electricity generation mix varies by country: natural gas-rich regions rely heavily on natural gas-fired electricity, while importing regions balance the use of natural gas with other fuels
- The Outlook reflects ExxonMobil's best views of technology improvements and policy evolution; sensitivities test the impact of alternate pathways on natural gas demand for electricity generation
- An accelerated deployment of solar and wind due to swifter cost declines and/or even more generous, targeted-support policies could reduce natural gas demand
- Conversely, stronger public sentiments against nuclear or coal and/or a shift toward more technology-neutral carbon abatement policies could increase the role of natural gas for baseload electricity generation





Emissions

Providing reliable, affordable energy to support prosperity and enhance living standards is coupled with the need to do so in ways that reduce impacts on the environment, including the risks of climate change. This is a dual challenge ExxonMobil takes seriously.

The challenge of meeting global energy needs and managing the risks of climate change is real – and daunting. Real in that billions of people need reliable, affordable energy every day, and daunting in the fact that people and governments in every nation have a variety of important goals and limited financial resources to address them. Progress on energy and climate objectives requires practical approaches that will contribute to both without stifling economic costs.

Governments bear a unique responsibility in this regard. A key challenge is to develop and implement policies that focus emission-reduction efforts on low-cost options. This approach will help promote better living standards while reducing emissions.

The long-term nature of the climate challenge promises an evolution of available solutions as knowledge expands, technology advances and markets adapt. Policies that promote innovation and flexibility afforded by competition and free markets will be critical to help ensure nations pursue the most cost-effective opportunities to reduce global GHG emissions and meet people's energy needs.



Emissions

Emissions – projections

Energy-related CO₂ emissions peak

Billion tonnes



- Global CO $_2$ emissions rose close to 40 percent from 2000 to 2016, despite a roughly 10 percent decline in emissions in Europe and North America
- Global CO $_2$ emissions are likely to peak by 2040, at about 10 percent above 2016 levels
- Combined \mbox{CO}_2 emissions in Europe and North America fall about 15 percent by 2040 versus 2016
- China contributed about 60 percent of the growth in emissions from 2000 to 2016; its emissions peak about 2030, and gradually decline toward the 2016 level in 2040
- Emissions outside North America, Europe and China rise about 35 percent from 2016 to 2040, with the share of global emissions reaching 50 percent by 2040

All sectors contributing to restrain CO₂ emissions growth Global energy-related CO₂ emissions - billion tonnes



- Electricity generation accounts for about 40 percent of energy-related CO₂ emissions; shift to less carbon-intensive sources of electricity (e.g. wind, solar, nuclear and natural gas) will help reduce the CO₂ intensity of delivered electricity by more than 30 percent
- Transportation represents about 25 percent of CO₂ emissions, and this share is likely to grow modestly to 2040 driven by expanding commercial transportation activity
- Light-duty vehicle CO₂ emissions are expected to decline close to 10 percent from 2025 to 2040 as more efficient conventional vehicles and electric cars gain significant share
- Industrial sector activities account for about 30 percent of CO_2 emissions; over the outlook, efficiency gains and growing use of less carbon-intensive energy will help reduce industrial CO_2 emissions relative to GDP by about 50 percent

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Emissions

Emissions – projections

Restraining global energy-related CO_2 emissions Billion tonnes



- The primary driver of increasing global CO $_2$ emissions between 2000 and 2016 was economic growth, as global GDP expanded about 55 percent
- Improving energy efficiency across economies (energy use per unit of GDP) helped slow the growth in emissions, while CO_2 intensity of energy use remained fairly constant
- As economic growth continues to drive CO₂ emissions through 2040, efficiency gains and a shift to less CO₂-intensive energy will each help substantially moderate emissions
- As the world's economy nearly doubles by 2040, energy efficiency gains and a shift in the energy mix will contribute to a nearly 45 percent decline in the carbon intensity of global GDP

Learn more

Want to learn more about energy-related CO₂ emissions?

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Supply

What resources will be available to meet the world's increasing demand for more energy?

Technology advancements underpin the diversification of energy choices. The supply mix to meet growing energy demand will be historically diverse – from the oil and natural gas in America's shale regions, to the deepwater fields off Brazil; from new nuclear reactors in China, to wind turbines and solar arrays in nations around the world.

This diversification in global energy supply will grow over the next two-and-a-half decades. Society's push for lower-emission energy sources will drive substantial increases in renewables such as wind and solar. By 2040, nuclear and all renewables will be approaching 25 percent of global energy supplies.

Oil grows and continues to be the primary source of energy for transportation and as a feedstock for chemicals. Natural gas also grows, with increasing use in power generation, as utilities look to switch to lower-emissions fuels. Coal struggles to grow due to increased competition in power generation from renewables and natural gas, led by declines in OECD nations.



Supply Supply - projections

Energy supply evolves to meet diverse demand Global demand by fuel – quadrillion BTUs



- Technology improvements lead to wind, solar and biofuels increasing, with a combined growth of about 5 percent per year
- Non-fossil fuels reach about 22 percent of total energy mix by 2040
- Oil continues to provide the largest share of the energy mix; essential for transportation and chemicals
- Natural gas demand rises the most, largely to help meet increasing needs for electricity and support increasing industrial demand

- Oil and natural gas continue to supply about 55 percent of the world's energy needs through 2040
- Coal's share falls as OECD countries and China turn to lower-emission fuels
- Nuclear demand grows 70 percent between 2016 and 2040, led by China
- Wind, solar and biofuels reach about 5 percent of global energy demand

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Liquids

Liquids demand is expected to grow by about 20 percent over the next two-and-a-half decades, driven by the transportation and chemicals sectors.

To meet the demand, supply growth will come from diverse sources, with technology advancements a key enabler. Technology enables growth in supply from tight oil and natural gas liquids, together reaching nearly 30 percent of global supply by 2040. Combined with growth in oil sands, energy markets shift, and North America becomes a net exporter.

Liquids - Demand

Liquids demands driven by transportation and chemicals By region and sector – MBDOE



Global liquids demand grows about 20 percent from 2016 to 2040

- · Commercial transportation and chemicals sectors lead demand growth
- Advances in light-duty vehicle efficiency lead to liquids demand decline in North America and Europe
- Africa liquid demand grows by about 30 percent as emerging economies advance
- Asia Pacific accounts for nearly 65 percent of the increase in global liquids demand to 2040, surpassing the combined liquids demand of North America and Europe by 2025

Supply Liquids – projections

Liquids supply highlights technology gains Global liquids supply by type – MBDOE



- Global liquids production rises by 20 percent to meet demand growth
- Technology innovations lead to growth in natural gas liquids, tight oil, deepwater, oil sands and biofuels
- Technology enables efficient production from conventional sources, which still account for more than 50 percent of production in 2040
- Most growth over the *Outlook* period is seen in tight oil and natural gas liquids, which reach nearly 30 percent of global liquids supply by 2040
- Continued investment is needed to mitigate decline and meet growing demand

Liquids supply highlights regional diversity By region and sector – MBDOE



- Liquids trade balances shift as supply and demand evolve
- North America swings to a net exporter as shale growth continues
- Latin America exports increase from deepwater, oil sands and tight oil supplies
- The Middle East and Russia/Caspian remain major oil exporters to 2040, and Africa shifts to an importer
- Europe remains a net oil importer, as demand and production both decline
- Asia Pacific imports increase to 80 percent of oil demand in 2040

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Supply Liquids – projections

Liquids demand and supply warrant investment $_{\mbox{World}\,-\,\mbox{MBDOE}}$



Excludes biofuels

- Without further investment, liquids supply would decline steeply
- More than 80 percent of new liquids supply needed to offset natural decline
- Per the International Energy Agency, about \$400 billion a year of upstream oil investment is needed from 2017 to 2040

Technology expands recoverable resources

World – crude and condensate technically recoverable resources – trillion barrels





- Global oil resources are abundant
- Oil resource estimates keep rising as technology improves
- Technology has added tight oil, deepwater and oil sands resources
- · Less than one-quarter of global oil resources have been produced
- Remaining oil resources can provide about 150 years of supply at current demand

Natural gas

It is not surprising that natural gas grows more than any other energy source when one considers its abundance, convenience and many uses: home heating, fertilizer feedstock, delivery truck fuel and flexible, reliable electricity generation, just to name a few. Global natural gas demand grows by about 40 percent, as its share of the world's energy mix rises from 23 percent to 26 percent between 2016 and 2040. As a lower carbon alternative to coal, natural gas also plays a key role in the pathway to lower CO_2 emissions.

Natural gas resources are geographically and geologically diverse. Technologies, such as horizontal drilling and hydraulic fracturing, have unlocked vast unconventional resources, which have dramatically altered the natural gas supply landscape in the past decade, particularly for North America. Unconventional gas will continue to play a significant role, contributing more than half of the growth in natural gas supply to 2040.

Trade is critical to move natural gas to where consumers need it. Liquefied natural gas is well-suited to transport natural gas over long distances where pipelines are impractical. Liquefied natural gas trade will meet one-third of demand growth to 2040.

Natural gas - projections

Natural gas competes in every sector World – percent of total energy demand



- As an abundant, versatile and cleaner-burning energy source, natural gas is increasingly a fuel of choice for homes, businesses and large-scale electricity generators
- Natural gas supplies about a quarter of the energy for industry and electricity generation in 2040
- Residential and commercial users continue to rely on natural gas as a convenient, modern fuel for heating and cooking
- Natural gas is a small fraction of transportation demand, but sees strong growth in the commercial road and marine sectors

Supply Natural gas – projections

Natural gas meets an increasing share of world demand Percent of primary energy demand (%)



- Global natural gas demand grows by about 40 percent from 2016 to 2040
- The share of natural gas in the world's energy supply mix increases from 23 percent in 2016 to 26 percent in 2040
- Natural gas-rich regions like the Middle East and Russia/Caspian rely on natural gas to meet about half of their energy needs
- Abundant unconventional resources prompt North America's steady shift toward natural gas
- Natural gas plays an important role in fueling economic growth in Asia, Africa and Latin America

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Supply Natural gas – projections

Natural gas supply highlights regional diversity in meeting demand $_{\mbox{\scriptsize BCFD}}$



- · Advances in unconventional gas production and liquefied natural gas markets continue to reshape natural gas supplies
- · Abundant unconventional gas fuels regional demand growth and liquefied natural gas exports for North America
- Russia/Caspian remains a significant exporting region, supplying Europe and Asia Pacific via pipeline, while also expanding liquefied natural gas export capabilities
- The Middle East and Africa see rising demand and exports; Latin American demand outpaces supply growth
- Europe and Asia Pacific increasingly rely on natural gas trade to meet consumer needs, as local production falls short of demand

Supply Natural gas – projections



Europe and Asia Pacific dominate LNG imports BCFD





- Liquefied natural gas trade supplies one-third of natural gas demand growth from 2016 to 2040
- Together, Asia Pacific and Europe account for about 85 percent of liquefied natural gas imports in 2016 and 95 percent of the growth from 2016 to 2040
- Europe leverages competitive liquefied natural gas to diversify its natural gas import portfolio
- Air quality management is a key driver for China's and India's natural gas demand growth
- Other Asia Pacific importers utilize liquefied natural gas to fill existing natural gas infrastructure as domestic natural gas supplies plateau or decline

- Three-quarters of liquefied natural gas exports in 2016 originated in Asia Pacific or the Middle East
- By 2040, four regions will have similar liquefied natural gas exports: Asia Pacific, the Middle East, North America and Africa
- North America's exports grow the most as low-cost unconventional gas production
 prompts investment in liquefied natural gas
- Liquefied natural gas will remain highly competitive due to abundant natural gas resources and many aspiring exporters
- Low-cost liquefied natural gas supply sources will be advantaged in the marketplace

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Supply Natural gas – projections

Technology expands recoverable resources



• Less than 15 percent of recoverable natural gas resources have been produced

- Remaining natural gas resources can provide more than 200 years of supply at current demand
- Natural gas resource estimates keep rising as technology unlocks resources previously considered too difficult or costly to produce
- About 45 percent of remaining natural gas resources are from unconventional sources like shale gas, tight gas and coal-bed methane
- Natural gas resources are geographically widespread



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Test uncertainty

Demand for liquid fuels is projected to grow by about 20 percent through the *Outlook* period, driven primarily by commercial transportation and chemicals demand. Liquids demand from light-duty transportation peaks and declines with more efficient vehicles, even as personal mobility continues to rise.

Uncertainties in government policies and the pace of market penetration of various technologies could have a significant impact on light-duty transport sector demand. To assess the magnitude of this uncertainty, we developed a hypothetical sensitivity to illustrate the impact of all light-duty liquids demand being replaced by electricity by 2040.

To achieve this, global sales of light-duty vehicles would likely need to be 100 percent all-electric starting in 2025. This would require sales of about 110 million electric vehicles starting in 2025, rising to about 140 million in 2040 – more than 100 times the number of electric vehicles sold in 2016. Battery manufacturing capacity for electric cars would need to increase by more than 50 times from existing levels by 2025 under this hypothetical case.

Sensitivities – projections



- In a 100 percent electric light-duty vehicles by 2040 sensitivity, light-duty transportation liquids demand would be fully displaced
- In this sensitivity, total liquids demand in 2040 could be similar to levels seen in 2013 as growth in chemicals and commercial transportation would mostly offset a decline in light-duty vehicle demand
- Post-2040, liquids demand would likely revert to modest growth as chemicals and commercial transportation demand continue to rise



Supply





Energy-related CO₂ emissions World – billion tonnes



Natural gas demand increases World – gas into power generation - BCFD



- The additional electricity needed to power a 100 percent all-electric light-duty vehicle fleet could increase total electricity demand by about 15 percent in 2040 relative to the base Outlook
- Assuming the fuel mix for electricity generation is the same as in the Outlook, power generation from natural gas would be about 25 percent of the overall increase

- Under a 100 percent light-duty EV sensitivity, total energy-related CO₂ emissions in 2040 could be reduced by about 5 percent
- Light-duty tailpipe emissions would reduce to zero but emissions from power generation would rise with the increase in electricity demand
- CO₂ emissions from power generation could increase by about 15 percent, with coal accounting for 60 percent of the increase

 Higher electricity demand could lead to about a 20 percent increase in natural gas demand for power generation in 2040



Special Section

Pursuing a 2°C pathway The climate challenge

Many uncertainties exist concerning the future of energy demand and supply, including potential actions that societies may take to address the risks of climate change. The following analysis is intended to provide a perspective on hypothetical 2°C scenarios.

Since 1992, when nations around the world established the United Nations Framework Convention on Climate Change (UNFCCC), there has been an international effort to understand and address the risks of climate change. After more than two decades of international effort, in December 2015, nations convened in Paris and drafted an agreement that for the first time signals that both developed and developing nations will strive to undertake action on climate change and report on related progress.

The Paris Agreement¹ "aims to strengthen the global response to the threat of climate change... by: Holding the increase in the global average temperature to well below 2°C above pre-industrial levels..."

Key elements of the agreement include:

- "Each party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve."
- "Each party shall communicate nationally determined contributions every five years."

The nationally determined contributions (NDCs) provide important signals on government expectations related to the general direction and pace of likely policy initiatives to address climate risks.⁴ In this regard, the UNFCCC reported in May 2016 that "the estimated aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the intended nationally determined contributions do not fall within the least-cost 2°C scenarios."^{5,6}



The climate challenge – Considering 2°C scenarios

According to the International Energy Agency (IEA), setting upon a "well below 2°C" pathway in concert with the Paris Agreement implies "comprehensive, systematic, immediate and ubiquitous implementation of strict energy and material efficiency measures."⁷⁷ Given a wide range of uncertainties, no single pathway can be reasonably predicted. As a result, many governments, universities and non-governmental organizations are seeking to analyze potential 2°C scenarios or pathways. Such studies may be useful in helping identify options to address climate risks and ensure energy remains reliable and affordable.

A key uncertainty relates to advances in technology that may influence the cost and potential availability of certain pathways toward a 2°C scenario. Many potential pathways are designed to utilize a full range of technology options, which may have significant benefits for society by minimizing related costs of a dramatic transition process.

Considerable work has been done in the scientific community to explore energy transformation pathways. A recent multi-model study coordinated by the Energy Modeling Forum at Stanford University (EMF 27) brought together many energyeconomic models to assess technology and policy pathways associated with various climate stabilization targets (e.g., 450, 550 ppm CO_2 equivalent or CO_2 e), partially in support of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The chart to the right illustrates potential CO_2 emission trajectories under EMF 27 full technology scenarios⁸ targeting a 2°C pathway (Assessed 2°C Scenarios) relative to the 2018 *Outlook*, and baseline pathways (Assessed Baseline Scenarios) with essentially no policy evolution beyond 2010. The 2018 *Outlook* incorporates significant efficiency gains and changes in the energy mix, resulting in a projected CO_2 emissions trajectory that resides between the pathways illustrated by the baseline and 2°C scenarios.

A key characteristic of the Assessed 2° C Scenarios is that energy-related CO₂ emissions go to zero, or potentially negative, by the end of the century. As shown, the 2° C pathways represent a stark and fairly rapid transition from the baseline scenarios, while also illustrating significantly different emission trajectories toward a 2° C ambition.



Assessed scenarios include CO₂ emissions from energy and industrial processes

Many experts developed scenarios to reduce global CO₂ emissions consistent with an atmospheric GHG concentration (450 ppm CO₂e in 2100) consistent with a 2°C pathway. The chart above shows indicative pathways based on results of 13 models.
The climate challenge – Considering 2°C scenarios (continued)

It is generally accepted that population and world economies will continue to grow, and that measures to address the risks of climate change should accommodate these factors. Therefore, across any reasonable range of pathways, two other factors remain critical to limiting CO₂ emissions:

- 1. Reducing the energy intensity of economies (i.e., being more energy efficient), and
- 2. Reducing the $\ensuremath{\text{CO}_2}$ emissions intensity of the global energy mix.

In this regard, the adjacent chart illustrates the gains expected for both parameters under the Assessed 2°C Scenarios from 2010 to 2100, along with ExxonMobil's 2018 *Outlook* for 2010 to 2040. The *Outlook* projects progress on both parameters to 2040, with generally greater progress on energy intensity gains compared to the other pathways.

Energy and CO₂ emissions intensity pathways

World - percent change from 2010-2100 - ten year increments



EMF27-FT cases include CO_2 emissions from energy and industrial processes

These pathways imply that two things must happen. First, countries need to be more efficient in how they use energy (left axis)... and second, they need to use energies or technologies that reduce CO₂ emissions for every unit of energy they use (bottom axis).

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The climate challenge – Considering 2°C scenarios (continued)

The chart to the right helps provide some historical context for the projected progress on these important parameters from 1980 through 2040 based on the 2018 *Outlook*. From 1980 to 2015, progress to slow the growth in energy-related CO₂ emissions was made primarily through energy efficiency gains. Despite those gains over 35 years, emissions rose from about 18 billion tonnes to about 33 billion tonnes. From 2015 to 2040, further gains in efficiency and CO₂ emissions intensity will be significant, helping slow global energy-related CO₂ emissions so that they will likely peak before 2040. However, they are projected to be twice the level of 1980 and about 10 percent above the 2016 level in 2040.

The chart also illustrates a range of 2040 "performance levels" reflecting hypothetical combinations of global energy intensity and CO_2 emission intensity levels that, if reached in 2040, might indicate the world was on a 2°C pathway. Even with the significant progress on energy and CO_2 emissions intensities envisioned by 2040 in the 2018 *Outlook*, it is estimated that there remains a significant gap to reach performance levels in 2040 that are indicative of 2°C pathway. In summary, transitioning toward a 2°C pathway, as suggested by the range of related 2040 performance levels shown on the chart, would imply that global emissions peak and steadily fall to close to 1980 levels by 2040. This is daunting, considering the global population may be twice as large, and the world's economy may be five times as large by 2040 versus 1980 levels.

World energy-related CO_2 emissions relative to energy intensity and CO_2 emissions intensity



This chart shows global energy intensity (left axis) and CO_2 emissions intensity (bottom axis).

From 1980 to 2015, there were large gains in efficiency, though energy-related CO_2 emissions rose from 18 to 33 billion tonnes. The blue circle shown for 2040 indicates these emissions are projected to be about 36 billion tonnes even with significant gains in efficiency and CO_2 emissions intensity.

To be on a 450 ppm, or hypothetical 2°C, pathway, the performance in 2040 likely needs to be significantly closer to the purple line, implying faster gains in efficiency and/or faster reductions in CO_2 emissions per unit of energy. This would increase the chance of reaching a 2°C pathway, with further gains required between 2040 and 2100.

The climate challenge – *Key takeaways considering 2°C scenarios*

The review of the Assessed 2°C Scenarios relative to the 2018 *Outlook* suggest several key takeaways:

- To quickly reduce global GHG emissions (including CO₂) toward a 2°C pathway, much more stringent policy interventions, with restrictive impacts on economic and human activities, will be needed.
- Reducing the CO₂ emissions intensity of the world's energy mix remains challenging; the Assessed 2°C Scenarios generally include significant reductions in coal and growing utilization of carbon capture and storage (CCS) technologies for coal, natural gas and bioenergy. The cost-effective availability and deployment of many different technologies is likely to be critical to ensure reliable, affordable energy while also moving toward a 2°C pathway.
- To close the gap, and barring a reduction in projected GDP, much faster improvements in energy intensity and/or CO₂ emissions intensity are required to achieve a 2°C pathway. As the chart at the right illustrates, the Assessed 2°C Scenarios suggest that predicting absolute 2040 energy demand levels in total and by energy type carries significant uncertainty, and further suggest that scenario outcomes may be heavily influenced by technology and policy assumptions.

2040 global demand by model by energy type in the Assessed 2°C Scenarios _{Exajoules}



The climate challenge -

Potential energy implications considering 2°C scenarios

The Assessed 2°C Scenarios produce a variety of views on the potential impacts on global energy demand in total and by specific types of energy, with a range of possible growth rates for each type of energy (adjacent chart). Since it is impossible to know which elements, if any, of these models are correct, we used an average of all 13 scenarios to approximate growth rates for the various energy types as a means to estimate trends to 2040 indicative of hypothetical 2°C pathways.

On a worldwide basis, based on the average of the Assessed 2°C Scenarios' growth rates, primary energy demand is projected to increase about 0.5 percent per year on average from 2010 to 2040. Expected changes in demand vary by energy type by model. Based on the average of the growth rates:

- Oil demand is generally projected to decline about 0.4 percent per year.
- Natural gas demand is expected to increase about 0.9 percent per year.
- The outlook for coal is the most negative, with diverse projections showing an average decline of about 2.4 percent per year, or about a 50 percent decline by 2040.
- The average annual growth rates for renewable energies and nuclear are generally quite strong, averaging between 4 and 4.5 percent for nonbioenergy (e.g., hydro, wind, solar) and bioenergy, and about 3 percent for nuclear.

Ranges of predicted changes in global demand in Assessed 2°C Scenarios 13 models - Average annual growth rates in percent, 2010-2040



This chart illustrates model results of the 13 scenarios showing how energy demand is projected to grow or decline by energy type through 2040.

All energy sources remain important across all 13 scenarios though the mix of energy and technology shifts over time. Oil and natural gas remain important energy types across all 13 scenarios. Oil demand is projected to decline modestly on average, and much more slowly than its natural rate of decline from existing fields. Natural gas demand is projected to grow on average due to its many advantages.

The climate challenge – Potential investment implications

Using the growth rates from the Assessed 2°C Scenarios and a standard baseline for 2010 demand, oil demand is estimated to decline on average from about 95 million barrels per day in 2016 to about 78 million barrels per day in 2040. Estimated demand based on the low and high growth rates ranges from about 53 to 103 million barrels per day in 2040.

Using the same approach for natural gas, demand is estimated to increase on average to about 445 billion cubic feet per day in 2040. Based on the low and high end growth rates, estimated demands ranges from about 265 to 625 billion cubic feet per day in 2040.

Significant investments will be needed in the upstream sector to meet global demand for oil and natural gas. This reflects the fact that natural declines in production from existing fields are higher than a decline in demand, such as is envisioned for oil on average in the Assessed 2°C Scenarios. A large portion of the investments would be needed simply to compensate for the declines at existing fields.

The International Energy Agency, in its New Policies Scenario, estimates cumulative oil and natural gas investment may reach approximately \$21 trillion between 2017 and 2040, including about \$15 trillion in the upstream sector, with about \$10 trillion in the upstream oil sector.







The climate challenge – Seeking practical solutions

Billions of people still lack access to modern energy and technology as they struggle to improve their living standards and reduce the negative health impacts of energy poverty, while billions of others enjoy the conveniences of modern life. Awareness of this enduring disparity is a reminder of the need to expand access to reliable, affordable energy for all, even as parties around the world pursue common ambitions to improve the environment and address the risks of climate change.

Effectively managing the risks of climate change will require practical, cost-effective solutions. Opportunities exist worldwide across all sectors to improve efficiency and reduce energy-related emissions. As noted earlier, these solutions are expected to focus on improving energy intensity or efficiency of economies, as well as reducing the carbon intensity of the world's energy mix.

Boosting energy efficiency

To pursue a 2°C pathway to address the risks of climate change, the need for efficiency gains is likely to ramp up significantly, meaning that capturing the most cost-effective efficiency gains will become even more important in order to spare society an unnecessary economic burden associated with high-cost options to reduce emissions. Boosting efficiency while meeting essential needs for products and services and supporting standard of living improvements will require effective investments and sound policies to promote them. Opportunities to boost efficiency are many and varied, ranging from better equipment (e.g., transportation vehicles, appliances) to electrical distribution networks to better insulation in buildings. Gains are also likely in systems affecting how people live or how businesses operate. Importantly, not all of the same mechanisms apply across all energy sectors.

Shifting the energy mix

Shifting the CO₂ emissions intensity of the energy mix to lower levels, while keeping energy reliable and affordable, also requires investment, with an eye toward opportunities for using less carbonintensive energy sources to meet needs across the range of demand sectors. For example, while bioenergy could be used across all sectors, nuclear energy is limited to the power generation segment.

The table to the right highlights a likely distribution of technologies and other efforts across various energy demand sectors to boost efficiency and lower the CO_2 emissions intensity of energy use.

		Energy De	mand Sec	tors
Pathway levers	Power	Transport	Industry	Buildings
Energy intensity				
Equipment/ Operations	×	x	×	×
Materials		x	x	х
Retrofits				х
Lifestyle choices		х		х
Carbon intensity				
Bioenergy	х	х	x	х
Hydro	х			
Geothermal	х			х
Nuclear	×			
Solar	×			х
Wind	х			
Electrification		x	x	х
Natural gas	×	x	x	х
CCS	х		x	

2018 Outlook for Energy

The climate challenge -Seeking practical solutions (continued)

Adopting policies to promote cost-effective solutions

To help speed the application of practical and costeffective solutions across the entire energy system, open and informed discussions will help clarify the potential and relative value of available options. Further, policy frameworks that promote better transparency on the costs and benefits of various options and rely on market-based solutions should be pursued. As the IEA has noted, clear price signals have advantages, including that "higher prices stimulate consumers to reconsider their energy consumption and make savings where this can be done most cheaply, whereas regulation through mandatory standards may not be the least-cost or most effective approach." 10

The long-term nature of the climate challenge promises an evolution of available solutions. Therefore, policies that promote innovation and flexibility afforded by competition and free markets will be critical to ensuring the world pursues the most cost-effective opportunities.

Investing in research and development to advance technology

Ongoing research and development to spark technological advances will also be important to help minimize the costs of reducing emissions. This will preserve limited financial resources for other needs, including helping to ensure universal access to reliable and affordable energy.

Advancing the application of cost-effective technology solutions around the world will likely be critical to pursue a 2°C pathway, while helping keep energy reliable and affordable for an expanding population. As the chart to the right shows, expanding technology options through ongoing research and development efforts remains important to accelerate the options that can play a role in meeting people's energy needs while reducing the risks of climate change. Such technologies include those related to carbon capture and storage (CCS), advanced biofuels and battery technology. Without robust development of such technology options, the stringency of policies and their related costs to society will prove more burdensome.



Policy / Technology matrix is illustrative only

Technology advances are expected to lower the cost to consumers and taxpayers of reducing GHG emissions like CO₂.

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2018 Outlook for Energy

The climate challenge – Seeking practical solutions (continued)

Keeping options open

Transformation of the world's energy system as envisioned by a 2°C scenario is unprecedented. Therefore, it is understandable that governments, businesses and individuals exercise care in weighing its potential implications. A key consideration is the significant value for society in not prematurely foreclosing options or negating reliable, affordable and practical energy systems that billions of people depend upon.

Practical solutions to the world's energy and climate challenges will benefit from market competition as well as well-informed, well-designed and transparent policy approaches that carefully weigh costs and benefits. Such policies are likely to help manage the risks of climate change while also enabling societies to pursue other high priority goals around the world – including clean air and water, access to reliable, affordable energy, and economic progress for all people.

¹ http://unfccc.int/paris_agreement/items/9485.php

² EMF was established at Stanford in 1976 to bring together leading experts and decisionmakers from government, industry, universities, and other research organizations to study important energy and environmental issues. For each study, the Forum organizes a working group to develop the study design, analyze and compare each model's results and discuss key conclusions. https://emf.stanford.edu/about. EMF is supported by grants from the U.S. Department of Energy, the U.S. Environmental Protection Agency as well as industry affiliates including ExxonMobil. https://emf.stanford.edu/industry-affiliates

³ Energy demand as used in this Outlook refers to commercial and non-commercial energy (e.g., traditional biomass) consumed as a fuel or used as a feedstock for the production of chemicals, asphalt, lubricants, waxes and other specialty products. Coal demand includes metallurgical coal. Gas demand includes flared gas. To avoid double counting, derived liquids (e.g., from gasto-liquids) and synthetic gas (e.g., from coal-to-gas) are only accounted for in their final form (i.e., liquid or gas) and not in the energy type from which they were derived (i.e., gas or coal). The fuel and loss involved in the conversion process is accounted for in the energy industry sub-sector.

⁴ Taking action to address climate change and its impacts is also one of the United Nations' 17 Sustainable Development Goals.

⁵ UNFCCC, Aggregate effect of the intended nationally determined contributions: an update, page 12, http://unfccc.int/focus/ indc_portal/items/9240.php

⁶ Ibid, page 10: "Compared with global emission levels in 1990, 2000 and 2010, global aggregate emission levels resulting from the INDCs are expected to be higher by: 40 (33-47) per cent in 2025 and 44 (34-53) per cent in 2030 in relation to the global emission level in 1990; 35 (28-41) per cent in 2025 and 38 (29-47) per cent in 2030 in relation to the global emission level in 2000; and 13 (7-19) per cent in 2025 and 16 (8-23) per cent in 2030 in relation to the global emission level in 2010."

⁷ IEA, Perspectives for the Energy Transition, page 57

⁸ To understand some of the characteristics of future transition pathways, we analyzed energy and emissions data from a range of EMF27 stabilization, policy and technology targets, primarily focusing on 450 and 550 stabilization targets, as well as no policy cases that utilize a full suite of technologies. The suite of full technologies (FT) includes a range of options, including: energy efficiency, nuclear, carbon capture and storage (CCS), biofuels and non-bio renewables such as solar and wind. The EMF27 study considered other technology-limited scenarios, but a key finding was that the unavailability of carbon capture and storage and limited availability of bioenergy had a large impact on feasibility and cost. Given the potential advantages to society of utilizing all available technology options, we focused on capturing the results of different EMF27 models that ran 450-FT cases; we were able to download data for 13 such scenarios, and utilized that data as provided for analysis purposes (most of the scenarios had projections extending to 2100). Data downloaded from: https://secure.iiasa.ac.at/web-apps/ene/AR5DB

 $^{\circ}$ Based on average Assessed 2°C Scenarios CO₂ emissions (~20 billion tonnes including energy and industrial processes); ExxonMobil GDP assumptions consistent with 2018 Outlook.

¹⁰ IEA, World Energy Outlook 2016, page 290

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2018 Outlook for Energy

Energy matters

As the world's population approaches 9 billion people in 2040, we are challenged to help improve living standards everywhere. We expect that progress will be powered by human ingenuity and the energy that helps make better lives possible.

Meeting energy demand safely, reliably and affordably – while also minimizing risks and environmental impacts – will require expanded trade and investment. It will require innovation and advanced technology. And it will require practical and robust solutions to meet the wide-ranging needs of individuals, businesses and governments.

Understanding the factors that drive the world's energy needs – and likely solutions to meet those needs – is the mission of the *Outlook*. By sharing the *Outlook* with the public, we hope to broaden that understanding among individuals, businesses and governments. Energy matters to everyone, and we all play a role in shaping its future.

ExxonMobil is committed to doing our part. As one of the world's premier technology companies, we are well-positioned to continue providing effective solutions to help meet the world's energy needs while addressing the risks of climate change.





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Energy demand (quadrillion BTUs, unless otherwise noted)									Average annual change	% change	Share	of total
									2016	2016		
Regions	2000	2010	2016	2020	2025	2030	2035	2040	2040	2040	2016	2040
World	404	515	552	579	613	643	665	681	0.9%	23%	100%	100%
OECD	218	224	218	219	220	219	216	212	(0.1)%	(3)%	39%	31%
Non-OECD	186	292	334	360	394	423	449	469	1.4%	40%	61%	69%
Africa	22	29	33	37	42	47	53	59	2.4%	77%	6%	9%
Asia Pacific	123	202	231	250	273	290	305	315	1.3%	36%	42%	46%
China	46	102	118	125	135	141	146	147	0.9%	25%	21%	22%
India	18	27	36	41	49	56	61	66	2.6%	85%	6%	10%
Europe	77	80	75	75	73	72	70	68	(0.4)%	(9)%	14%	10%
European Union	71	72	67	66	64	62	60	58	(0.6)%	(14)%	12%	8%
Latin America	19	25	28	30	32	34	37	40	1.5%	42%	5%	6%
Middle East	17	28	34	37	40	44	46	48	1.4%	40%	6%	7%
North America	110	109	109	110	112	114	113	111	0.1%	3%	20%	16%
United States	93	91	89	90	91	92	91	89	-%	-%	16%	13%
Russia/Caspian	37	42	41	41	41	41	40	40	(0.2)%	(4)%	8%	6%
Energy by type - World												
Primary	404	515	552	579	613	643	665	681	0.9%	23%	100%	100%
Oil	145	164	177	186	195	203	208	211	0.7%	19%	32%	31%
Natural gas	89	116	127	137	149	160	168	175	1.3%	38%	23%	26%
Coal	91	140	141	139	143	141	141	138	(0.1)%	(2)%	25%	20%
Nuclear	27	29	27	31	33	38	42	46	2.3%	72%	5%	7%
Biomass/waste	40	49	54	56	57	57	57	57	0.2%	5%	10%	8%
Hydro	9	12	14	15	16	17	18	19	1.3%	35%	2%	3%
Other renewables	3	7	12	16	21	26	30	36	4.6%	195%	2%	5%
End-use sectors - World												
Tetel	0/	110	11/	100	120	124	120	140	0.00/	220/	1000/	1000/
	70	112	11	122	129	154	10	145	(0.6%)	(12)0/	100%	70/
Natural das	21	74	24	25	26	10	20	20	0.7%	19%	20%	20%
Riemace (waste	20	24	24	25	20	27	20	20	(0.1)9/	(4)9/	20%	20%
Electricity	29	22	26	40	30	50	55	55	2.2%	(4)%	210/	23%
Other	25	52	11	40	45	11	11	11	(0.2)9/	(4)9/	109/	42%
Transportation	10	11	11	11	11	11	11	11	(0.2)%	(4)%	10%	070
Total	77	05	109	110	126	122	127	1/1	1 10/	20%	100%	100%
Oil	75	93	107	110	117	132	12/	126	0.8%	27%	95%	89%
Biofuels	0	2	3	4	4	5	5	6	2.5%	80%	3%	/%
Natural app	0	1	2	2	2	1	5	7	6.2%	221%	10/	476
Other	1	1	1	1	1	2	2	2	1.2%	167%	1%	2%
Inductrial	1	1	1	1	1	2	2	5	4.270	10770	170	270
Total	143	193	205	213	226	237	245	250	0.8%	22%	100%	100%
Oil	44	50	53	55	59	63	66	68	1.1%	29%	26%	27%
Natural das	37	45	50	53	57	61	63	65	1.2%	32%	24%	26%
Coal	26	49	47	47	47	47	46	44	(0.3)%	(7)%	23%	18%
Electricity	22	31	36	39	43	46	50	53	1.6%	46%	18%	21%
Other	14	18	19	19	19	20	20	20	0.2%	5%	9%	8%
Power generation - World												
Primary	145	191	207	217	234	248	262	273	1.2%	32%	100%	100%
Oil	13	11	10	9	8	8	8	7	(1.4)%	(29)%	5%	3%
Natural gas	31	46	52	56	62	67	72	75	1.5%	43%	25%	27%
Coal	61	86	89	88	92	91	93	91	0.1%	2%	43%	33%
Nuclear	27	29	27	31	33	38	42	46	2.3%	72%	13%	17%
Hydro	9	12	14	15	16	17	18	19	1.3%	35%	7%	7%
Wind	0	1	3	5	7	9	11	13	6.0%	308%	2%	5%
Other renewables	4	7	11	13	15	18	20	22	2.9%	98%	5%	8%
Electricity demand (terawatt hours)										. 270	270	570
World	13225	18597	21300	23319	26095	28793	31444	33985	2.0%	60%	100%	100%
OECD	8609	9715	9676	10056	10546	11030	11367	11630	0.8%	20%	45%	34%
Non-OECD	4616	8882	11624	13263	15549	17763	20077	22355	2.8%	92%	55%	66%
	-	-										

Energy demand (quadrillion BTUs, unless of	therwise noted)								Average annual change	% change	Share	of total
OECD									2016	2016		
Energy by type	2000	2010	2016	2020	2025	2030	2035	2040	2040	2040	2016	2040
Primary	218	224	218	219	220	219	216	212	(0.1)%	(3)%	100%	100%
Oil	91	86	85	84	83	81	79	76	(0.5)%	(10)%	39%	36%
Natural gas	47	55	58	60	63	66	67	67	0.6%	16%	27%	32%
Coal	43	42	34	31	27	23	20	17	(2.9)%	(51)%	15%	8%
Nuclear	23	24	20	21	21	21	22	22	0.3%	7%	9%	10%
Biomass/waste	7	9	10	10	10	10	10	10	0.1%	2%	5%	5%
Нуdго	5	5	5	5	5	5	5	6	0.6%	15%	2%	3%
Other renewables	2	4	7	9	11	12	14	15	3.5%	126%	3%	7%
End-use sectors Residential and commercial												
Total	46	50	46	46	46	46	45	45	(0.1)%	(2)%	100%	100%
Oil	9	7	5	4	4	3	2	2	(3.8)%	(60)%	11%	4%
Natural gas	16	17	16	16	16	15	15	15	(0.2)%	(5)%	34%	33%
Biomass/waste	2	3	3	3	2	2	2	2	(0.9)%	(20)%	5%	5%
Electricity	17	21	21	21	22	23	24	24	0.7%	18%	45%	54%
Other	2	3	2	2	2	2	2	2	(0.9)%	(19)%	5%	4%
Transportation												
Total	52	54	57	57	57	57	57	55	(0.1)%	(2)%	100%	100%
Oil	51	52	54	54	54	53	52	50	(0.3)%	(8)%	95%	90%
Biofuels	0	2	2	2	2	3	3	3	1.4%	39%	4%	5%
Natural gas	0	0	0	0	1	1	1	2	10.6%	1022%	-%	3%
Other	0	0	0	0	0	1	1	1	4.1%	163%	1%	2%
Industrial												
Total	68	65	66	67	68	69	69	69	0.2%	4%	100%	100%
Oil	25	24	23	23	24	24	24	23	-%	-%	35%	34%
Natural gas	18	18	20	21	23	24	24	24	0.8%	20%	30%	34%
Coal	8	7	6	5	4	4	3	3	(3.8)%	(60)%	10%	4%
Electricity	12	12	12	12	13	14	14	14	0.8%	20%	18%	21%
Other	4	4	4	5	5	5	5	5	0.2%	5%	7%	7%
Power generation												
Primary	85	90	85	86	86	86	86	85	-%	-%	100%	100%
Oil	6	3	2	2	1	1	1	1	(4.6)%	(68)%	3%	1%
Natural gas	14	20	22	22	24	26	26	27	0.8%	20%	26%	32%
Coal	35	34	27	25	23	20	17	14	(2.7)%	(48)%	32%	16%
Nuclear	23	24	20	21	21	21	22	22	0.3%	7%	24%	25%
Hydro	5	5	5	5	5	5	5	6	0.6%	15%	6%	7%
Wind	0	1	2	3	4	5	6	7	5.0%	224%	2%	8%
Other renewables	3	4	6	7	8	8	9	9	1.6%	46%	8%	11%

General note on data tables: Rounding may lead to minor differences between totals and the sum of their individual parts.

Energy demand (quadrillion BTUs, unless otherwise n	ioted)								Average annual change	% change	Share	of total
Non-OECD									2016	2016		
Energy by type	2000	2010	2016	2020	2025	2030	2035	2040	2040	2040	2016	2040
Primary	186	292	334	360	394	423	449	469	1.4%	40%	100%	100%
Oil	55	78	93	102	112	122	129	135	1.6%	46%	28%	29%
Natural gas	41	61	70	77	86	94	101	108	1.9%	56%	21%	23%
Coal	48	98	107	108	116	118	121	121	0.5%	13%	32%	26%
Nuclear	4	5	7	9	12	17	21	24	5.6%	272%	2%	5%
Biomass/waste	33	40	44	46	46	47	47	47	0.2%	6%	13%	10%
Hydro	4	7	9	10	11	12	12	13	1.6%	45%	3%	3%
Other renewables	1	3	5	8	10	13	16	20	5.8%	284%	2%	4%
End-use sectors Residential and commercial												
Total	50	63	71	76	83	88	93	98	1.4%	38%	100%	100%
Oil	5	5	6	7	7	7	8	8	0.9%	25%	9%	8%
Natural gas	5	7	8	10	11	12	13	13	2.0%	62%	12%	14%
Biomass/waste	27	30	32	33	33	33	32	31	(0.1)%	(2)%	46%	32%
Electricity	6	11	15	18	23	27	32	36	3.7%	141%	21%	37%
Other	8	8	9	9	9	9	9	9	-%	-%	13%	9%
Transportation												
Total	25	41	52	60	68	75	81	86	2.1%	64%	100%	100%
Oil	24	39	49	56	63	68	72	76	1.8%	55%	94%	88%
Biofuels	0	1	1	1	2	2	3	3	3.9%	152%	2%	3%
Natural gas	0	1	1	2	3	3	4	5	5.3%	247%	3%	6%
Other	0	1	1	1	1	1	2	2	4.2%	169%	1%	2%
Industrial												
Total	76	127	139	146	157	168	176	182	1.1%	31%	100%	100%
Oil	19	26	30	32	35	39	42	45	1.7%	51%	21%	25%
Natural gas	19	27	30	32	35	38	40	42	1.4%	40%	21%	23%
Coal	18	42	41	42	43	44	43	42	0.1%	1%	30%	23%
Electricity	9	19	24	26	29	32	35	38	1.9%	59%	17%	21%
Other	10	13	14	15	15	15	15	15	0.2%	5%	10%	8%
Power generation												
Primary	60	101	122	131	148	162	176	189	1.8%	55%	100%	100%
Oil	7	8	8	7	7	7	7	6	(0.8)%	(18)%	6%	3%
Natural gas	17	26	30	33	38	41	45	48	2.0%	61%	25%	26%
Coal	26	52	62	63	69	71	76	77	0.9%	23%	51%	41%
Nuclear	4	5	7	9	12	17	21	24	5.6%	272%	5%	13%
Hydro	4	7	9	10	11	12	12	13	1.6%	45%	7%	7%
Wind	0	0	1	2	3	4	5	7	7.4%	461%	1%	3%
Other renewables	1	3	5	6	8	9	11	13	4.2%	167%	4%	7%

Energy demand (quadrillion BTUs, unless otherwise	e noted)								Average annual change	% change	Share o	of total
Designs	2000	2010	2016	2020	2025	2020	2025	2040	2016	2016	2016	2040
Regions	2000	2010	2016	2020	2025	2050	2035	2040	2040	2040	2010	2040
AFRICA												
Primary	22	29	33	37	42	47	53	59	2.4%	77%	100%	100%
Oil	5	7	8	9	11	12	14	16	3.1%	107%	23%	27%
Natural gas	4	5	6	6	8	9	11	13	3.5%	129%	17%	22%
Coal	3	4	4	4	4	5	5	6	1.4%	39%	12%	9%
Nuclear	0	0	0	0	0	0	1	1	8.1%	549%	-%	2%
Biomass/waste	10	13	15	16	17	18	20	20	1.3%	36%	45%	35%
Hydro	0	0	0	1	1	1	1	1	5.2%	239%	1%	2%
Other renewables	0	0	0	0	1	1	1	1	6.6%	365%	1%	2%
Demand by sector												
Total end-use (including electricity)	19	26	29	32	36	40	45	49	2.2%	69%	100%	100%
Residential and commercial	9	12	14	15	17	19	21	23	2.2%	69%	48%	47%
Transportation	3	4	5	6	7	7	8	9	2.8%	94%	17%	19%
Industrial	7	9	10	11	12	13	15	16	1.9%	58%	35%	33%
Memo: electricity demand	1	2	2	3	4	5	6	7	5.2%	236%	8%	15%
Power generation fuel ¹	4	6	7	8	9	12	15	17	4.1%	163%	20%	30%
ASIA PACIFIC												
Primary	123	202	231	250	273	290	305	315	1.3%	36%	100%	100%
Oil	40	52	61	67	74	79	82	85	1.3%	38%	27%	27%
Natural gas	12	21	27	32	37	42	45	48	2.5%	80%	12%	15%
Coal	43	93	103	104	110	113	116	115	0.5%	12%	45%	37%
Nuclear	5	6	5	8	12	15	18	21	6.2%	325%	2%	7%
Biomass/waste	20	23	25	25	25	24	23	22	(0.5)%	(12)%	11%	7%
Hydro	2	4	6	6	7	7	7	7	1.2%	33%	2%	2%
Other renewables	1	2	4	7	9	11	14	17	5.7%	274%	2%	5%
Demand by sector												
Total end-use (including electricity)	96	153	176	190	206	219	229	236	1.2%	35%	100%	100%
Residential and commercial	31	39	45	48	52	55	57	59	1.2%	33%	25%	25%
Transportation	17	26	34	40	45	49	53	56	2.1%	63%	19%	24%
Industrial	47	88	97	102	109	115	119	121	0.9%	25%	55%	51%
Memo: electricity demand	12	24	32	36	42	47	52	57	2.4%	77%	18%	24%
Power generation fuel ¹	41	76	92	100	112	122	132	140	1.8%	53%	40%	44%
EUROPE												
Primary	77	80	75	75	73	72	70	68	(0.4)%	(9)%	100%	100%
Oil	31	29	27	26	26	25	24	23	(0.8)%	(18)%	36%	33%
Natural gas	17	20	18	17	18	18	18	18	0.1%	3%	23%	26%
Coal	14	13	11	10	9	7	6	4	(3.8)%	(61)%	14%	6%
Nuclear	10	10	9	9	8	8	9	9	-%	-%	12%	13%
Biomass/waste	3	5	6	6	6	6	6	6	0.2%	5%	7%	9%
Hydro	2	2	2	2	2	2	2	2	0.3%	8%	3%	3%
Other renewables	0	2	3	4	4	5	6	6	3.2%	112%	4%	9%
Demand by sector												
Total end-use (including electricity)	59	62	59	58	58	57	56	54	(0.3)%	(8)%	100%	100%
Residential and commercial	18	21	19	19	18	18	17	17	(0.5)%	(11)%	32%	31%
Transportation	17	18	18	19	19	19	18	18	(0.1)%	(2)%	31%	33%
Industrial	25	23	22	21	21	20	20	20	(0.4)%	(9)%	37%	36%
Memo: electricity demand	10	12	11	12	12	13	13	14	0.8%	21%	19%	25%
Power generation fuel ¹	30	32	30	31	30	30	30	29	(0.1)%	(3)%	40%	43%

¹Share based on total primary energy

Energy demand (quadrillion BTUs, unl	ess otherwise not	ed)							Average annual change	% change	Share	Share of total	
									2016	2016			
Regions	2000	2010	2016	2020	2025	2030	2035	2040	2040	2040	2016	2040	
LATIN AMERICA													
Primary	19	25	28	30	32	34	37	40	1.5%	42%	100%	100%	
Oil	9	11	12	13	14	14	15	16	1.1%	29%	44%	40%	
Natural gas	4	6	6	6	7	8	9	11	2.4%	77%	22%	27%	
Coal	1	1	1	1	1	1	1	1	0.4%	10%	4%	3%	
Nuclear	0	0	0	0	0	1	1	1	3.2%	112%	1%	1%	
Biomass/waste	3	4	5	5	5	5	5	5	(0.1)%	(2)%	17%	12%	
Нуdго	2	2	2	3	3	3	3	4	1.7%	50%	8%	9%	
Other renewables	0	1	1	2	2	2	3	3	4.5%	187%	4%	8%	
Demand by sector													
Total end-use (including electricity)	17	22	24	26	27	30	32	34	1.5%	43%	100%	100%	
Residential and commercial	3	4	4	5	5	5	6	6	1.4%	40%	18%	18%	
Transportation	5	7	8	8	9	10	11	11	1.6%	47%	32%	33%	
Industrial	9	12	12	13	13	14	15	17	1.4%	41%	50%	49%	
Memo: electricity demand	2	3	4	4	5	5	6	7	2.6%	86%	15%	20%	
Power generation fuel ¹	4	6	7	8	9	10	11	12	2.0%	62%	27%	31%	
MIDDLE EAST													
Primary	17	28	34	37	40	44	46	48	1.4%	40%	100%	100%	
Oil	10	14	16	17	18	19	19	20	0.8%	21%	48%	41%	
Natural gas	7	13	17	19	22	23	25	26	1.7%	49%	51%	54%	
Coal	0	0	0	0	0	0	0	0	(3.9)%	(62)%	1%	-%	
Nuclear	0	0	0	0	0	1	1	1	14.4%	2426%	-%	2%	
Biomass/waste	0	0	0	0	0	0	0	0	7.6%	485%	-%	-%	
Нуdго	0	0	0	0	0	0	0	0	2.3%	73%	-%	-%	
Other renewables	0	0	0	0	0	0	1	1	9.2%	720%	-%	1%	
Demand by sector													
Total end-use (including electricity)	13	22	27	29	31	34	36	38	1.5%	43%	100%	100%	
Residential and commercial	3	4	5	5	6	6	7	7	1.8%	53%	17%	19%	
Transportation	4	6	8	8	9	9	10	10	1.2%	34%	29%	27%	
Industrial	7	11	14	15	17	19	20	21	1.5%	44%	54%	54%	
Memo: electricity demand	1	3	3	4	4	5	6	6	2.9%	100%	12%	17%	
Power generation fuel ¹	5	9	11	12	14	15	16	16	1.7%	51%	32%	34%	
NORTH AMERICA													
Primary	110	109	109	110	112	114	113	111	0.1%	3%	100%	100%	
Oil	44	43	43	43	44	44	43	42	(0.1)%	(2)%	39%	38%	
Natural gas	26	28	33	34	36	39	39	40	0.9%	23%	30%	36%	
Coal	23	21	14	13	11	10	8	6	(3.3)%	(55)%	13%	6%	
Nuclear	9	10	10	9	9	9	9	9	(0.3)%	(7)%	9%	8%	
Biomass/waste	4	3	3	3	3	3	3	3	(0.2)%	(5)%	3%	3%	
Hydro	2	2	2	2	2	3	3	3	0.9%	24%	2%	3%	
Other renewables	1	2	3	4	5	6	7	7	3.6%	131%	3%	7%	
Demand by sector													
Total end-use (including electricity)	82	82	84	86	89	91	91	90	0.3%	8%	100%	100%	
Residential and commercial	22	23	21	22	22	22	22	22	0.1%	3%	26%	25%	
Transportation	28	30	31	32	32	32	32	31	-%	-%	38%	35%	
Industrial	32	30	31	32	35	36	37	37	0.7%	18%	37%	41%	
Memo: electricity demand	14	16	16	16	17	18	19	19	0.8%	20%	19%	21%	
Power generation fuel ¹	42	43	41	40	40	41	41	40	-%	(1)%	38%	36%	

Energy demand (quadrillion BTUs, unless otherwise noted)									Average annual change	% change	Share of total	
Regions	2000	2010	2016	2020	2025	2030	2035	2040	2016 2040	2016 2040	2016	2040
RUSSIA/CASPIAN												
Primary	37	42	41	41	41	41	40	40	(0.2)%	(4)%	100%	100%
Oil	7	8	9	10	10	10	10	10	0.3%	7%	23%	25%
Natural gas	20	23	21	21	21	20	20	19	(0.4)%	(10)%	51%	48%
Coal	7	7	7	6	6	5	5	5	(1.4)%	(29)%	16%	12%
Nuclear	2	3	3	3	4	4	4	4	1.9%	57%	7%	11%
Biomass/waste	0	0	0	0	0	0	0	0	-%	-%	1%	1%
Hydro	1	1	1	1	1	1	1	1	-%	1%	2%	2%
Other renewables	0	0	0	0	0	0	0	0	9.6%	800%	-%	-%
Demand by sector	20	22	22	22	22	22	22	22	(0.1)0((2)0/	1000/	1000/
lotal end-use (including electricity)	29	33	33	33	33	33	33	32	(0.1)% (0.5)%	(2)%	100%	100%
Residential and commercial	9	9	9	9	9	9	8	8	(0.5)%	(12)%	28%	25%
Industrial	17	20	10	10	10	20	10	10	0.1%	4%	5.8%	60%
Memo: electricity demand	3	4	4	4	5	5	5	6	1.1%	30%	13%	17%
Power generation fuel ¹	19	20	19	19	18	18	18	18	(0,2)%	(6)%	46%	45%
GDP by region (2010\$, trillions)									(0.2).0	(0).0		
World	50	66	77	86	100	115	132	150	2.8%	95%	100%	100%
OECD	38	44	49	53	58	64	70	77	1.9%	56%	64%	51%
Non-OECD	12	21	28	33	42	51	62	73	4.1%	163%	36%	49%
Africa	1	2	2	3	3	4	5	6	3.9%	151%	3%	4%
Asia Pacific	12	19	25	29	36	44	52	61	3.8%	147%	32%	41%
China	2	6	9	12	16	20	24	29	4.8%	205%	12%	19%
India -	1	2	3	3	5	6	8	10	5.9%	299%	3%	7%
Europe	16	19	20	22	24	26	28	30	1.7%	49%	27%	20%
European Union	15	17	18	19	21	23	25	26	1.6%	45%	24%	18%
Middle East	1	2	2	2	2	1	5	7	2.0%	93%	20/	070
North America	15	18	20	22	24	27	31	34	2.3%	71%	26%	23%
United States	13	15	17	18	21	23	26	29	2.2%	70%	22%	19%
Russia/Caspian	1	2	2	2	3	3	3	4	2.1%	65%	3%	3%
Energy intensity (thousand BTU per \$ GDP)												
World	8.1	7.8	7.2	6.7	6.1	5.6	5.0	4.5	(1.9)%	(37)%		
OECD	5.7	5.0	4.4	4.1	3.8	3.4	3.1	2.8	(2.0)%	(38)%		
Non-OECD	15.9	13.7	12.1	10.8	9.5	8.3	7.3	6.4	(2.6)%	(47)%		
Africa	18.6	14.9	13.8	13.1	12.1	11.3	10.5	9.7	(1.4)%	(30)%		
Asia Pacific	10.4	10.7	9.4	8.5	7.6	6.6	5.9	5.1	(2.5)%	(45)%		
China	20.4	16.8	12.5	10.4	8.6	7.1	6.0	5.1	(3.7)%	(59)%		
India	21.3	16.0	14.1	12.3	10.5	8.9	/./	6.5	(3.1)%	(54)%		
European Llaion	4.7	4.2	3./	3.4	3.1	2.8	2.5	2.3	(2.0)%	(39)%		
	4.0	4.3	5.7	5.4	5.6	5.2	2.4	4.5	(2.1)%	(41)/8		
Middle East	12.5	13.1	13.4	12.7	11 7	10.8	9.7	87	(1.8)%	(35)%		
North America	7.3	6.2	5.5	5.0	4.6	4.1	3.7	3.3	(2.1)%	(40)%		
United States	7.3	6.0	5.3	4.9	4.4	4.0	3.5	3.1	(2.2)%	(41)%		
Russia/Caspian	29.5	19.7	18.0	16.5	14.8	13.1	11.7	10.5	(2.2)%	(42)%		
Energy-related CO ₂ emissions (billion tonnes)												
World	23.7	31.1	32.7	33.5	35.0	35.9	36.4	36.3	0.4%	11%	100%	100%
OECD	12.9	12.9	12.2	11.9	11.5	11.2	10.7	10.1	(0.8)%	(17)%	37%	28%
Non-OECD	10.8	18.2	20.5	21.6	23.5	24.7	25.7	26.3	1.0%	28%	63%	72%
Africa	0.9	1.2	1.3	1.4	1.7	1.9	2.2	2.4	2.7%	90%	4%	7%
Asia Pacific	/.4	13.6	15.4	16.2	17.4	18.1	18./	18.9	0.8%	22%	4/%	52%
	3.2	1.9	ö./ 2 2	0.0 2.7	¥.3 3 0	¥.3 2.4	9.2	0.9 1 0	0.1%	∠% 87%	∠1% 70/	∠⊃% 1.7%
Furope	4.4	4.2	2.5	2./	3.4	3.0	4.0	4.5	(1 2)%	(25)%	12%	8%
European Union	4.0	3.0	3.4	3.3	3.1	2.4	2.6	2.7	(1.5)%	(30)%	11%	7%
Latin America	0.9	1.2	1.3	1.4	1.5	1.7	1.8	1.9	1.4%	39%	4%	5%
Middle East	1.1	1.8	2.1	2.3	2.4	2.5	2.6	2.6	0.9%	23%	7%	7%
North America	6.7	6.6	6.2	6.1	6.1	6.0	5.8	5.5	(0.5)%	(11)%	19%	15%
United States	5.8	5.6	5.1	5.1	5.0	4.9	4.7	4.4	(0.6)%	(14)%	16%	12%
Russia/Caspian	2.3	2.5	2.4	2.3	2.3	2.2	2.2	2.1	(0.6)%	(14)%	7%	6%

60

Glossary

Billion cubic feet per day (BCFD): A standard unit used to define volumetric rates of natural gas. One billion cubic feet per day of natural gas is enough to meet about 2 percent of the natural gas used in homes around the world. Six billion cubic feet per day of natural gas is equivalent to about 1 million oil-equivalent barrels per day.

British thermal unit (BTU): A BTU is a standard unit of energy that can be used to measure any type of energy source. The energy content of one gallon of gasoline is about 120,000 BTUs. "Quad" refers to a quadrillion (10¹⁵) BTUs. In the 2018 *Outlook for Energy*, energy content in BTUs for each oil product (e.g., gasoline, diesel, LPG, etc.) is based on its specific energy density.

Conventional vehicle: A type of light-duty vehicle with an internal combustion engine, typically either a gasoline-fueled spark ignition engine or a diesel-fueled compression ignition engine. Conventional includes vehicles with advanced technologies such as turbocharging and "mild hybrid" features such as a stop-start engine.

Exajoule: A joule is a standard unit that can be used to measure any type of energy. 1 exajoule = 10^{18} joules, roughly equivalent to 1 quadrillion BTUs.

Generation efficiency: The ratio of useful energy output to energy input in the generation of electricity from primary energy sources. Generation efficiency typically varies by generation type and region, however wind, solar PV and hydro are assumed to be 100 percent efficient.

Hybrid vehicle: A "full" hybrid is a type of light-duty vehicle that has a battery (usually a nickel metal hydride) and an electric motor, as well as a conventional internal combustion engine. When brakes are applied, the energy of the moving vehicle is stored in the battery and can be used later, thus saving fuel.

Hydrogen fuel cell vehicle: A type of light-duty vehicle for which hydrogen is the fuel and is stored onboard. This hydrogen is passed through a fuel cell that then provides electricity to power the vehicle.

Light-duty vehicle (LDV): A classification of road vehicles that includes cars, light trucks and sport utility vehicles (SUVs). Motorcycles are not included in the light-duty vehicle fleet size or fuel-economy, but the fuel used in motorcycles is included in light-duty transportation demand.

Liquefied natural gas (LNG): Natural gas (predominantly methane) that has been super-chilled for conversion to liquid form for ease of transport.

Liquefied petroleum gas (LPG): A classification of hydrocarbon fuel including propane, butane and other similar hydrocarbons with low molecular weight.

Million oil-equivalent barrels per day (MBDOE): A standardized unit of measure for different types of energy sources (natural gas, coal, etc.) based on energy content relative to a typical barrel of oil. One million oil-equivalent barrels per day is enough energy to fuel about 4 percent of the light-duty vehicles on the world's roads today. Reporting for all energy types in MBDOE is done on an oil-equivalent basis, with the exception of oil products, which are reported in physical barrels.

Natural gas liquid (NGL): A liquid fuel produced chiefly in association with natural gas. NGLs are components of natural gas that are separated from the gaseous state into liquid form during natural gas processing. Ethane, propane, butane, isobutane and pentane are all NGLs.

Organisation for Economic Co-operation and Development (OECD): A forum for about 35 nations from across the world that work with each other, as well as with many more partner nations, to promote policies that will improve the economic and social well-being of people around the world.

Plug-in hybrid electric vehicle (PHEV): A type of light-duty vehicle that typically uses an electric motor. Unlike other electric vehicles, a PHEV also has a conventional internal combustion engine that can charge its battery using petroleum fuels if needed, and in some cases power the vehicle.

PPP: Purchasing power parity.

Primary energy: Includes energy in the form of oil, natural gas, coal, nuclear, hydro, geothermal, wind, solar and bioenergy sources (biofuels, municipal solid waste, traditional biomass). It does not include electricity or market heat, which are secondary energy types reflecting conversion/production from primary energy sources.

Secondary energy: Energy types, including electricity and market heat, that are derived from primary energy sources. For example, electricity is a secondary energy type generated using natural gas, wind or other primary energy sources.

TCF: Trillion cubic feet

Watt: A unit of electrical power, equal to one joule per second. A 1-gigawatt power plant can meet the electricity demand of more than 500,000 homes in the United States. Kilowatt (kW) = 1,000 watts; gigawatt (GW) = 1,000,000,000 watts; terawatt (TW) = 10^{12} watts.

Watt-hour: A unit of electrical energy. 300 terawatt hours is equivalent to about 1 quadrillion BTUs (quad). Kilowatt-hour (kWh) = 1,000 watt-hours; gigawatt-hour (GWh) = 1,000,000,000 watt-hours; terawatt-hour (TWh) = 10^{12} watt-hours.

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The Outlook for Energy includes Exxon Mobil Corporation's internal estimates and forecasts of energy demand, supply, and trends through 2040 based upon internal data and analyses as well as publicly available information from external sources including the International Energy Agency. Third-party scenarios discussed in this report reflect the modeling assumptions and outputs of their respective authors, not ExxonMobil. Work on the report was conducted throughout 2017. This presentation includes forward-looking statements. Actual future conditions and results (including energy demand, energy supply, the relative mix of energy across sources, economic sectors and geographic regions, imports and exports of energy) could differ materially due to changes in economic conditions, technology, the development of new supply sources, political events, demographic changes, and other factors discussed herein and under the heading "Factors Affecting Future Results" in the Investors section of our website at www.exxonmobil.com. This material is not to be used or reproduced without the permission of Exxon Mobil Corporation. All rights reserved.

Exhibit 20

2019 OUTLOOK FOR ENERGY: A PERSPECTIVE TO 2040



11

DUALGHALLENGE

OUTLOOK FOR ENERGY: A PERSPECTIVE TO 2040

The 2019 Outlook for Energy is ExxonMobil's latest view of energy demand and supply through 2040. For many years the Outlook has helped inform ExxonMobil's long-term business strategies, investment plans and research programs.

The Dual Challenge

As energy is essential for human development, society faces a dual challenge: to provide reliable and affordable energy to a growing population, while reducing environmental impacts, including the risks of climate change.

A significant portion of the world's population remains energy-deprived, facing living conditions that would be considered dire by most people in developed countries. Access to modern energy improves a community's quality of life; it is closely correlated to increased life expectancy, reduced poverty and malnutrition, and higher levels of childhood education.

As growing populations gain increased access to energy, rising living standards in many parts of the world will create the largest expansion of the global middle class in history, meaning more demand for homes, transportation, electricity, consumer goods and the energy to power them all. The challenge is to satisfy this growing demand, while reducing the risks of climate change.

Building a perspective

The *Outlook* provides a projection of energy demand through 2040 using the International Energy Agency (IEA) and other credible third-party sources as a foundation. The projection is based on likely trends in technology, policy, consumer preferences, geopolitics and economic development. While these individual trends may vary over time, the snapshot provided by the *Outlook* can help to evaluate society's progress toward addressing both aspects of the dual challenge.

As these trends evolve, we continue to discuss our approach and conclusions with numerous stakeholder groups, economists and policy experts. The *Outlook* team also considers various sensitivities and third-party scenarios from peer-reviewed work to improve our understanding of the energy landscape.

Addressing the dual challenge will have ramifications for every nation's economic, energy security and environmental goals. By sharing our *Outlook* with the public, we seek to broaden understanding of the world's energy system and enrich the dialogue on practical, robust solutions.

ExxonMobil supports the Paris Agreement

The Paris Agreement¹ on climate change declared governments' intentions to reduce greenhouse gas (GHG) emissions as outlined in each country's nationally determined contribution (NDCs). Many states, cities and businesses, including ExxonMobil, expressed support for the aims of the agreement. Our own climate change risk management strategy is described in ExxonMobil's *Energy & Carbon Summary*, which can be found at exxonmobil.com.

Based on the *Outlook* and third-party reports, including the 2018 Emissions Gap Report from the United Nations Environment Programme, we expect that the world is likely to meet, in aggregate, the 2030 Paris Agreement pledges with continued focused efforts, but further work is needed for the world to accelerate progress toward a 2° C pathway.²

Our 2019 Outlook, like the 2018 Outlook, includes a section, "Pursuing a 2°C Pathway", utilizing third-party, peer-reviewed work coordinated by the Energy Modeling Forum at Stanford University³. The discussion in this section highlights the need for enabling technologies and policies, a role for all primary energy sources, and the continued need for focused investments, including in oil and natural gas.

We believe technology holds the greatest potential to help society address the dual challenge. Technology has already significantly improved energy efficiency and helped to unlock diverse and abundant sources of energy. To address the dual challenge, no technology or energy type can be ignored. Instead, the world must harness a variety of energy sources and technology advances, guided by policies that fully reflect the costs and benefits, consumer preferences and the need to provide affordable energy to all.

Progress toward tackling the dual challenge requires thoughtful and meaningful action by everyone - policymakers, business leaders, technologists and consumers. ExxonMobil is committed to doing our part. As one of the world's premier energy and technology companies, we are well-positioned to continue providing safe, reliable energy today and effective solutions to meet the word's future energy needs - all while reducing environmental impacts and mitigating the risks of climate change.

Energy matters to everyone and we all play a role in shaping its future.

KEY TAKEAWAYS OF 2040 PROJECTIONS



Energy is fundamental for modern life

Access to modern energy is intrinsically linked with improvements in quality of life. Over the next few decades, increasing populations and rising prosperity will increase demand for homes, businesses and transportation – and the energy that powers them.



Global energy demand rises by 20 percent; market demand trends differ for OECD and non-OECD

Continued innovation will help OECD economies expand while reducing their energy demand by about 5 percent and energy-related CO_2 emissions by nearly 25 percent. In the non-OECD countries however, energy use and emissions will rise along with population growth, increased access to modern energy and improving living standards.



Global electricity demand rises 60 percent

The trend to further electrify buildings, factories, cars and buses, along with smart appliances and greater automation, spurs the need for more electricity everywhere. Solar, wind and natural gas contribute the most to meeting growth in electricity demand.



Almost half of the world's energy is dedicated to industrial activity

New homes and roads will be constructed and household appliances produced as a result of rising population and urbanization. Steel, cement and chemicals are essential materials to satisfy these needs which, today, are energy-intensive products.



Commerce and trade drive transportation energy consumption up more than 25 percent

Increased on-road efficiency and more electric vehicles will lead to a decline in light-duty vehicle liquid fuel demand. Overall transportation fuel demand growth is driven by increased commercial activity – moving more people and products by bus, rail, plane, truck and marine vessel. Energy-dense, affordable and widely available oil will remain the predominant transportation fuel.



Global energy-related CO₂ emissions peak, but remain above assessed 2°C scenarios

Increased energy efficiency and a shift to lower carbon energy sources will help curb CO_2 emissions, but not sufficiently to reach a 2°C pathway.² Innovative technology solutions and supportive policies are still needed to achieve society's emissions aspirations.

Oil and natural gas remain important energy sources and require significant investment

Oil and natural gas make up about 55 percent of global energy use today. By 2040, 10 of the 13 assessed 2°C scenarios project that oil and gas will continue to supply more than 50 percent of global energy. Investment in oil and natural gas is required to replace natural decline from existing production and to meet future demand under all assessed 2°C scenarios.

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FUNDAMENTALS

Energy is essential for society's progress. Economic expansion and improving access to energy enable longer, more productive lives for the growing global population.

Society's progress is intrinsically related to energy. Access to safe, reliable and affordable energy is a critical enabler of higher living standards, including a longer and healthier life. Today a significant portion of the global population still faces serious challenges in accessing energy on a daily basis, negatively impacting health and preventing many from fully realizing their potential. The challenges become even greater considering that by 2040 the global population is projected to grow to 9.2 billion from 7.5 billion today.

Improving access to energy and a growing global economy will lead to better economic opportunities, higher incomes and improved living conditions for many. As countries move up the human development index, the improving living standards are associated with increased energy use. Today, almost 50 percent of the global population lives in countries that rank low to medium on the U.N.'s human development index. Advancing development for nearly half the world's population creates the potential for significant global energy growth.



GLOBAL FUNDAMENTALS – PROJECTIONS

World demographics continue to shift Billions of people



- By 2040, the global population will reach 9.2 billion people, up from 7.5 billion today; India will soon surpass China as the most populous nation, but the most profound growth is in Africa
- Significant increases in prime working-age population in Africa, India and other Asia Pacific (AP) non-OECD countries contribute to the energy needs of these regions
- The rising youth population in Africa and maturing populations in the OECD and China will also influence the future of the global economy and energy demand
- These demographic trends impact global energy markets with geographic shifts in where and how energy is produced, transported and used



- Economic expansion is a key driver of energy demand. World GDP is projected to nearly double from 2017 to 2040 with the non-OECD growing at more than twice the rate of the OECD
- By 2040, the non-OECD countries will account for about half of global GDP, up from about a third today. China and India's combined growth is nearly the same as the OECD
- The widespread non-OECD economic expansion suggests continued robust demand for energy in these economies
- GDP for the OECD countries grows at a slower pace but from a much higher base than the non-OECD countries.

GLOBAL FUNDAMENTALS – PROJECTIONS

Purchasing power expands

GDP per capita – thousands of purchasing power parity dollars



- Access to modern energy enables economic progress and improves quality of life. As income grows, it enables a family to own a home, purchase labor-saving appliances, pursue an education, travel and obtain needed medical treatment
- As GDP grows faster than population around the globe, average personal incomes rise everywhere, albeit with significant country and regional variations
- By 2040, China GDP per capita is expected to triple and be at about 75 percent of the OECD
- Over the *Outlook* period, India per capita GDP level is likely to grow even faster than China, but remaining below the global average. Africa only achieves an average 50 percent increase

Middle class almost doubles Global middle class – billions of people



Source: The Brookings Institution - Global Economy & Development 2017

- Even though the average income in the non-OECD countries remains lower than in the OECD, there is already a burgeoning middle class that can afford more than the basic necessities of food and shelter. The Brookings Institution foresees continued rapid growth of the global middle class, with billions more people rising out of poverty by 2030
- Asia Pacific represents the largest growth, with India and China each expected to have more than 1 billion middle-class citizens by 2030
- The expanding middle class means billions of people will aim to improve their living conditions and access to energy is a critical enabler for these aspirations

GLOBAL FUNDAMENTALS – PROJECTIONS





- Technology advances and choices by consumers and businesses to use energy more efficiently can moderate growth in energy demand even as the economy expands
- Energy intensity measures the amount of energy used to produce a unit of GDP. Global energy intensity is expected to improve at nearly 2 percent per year from 2017 to 2040, more than double the pace of improvement from 2000 to 2017
- Meanwhile, the carbon intensity of energy (energy-related CO₂ emissions per unit of energy consumed) is also expected to trend down as policies drive efficiency and aim for a lower-carbon energy mix in pursuit of national climate policy goals
- By 2040 the combined effects of lower energy intensity and less carbon-intensive energy sources result in a nearly 45 percent reduction in the carbon intensity of the global economy (tonnes energy-related CO₂ emissions per unit of GDP)

Global efficiency limits demand growth

Energy demand – quadrillion British thermal units (BTUs)



- Hypothetically, if energy intensity remained the same over time, global energy demand would grow in lock step with GDP, almost doubling between 2017 and 2040
- However, global energy demand is projected to grow only by about 20 percent from 2017 to 2040 because continued efficiency improvement lowers the energy intensity of the global economy
- OECD demand is expected to decline about 5 percent from 2017 to 2040 despite about 50 percent GDP growth as efficiency more than offsets the underlying growth drivers
- All of the projected energy demand growth is expected to be from the non-OECD countries, led by China and India. There, the implied energy savings are not enough to offset the inherent demand growth driven by population and economic growth

DEMAND: THREE DRIVERS

Policy. Technology. Consumer preferences. All three impact how the world uses energy. Each driver influences the other. The interplay between these can vary depending on local circumstances (available resources, public support) and can change over time. At ExxonMobil, we're continually studying energy demand and developing models that measure its potential impact — all in an effort to gain a deeper understanding of the interconnectivity of the global energy system.

TECHNOLOGY: Deploying new technology allows society to do more with less. Most successful technologies often have the supporting policy and commercial frameworks to achieve scale. A policy, like tax incentives, can spur development of new TECHNOLOGY technology, but these technologies ultimately need to compete without subsidies to reach a large enough scale to impact global markets. Consumer preferences can also create a "pull effect" that increases demand in the marketplace for new technologies. DEMAND **POLICY:** Shifts in policy can stimulate new 77 technology and influence consumer choices. For example, policies can encourage adoption of new technology (free parking for electric vehicles) or discourage the use of an existing technology (restrictions on coal-CONSUMER POLICY based power). The corollary is also true: PREFERENCES policy not enabled by competitive technology or not aligned with consumer preferences can be difficult to implement because it is hard to mandate something that isn't better than current options in the eyes of the consumer.

CONSUMER PREFERENCES:

Demand for energy begins with the numerous choices consumers make in their daily lives. These preferences can shift as new technology enables options that better meet a consumer's needs, such as lower energy costs and lower emissions. Consumer preferences can also be altered over time by policies that incentivize choices, like a carbon tax that encourages more lower carbon electricity supply.

DEMAND – PROJECTIONS

Global energy demand varies by sector Primary energy – quadrillion BTUs



- Global demand reaches 675 quadrillion BTUs in 2040, up ~20 percent versus 2017, reflecting a growing population and rising prosperity
- Residential and commercial energy demand is flat out to 2040 as efficiency improvements offset the energy needs of a growing population
- Electricity generation is the largest and fastest-growing sector, primarily reflecting expanding access to reliable electricity in developing countries
- Industrial sector growth supports construction of buildings and infrastructure, and manufacturing of a variety of products to meet the needs of the world's population
- Commercial transportation grows with expanding economies, which increase the movement of goods. Personal mobility also expands, but efficiency improvements and more electric vehicles offset the increase in vehicle miles traveled

Energy demand led by non-OECD



Percent of primary energy (percent)

- Global energy consumption continues to shift proportionally to developing economies where population and economic growth are both faster than the global average. Non-OECD share of global energy demand reaches ~70 percent in 2040
- · China and India contribute ~50 percent of the world's energy demand growth to 2040
- Efficiency gains outpace economic growth in the OECD, which helps offset energy demand increases historically linked to economic expansion
- The combined share of energy used in the United States and European OECD nations declines from about 30 percent in 2017 to less than 25 percent in 2040

DEMAND – PROJECTIONS



- Oil continues to play a leading role in the world's energy mix, with growing demand driven by commercial transportation and feedstocks for the chemicals industry
- Natural gas grows the most of any energy type, reaching a quarter of all demand
- Renewables and nuclear see strong growth, contributing more than 40 percent of incremental energy supplies to meet demand growth
- Coal use remains significant in parts of the developing world, but drops below 20 percent global share as China and OECD nations transition toward lower-carbon sources like renewables, nuclear and natural gas
- · Electricity, an energy carrier and not an energy source, grows ~3X faster than overall energy demand

Visit energyfactor.com to learn more about technology and innovations such as our cogeneration operations generating electricity and heat that are helping make operations more energy efficient.

TRANSPORTATION – PROJECTIONS

Commerce and trade drive transportation energy consumption up more than 25 percent

Over the past few decades the movement of people and goods has grown dramatically, driven by vast growth in the purchasing power of individuals. Likewise, technology advancements have provided new and more efficient mobility options.

Global transportation demand is driven by differing trends for commercial transportation and light-duty passenger vehicles. As economic activity expands, especially in developing regions, commercial transportation is expected to grow. The majority of the growth comes from heavy-duty trucking as a result of goods movement, but increased aviation travel also plays a role as individual purchasing power expands.

Passenger vehicle ownership is expected to expand as a result of the dramatic growth in the middle class and increased urbanization, leading to increased passenger vehicle travel. The fuel mix continues to evolve with more alternatives, like electric vehicles (BEV and PHEV).

In the 2018 Outlook, hypothetical sensitivities for light-duty demand showed that for every additional 100 million EVs on the road, liquids demand could fall by ~1.2 million barrels per day in 2040. In a 100 percent light-duty EV sensitivity by 2040, light-duty liquids demand could see 100 percent displacement while growth in chemicals and commercial transportation offset much of the decline resulting in similar liquids demand as seen in 2013. This 100 percent EV sensitivity by 2040 would require all passenger vehicle sales to be electric starting in 2025. Transportation energy demand growth driven by commerce Global sector demand – million oil-equivalent barrels per day (MBDOE)



- Global transportation-related energy demand is expected to grow by more than 25 percent from 2017 to 2040
- Personal vehicle ownership continues to grow as purchasing power rises, however, higher efficiency and more electric vehicles lead to a peak and decline in light-duty vehicle energy demand in the mid-2020s
- Commercial transportation (heavy-duty, aviation, marine and rail) energy demand is driven by growth in economic activity and personal buying power, which drives increasing trade of goods and services
- Aviation demand sees the highest annual growth rate at 2.2 percent from 2017 to 2040 due to both rising economic activity as well as rapid growth of the middle class, specifically in emerging economies

TRANSPORTATION – LIGHT-DUTY PROJECTIONS



- When individual purchasing power increases, access to personal mobility also increases, driving growth of the global fleet of light-duty vehicles and motorcycles
- Motorcycles offer a lower-cost entry point to personal mobility, with ownership and growth particularly high in Asia Pacific
- Increasing access to vehicles drives a worldwide increase in personal mobility-related energy demand growth, with Asia Pacific leading the growth
- In the OECD (such as U.S. and Europe), while the number of cars per 1,000 people increases by about 10 percent, passenger vehicle fuel demand declines about 30 percent on average as a result of efficiency gains and powertrain diversification



- In 2017, the global fleet was about 1.1 billion vehicles, with ~3 million (0.3 percent) of the fleet being plug-in hybrids, battery electric & fuel cells
- By 2040, these advanced vehicles grow to over 20 percent of the fleet (~420 million) and nearly 30 percent of new car sales, driven by decreasing battery costs and policies for tailpipe emissions, efficiency and energy independence for importing countries
- Light-duty vehicle demand for internal combustion engine (ICE) fuels are projected to peak prior to 2025 and then decline to levels seen in the early-2010s by 2040
- The reduction in fuel demand, while driven in part by electrification, is mostly connected with efficiency gains across all vehicle types

TRANSPORTATION – COMMERCIAL TRANSPORTATION PROJECTIONS

Global transportation energy demand relative to GDP Index, 1990=100



- Historically, commercial transportation services (e.g. ton-miles of freight, passenger-miles of air travel) demand growth tracks with GDP and economic growth
- As GDP continues to grow, especially in developing nations, there will be increased demand for goods and services
- Recent accelerated decoupling of the trends for GDP and commercial transportation demand has been observed and is expected to continue as a result of fuel switching and efficiency improvements (e.g., mode shifting, engine improvements or logistical improvements)
- Continued improvements in efficiency will moderate commercial transportation energy demand associated with expanding economic activity.



- The largest growth in commercial transportation services is observed in the non-OECD countries, driven by increases in population and GDP
- While all regions see some increased demand, Asia Pacific leads the growth, rising to 40 percent of commercial transportation energy demand
- All modes of commercial transport grow over the *Outlook* period, with heavy-duty trucking accounting for over 50 percent of the growth through 2040
- Electrification plays a role in certain applications (e.g., short-haul trucks and buses), but electricity in commercial transportation grows slowly due to upfront costs, range limitations, payload requirements, and the pace of infrastructure development

TRANSPORTATION – HEAVY-DUTY LANDSCAPE

Heavy-duty transportation demand is driven by economic activity, which leads to increased commerce and movement of goods across oceans, nations, and cities. Fuel demand in this sector is influenced by the type of truck and its use, so understanding fleet dynamics and fuel usage is important for projecting future demand. For example, a light commercial vehicle (LCV) for intra-city deliveries has different energy needs versus a heavy commercial vehicle (HCV) for cross-country shipments of goods. Additionally truck fleets can be quite different from region to region based on the distribution of various sector and economic needs, such as heavy industry, manufacturing or resource extraction.



2015 Heavy-duty fleet/fuel usage mix



Source: IEA The Future of Trucks, 2017, EM analyses

- Fleet breakdown and truck usage play a critical role in understanding the types of alternate fuels available for substitution in trucking
- In 2015, HCV long-haul trucks made up ~15 percent of the fleet, but used ~55 percent of the fuel for trucking driven by the heavy loads carried over long distances

TRANSPORTATION — HEAVY-DUTY SENSITIVITY

We use sensitivity analyses to provide greater perspective on how changes to our base *Outlook* assumptions could affect the energy landscape. Our hypothetical sensitivities explore different fuel efficiency trends in a higher demand case as well as deep penetration of alternatives, such as electricity, biofuels, gas and hydrogen in a lower demand case



• The base Outlook assumes that future efficiency improves on average at double the historical rate from 2000 - 2016, and that alternative fuels grow to ~13 percent of demand

- In comparison, the high demand sensitivity above assumes future efficiency improves only at the historical rate, which could increase demand ~30 percent versus the base Outlook, and highlights the need for continued technology investments in efficiency improvements
- The low demand sensitivity assumes a deeper penetration of alternative fuels with accompanying efficiency gains. The penetration assumptions vary by truck type and usages. LCVs see nearly 100 percent penetration of EVs due to shorter, start/stop routes, MCVs see 70 percent alternative fuels, and HCVs see ~20 percent alternatives, mostly biofuels due to the need for high energy density fuels in long-haul trucks. This sensitivity would require a rapid acceleration in the early 2020s of both alternate fuels into the heavy-duty fleet as well as infrastructure build-out to support the alternatives. The resulting fuel penetration is ~3x the base *Outlook* in 2040, with traditional fuel demand peaking prior to 2025 before declining to mid-2000s levels
- The impact on total liquids demand from the high sensitivity shows liquids demand could be ~7 percent above the base Outlook, while in the low demand sensitivity total liquids demand could peak in the mid-2030s as growth in chemicals, aviation and marine are offset by the heavy-duty decline
- These hypothetical sensitivities highlight the difficulty of decarbonizing heavy-duty transportation and the need for further technology development on economic, lower-carbon solutions
RESIDENTIAL AND COMMERCIAL – PROJECTIONS

As populations grow and prosperity rises, more energy will be needed to power homes, offices, schools, shopping centers and hospitals.

Combined residential and commercial energy demand is projected to rise by around 20 percent through 2040. Led by the growing economies of non-OECD nations, average worldwide household electricity use will rise about 25 percent between 2017 and 2040.

Energy efficiency plays a big role in constraining energy demand growth within the residential and commercial sectors as modern appliances, advanced materials and policies shape the future.





 In addition to the energy people need to heat or cool their homes and keep appliances running, this sector also includes the energy required in hospitals, schools, grocery stores, retail shops, offices, sports facilities and cultural centers

- With rising prosperity and expanding commercial activity comes an increased demand for lighting, heating, cooling and power in homes and offices of around 20 percent by 2040
- Strong middle-class growth in non-OECD nations increases energy demand by more than 35 percent. Improving building efficiencies lower energy demand in OECD countries by about 5 percent
- · Globally, electricity supplies the entire net demand increase

RESIDENTIAL AND COMMERCIAL – PROJECTIONS

Household electricity up in non-OECD Residential electricity intensity Megawatt hours per household per year



- Residential electricity use is expected to rise about two-thirds by 2040 as a substantially increased middle class seeks to improve health, security and comfort at home
- The annual electricity use per household in non-OECD countries rises about 60 percent with residential electricity use in India and China expected to grow strongly, bringing electricity consumption per household close to the European average by 2040
- Electricity use per household in OECD nations will be stagnant or declining as more efficient appliances help limit electricity requirements

Residential energy fuel use varies across regions Quadrillion BTUs



- Efficient buildings, appliances and consumer products lead to a decrease of residential demand in North America and Europe increasingly met by electricity
- More households, urbanization and rising living standards in developing nations lead to continued energy increases
- While most developing nations transition away from traditional biomass (such as wood and charcoal) with improved access to LPG, electricity and gas, Africa's rising population and insufficient supplies of alternative sources increase its biomass use

INDUSTRIAL – PROJECTIONS

Almost half of the world's energy use is dedicated to industrial activity

As the global middle class continues to grow, demand for durable products, appliances and consumable goods will increase. Without exception, industrial activities are required to manufacture these products and their components. Industrial activities, such as textile manufacture, car assembly or creation of construction materials, take place in almost all regions, and for all this activity energy is required.

Industry grows in emerging markets, like India, Southeast Asia, the Middle East and Africa. Industry also evolves in OECD nations as businesses and consumers strive to reduce their environmental impact by using energy more efficiently.

Industrial growth takes energy. It also takes innovation. This *Outlook* anticipates technology advances, as well as the increasing shift toward cleaner sources of energy such as electricity and natural gas. The industry of the future will be more energy efficient and less carbon intensive than it is today.



INDUSTRIAL – PROJECTIONS

Industrial sector energy supports economic progress



- The industrial sector provides more than a billion jobs for people who work to feed, clothe, shelter and improve the lives of people around the world
- Rising population and prosperity trigger demand for modern cities, medical equipment, mobility and home appliances that underpin the need for steel, cement and chemicals
- In 2017, the industrial sector used about half the world's electricity and nearly as much primary energy as the transportation and residential/commercial sectors combined
- Increased options for consumers to 'reduce, reuse, recycle' and manufacturers' efforts to improve industrial processes and efficiency can conserve fuel and mitigate emissions
- Heavy industry (steel, cement, metals and manufacturing) and chemicals (plastics, fertilizer and other chemical products) are expected to account for 85 percent of growth to 2040

Oil, gas and electricity fuel industrial growth World - quadrillion BTUs



- Industry uses energy products both as a fuel and as a feedstock for chemicals, asphalt lubricants, waxes and other specialty products
- Oil, natural gas and electricity each contribute about one-third of industrial energy growth to 2040
- Oil grows because it is particularly well-suited as a feedstock; companies choose natural gas and electricity for their versatility, convenience and lower direct emissions
- Coal is expected to continue to play a role in steel and cement manufacturing but its use declines as nations and businesses strive to reduce their environmental impact
- Shifting to lower-carbon fuels holds the industrial sector's 2040 direct emissions at about the same level as 2017 even as energy demand increases by around 15 percent

INDUSTRIAL – HEAVY INDUSTRY PROJECTIONS

Heavy industry energy intensity improves Thousand BTUs per dollar of GDP



- Heavy industry energy intensity measures the amount of energy used in heavy industry and manufacturing per dollar of overall economic activity (GDP)
- Producing more value with less energy has a positive impact economically and environmentally for manufacturing companies and countries
- OECD nations have lower energy intensity due to their service-based economies and predominance of higher-value, energy-efficient industries
- China's intensity spiked as it invested in infrastructure and heavy industry; recently its intensity has been improving rapidly as its economy matures and efficiency increases
- Optimizing energy use via advances in technology, processes and logistics can help companies remain competitive and contribute to gains in global energy-intensity

Heavy industry transitions toward cleaner fuels 2017-2040 change in quadrillion BTUs



- Manufacturing tends to gravitate toward regions with access to abundant, affordable energy, an able workforce and balanced policies
- Each region's fuel mix differs based upon its unique blend of manufacturing activity and the relative availability and cost of its energy sources
- · Electricity use is expected to grow; it is ideal for motors, robotics and process controls
- Natural gas is expected to give a competitive edge to resource-rich areas of Africa, the Middle East and Latin America; it also helps China manage its air quality
- Coal's use declines in the OECD and China but doubles in coal-producing India and
 the rest of Asia because of coal's abundance and affordability relative to other fuels

INDUSTRIAL – CHEMICAL PROJECTIONS

Consumer demand boosts chemicals energy growth Quadrillion BTUs



- · Chemicals are the building blocks for a wide variety of products people rely on every day
- Demand for fertilizer, adhesives, cosmetics, textiles and plastics used in medical devices, cars, computers and other basic home goods spur chemicals growth
- Asia Pacific's chemicals production grows to meet the needs of its rising middle class
- Investors in the U.S. and Middle East chemicals production are expected to tap abundant, affordable energy supplies (used as feedstock and fuel) to gain competitive advantage
- Europe, Russia, South Korea and Japan remain important contributors to global chemicals production

Chemicals production relies on oil and natural gas World – quadrillion BTUs



- The chemical industry uses hydrocarbon products as both a feedstock and a fuel
- Naphtha and natural gas liquids are primarily used as feedstock; natural gas is used as both a feedstock (notably for fertilizer) and a fuel
- Natural gas liquids consumption almost doubles from 2017 to 2040, as unconventional oil and natural gas production in the United States expands supply
- Naphtha is expected to remain the dominant feedstock in Asia; the Middle East is expected to rely on natural gas liquids and natural gas
- Advances in plastic materials and chemical processes can save energy as the industry continues to meet rising consumer demand for high-performing products

ELECTRICITY AND POWER GENERATION – PROJECTIONS

Global electricity demand rises 60 percent

Since it first started lighting homes in the late 1800s, electricity has provided the means to boost economic productivity and improve the human condition with modern conveniences like electric motors, air conditioning and refrigeration. Power generation has witnessed transitions in fuel sources from coal to nuclear and gas, and now we are harnessing wind and solar energy. The growth of new energy sources is impacted by factors such as technology cost improvements, the availability and quality of domestic resources, and government policies.

Electricity demand is expected to grow around the globe, supplied primarily by growth in wind, solar, natural gas-fired generation and nuclear. Besides meeting residential, commercial, and industrial demand, the increase in electricity demand is also fueled by the growth of electric vehicles in light-duty transportation. Cost reductions in transportation batteries are being leveraged for other applications including larger-scale electricity storage.

Today, batteries represent a small share of installed capacity on the grid, and are used for short-duration storage. The increased variable production from weather-dependent wind and solar triggers additional transmission build-out, storage and flexible gas peaking generation but results in reduced asset efficiency. Further breakthroughs that provide new solutions deployable at commercial scale to maintain reliable and affordable electricity for consumers are needed.

Electricity generation highlights regional diversity

Net delivered electricity – thousand TWh



- The mix of electricity generation varies geographically as a result of technology costs, domestic resource availability and policy targets (e.g., renewable portfolio standards for local generation)
- Much of the world continues to shift further to lower-carbon sources for electricity generation, led by wind and solar, natural gas and nuclear, based on local opportunities and policies
- In 2017, coal-fired generation was the leading source of electricity production (accounting for over 45 percent in non-OECD countries). While China's coal-fired electricity remains nearly constant to 2040, its share in power generation decreases as renewables and nuclear provide almost 85 percent of the delivered electricity growth
- The share of electricity use into transportation is small today, but is expected to grow with increasing penetration of electric vehicles as a result of emissions/fuel economy targets and cheaper batteries

ELECTRICITY AND POWER GENERATION – PROJECTIONS

Renewables and natural gas dominate growth Global growth 2017-2040 – thousand TWh (net delivered)



- Wind and solar generation grow the most to 2040, supported by technology cost reductions (particularly for solar) and policies targeting lower CO_2 emissions
- Natural gas grows significantly; OECD growth is partially due to coal-to-gas switching, while half of the non-OECD growth is in gas-producing Africa and the Middle East
- China accounts for nearly 70 percent of all nuclear growth. OECD growth nets to near zero as expected nuclear restarts in Japan are offset by phase-out of nuclear in other OECD nations due to concerns about costs and safety
- Coal-fired generation grows in the non-OECD, primarily in Asia Pacific countries with domestic resources, growing electricity demand and favorable economics

Renewables penetration increases across all regions Wind/Solar share of delivered electricity percent – share of TWh



- Wind and solar grow across the globe, but penetration in 2040 varies based on natural resource quality and varying levels of policy support. Globally, wind and solar's share of delivered electricity grows significantly from about 6 percent in 2017 to about 20 percent in 2040
- In 2040, wind and solar are expected to deliver 25 percent or more of electricity in Europe and North America, contributing to renewables policy goals
- Renewables growth in Asia Pacific contributes to local air quality improvements and energy security goals
- Up to 20-30 percent wind and solar penetration can be achieved without significant additional costs to the power grid. Higher penetration levels incur additional costs to manage intermittency through flexible backup generation, transmission build-out and storage to ensure reliable electricity delivery

ELECTRICITY AND POWER GENERATION – CONSIDERATIONS

Wind and solar are potential solutions for lower-emission power generation, but the quality of resources varies geographically, even within national borders. These resources are also not always located near high population areas demanding electricity, requiring additional transmission and distribution infrastructure. Technology choices used in power generation can be compared by looking at the cost plus return on capital to generate a unit of electricity, known as the levelized cost of energy (LCOE). This cost is impacted by factors including the cost for the equipment, maintenance, fuel, financing terms and tax incentives. As shown below, resource quality variation can lead to a 2-3 fold increase in cost due to location. Assessing the optimum mix of power generation technologies is a local evaluation because cost factors and policies can vary greatly between sites even within a country.



ELECTRICITY AND POWER GENERATION – NATURAL GAS SENSITIVITY

Similar to the transportation sector, we use sensitivity analyses to provide greater perspective on how changes to our base *Outlook* assumptions in the power generation sector could affect the energy landscape.

Power generation modeling is complex with a number of questions to explore for both demand growth and supply mix, including:

- How will electricity access expand in developing nations?
- How will technology evolve to enable more electricity use in other sectors (e.g., EVs for personal mobility instead of gasoline-fueled cars or mass transit)?
- How will developing nations transition off coal if it is their lowest cost supply today?
- Will perceptions about nuclear safety challenge new builds in some countries?
- What is the optimum penetration of variable renewables before intermittency challenges create reliability and cost impacts for power grids?

There are a number of different potential outcomes for each of these questions that could yield different projections. The top chart shows outcomes for different third-party models, including some deep decarbonization scenarios like the IEA's Sustainable Development Scenario (IEA SDS). These results describe a range of potential outcomes with some common trends:

- Electricity demand grows significantly from today to 2040
- · Zero-carbon power generation grows 2-3x due to cost competitiveness and policies
- Gas use for electricity grows in all cases except the IEA SDS, accompanied with coal's decline primarily in developed countries

The bottom chart is a sensitivity to test the impact of alternate assumptions on natural gas:

- Lower cost wind and solar with efficient storage to manage their inherently variable production could increase penetration to 50 percent of supply (more than 2x the base Outlook). Ratable reductions in both coal and natural gas by region could reduce global natural gas demand by ~115 BCFD
- Decline in coal-fired generation occurs predominantly in developed countries out to 2040. Switching 50 percent of the remaining coal to natural gas to address issues such as air quality and emissions could increase natural gas demand by over 20 percent

Monitoring technology advancements, market behavior and the evolving policy landscapes can identify signposts related to cost reduction, technology deployment and policy targets indicating how a different outcome may materialize.

Views of the electricity supply mix vary based on assumptions Supply of electricity - Thousand TWh









Natural gas volume represents both power generation and non-power sector demand Shaded ranges are indicative of potential shifts in demand relative to base *Outlook*

SUPPLY – PROJECTIONS

Energy - in all its forms - enables growth and prosperity. As economies grow, as technology advances, as consumers become more environmentally aware and as policies adapt, global energy demand will evolve to meet changing needs.

The supply mix to meet rising consumer demand will be increasingly diverse, leveraging a wide range of economic energy sources. Renewables - wind, solar, biofuels, hydro and geothermal energy - together with carbon-free nuclear energy are expected to grow at the fastest pace. Oil and natural gas (and even coal) continue to play a significant role in providing reliable, affordable energy the world needs to sustain global economic progress.

From the industrial revolution to the shale revolution and the rise of modern renewables, innovators, engineers and entrepreneurs have tackled tough challenges to unlock new energy sources - and we expect they will continue to do so.



SUPPLY – PROJECTIONS

Energy supply evolves to meet demand projections

2040 global demand by fuel – quadrillion BTUs



- Technology improvements help achieve more efficient fuel use and lower emissions intensity across all sources of supply
- · Oil remains the largest source; essential for commercial transportation and chemicals
- Natural gas demand rises the most, largely to help meet increasing needs for electricity and lower-carbon industrial heat
- Lower carbon energy sources including wind/solar, biofuels and nuclear increase at the fastest pace
- Coal is still prominent in some non-OECD countries, however global consumption likely peaked in 2013, as the OECD and China shift to lower-carbon energy sources

Global energy supplies vary by sector End-use energy - quadrillion BTUs



- The energy mix to meet rising demand while also addressing environmental impacts, including the risks of climate change will vary by sector
- Oil remains essential for transportation, where growing commercial transportation still relies on liquid fuels to meet more than 90 percent of demand
- With a drive for cleaner and more efficient operations, the industrial sector relies primarily on electricity and natural gas for growth; industrial oil demand grows as a feedstock for chemicals, asphalt, lubricants and other specialty products
- Electricity demand rises in all end-use sectors while the mix of fuel supply for electricity generation is shifting to lower-carbon sources

Primary energy - guadrillion BTUs

LIQUIDS – PROJECTIONS

Liquids are projected to remain the world's leading energy source in 2040, even as demand growth slows beyond 2030.

Commercial transportation and chemicals sectors where liquid fuels are favored for their high energy density and distinctive chemical properties - drive liquids demand growth. Overall, demand for liquids is expected to rise about 16 million barrels per day by 2040 with almost all of the growth in the emerging markets of Asia, Africa, the Middle East and Latin America.

New investments in oil production - and in technologies to improve recoverability, enhance efficiency and reduce cost - are needed to offset natural production decline and meet rising demand. Much of the growth in liquids production is expected to be from sources of supply that have been unlocked by technology advances in the past two decades: North American tight oil and the natural gas liquids associated with unconventional oil and gas production, deepwater projects offshore Brazil and Guyana, and Canadian oil sands, for example.

Continued investment in conventional crude and condensate is required too as the Middle East and Russia/Caspian remain significant oil producing regions helping meet the needs of consumers worldwide. Liquids demand driven by transportation and chemicals By region and sector – MBDOE



- Global liquids demand growth is concentrated in developing nations, with Asia Pacific accounting for about 65 percent of global growth by 2040
- Efficiency gains and fuel switching in Europe reduce liquids demand by about 20 percent from 2017 to 2040, led by a reduction of about 55 percent in light-duty vehicle liquids demand
- Chemicals and commercial transportation sectors make up nearly all of the liquids demand growth, with these sectors growing about 60 percent and 40 percent, respectively to 2040

LIQUIDS – PROJECTIONS

Liquids supply highlights the need for investment Global liquids supply by type – MBDOE



Liquids supply highlights regional diversity By region and type – MBDOE



- The supply of existing oil production naturally declines at an estimated 7 percent per year without further investment. Significant investment is needed to offset this natural decline and meet the projected demand growth
- In 2017, conventional crude and condensate made up about two-thirds of the liquid supply. By 2040, new investment is expected to have diversified oil supply such that only about half of liquids will come from these conventional sources
- Tight oil is also rich in Natural Gas Liquids (NGLs), so tight oil growth brings significant new supplies of NGLs
- Biofuels grow more than 70 percent with increasing demand for lower-carbon liquid fuels and technology advancements that reduce costs and land-use

- North America tight oil and associated NGLs production nearly doubles between 2017 and 2025. This significant growth swings North America to a net exporter of liquids
- After 2025, new deepwater supplies from Latin America and conventional crude from
 the Middle East grow to meet global demand
- The Middle East and Russia/Caspian will continue to invest in conventional oil production to maintain their role as leading exporters, at about two-thirds of their production in 2040
- Asia Pacific remains the largest and fastest growing region for liquids demand, and relies on increasing imports to supply the strong demand

NATURAL GAS - PROJECTIONS

Natural gas plays a vital role in satisfying the energy needs of consumers worldwide while helping to mitigate the risks of climate change.

Choosing natural gas as a cleaner-burning alternative to coal improves air quality and reduces carbon intensity.

Natural gas is abundant and versatile. It is a reliable and flexible fuel for electricity generation, a cleaner industrial fuel and convenient for home use. Natural gas grows more than any other energy source, rising from 23 percent of global energy supply in 2017 to 26 percent in 2040.

Natural gas resources are geographically and geologically diverse. North America's unconventional gas resources are produced by applying horizontal drilling and hydraulic fracturing technologies. The Middle East and Africa are expected to tap large conventional natural gas resources. Natural gas production is expected to grow in every region except Europe.

Natural gas trade is a critical link between resource-rich regions and demand centers in Asia Pacific and Europe. New liquefied natural gas export projects are expected to diversify the market and meet 40 percent of the growth in natural gas demand to 2040. Reliable natural gas grows in every sector World – BCFD



- Natural gas is well-suited for homes, businesses and electric utilities seeking versatile, cleaner-burning energy
- Abundant and convenient, natural gas grows more than any other source of primary energy during the Outlook period
- Half of the growth in natural gas demand is for electricity generation and one-third is for industrial use
- Residential users rely on natural gas for heating and cooking
- Increased penetration of natural gas-fueled buses and trucks can help urban areas manage air quality

NATURAL GAS - PROJECTIONS

Natural gas is growing, but coal is still predominant in non-OECD Asia 2040 - Quadrillion BTUs



- Natural gas rises in prominence as a cleaner burning alternative to coal over the *Outlook* period
- In China and Other AP non-OECD together, gas demand more than doubles from 2017 to 2040, but coal still plays a significant role in the region
- Coal demand doubles in Other AP non-OECD, partially offsetting major strides to reduce the use of coal in the OECD and China
- Outside of Asia Pacific, many developing countries are expected to leverage domestic natural gas supplies to meet rising electricity demand and fuel industrial growth





- In 2040, coal is expected to meet just 20 percent of global energy demand but produce more than 35 percent of energy-related CO₂ emissions
- With the same boiler efficiency, burning natural gas to produce heat emits about 40 percent less \mbox{CO}_2 than burning coal
- Choosing flexible, highly efficient gas-fired electricity generation to replace older, inefficient coal plants can reduce CO₂ emissions by up to 60 percent while also producing fewer air pollutants
- Every 1 percent of global primary energy shifted from coal to natural gas can reduce energy-related CO_2 emissions by nearly 1 percent in 2040

NATURAL GAS – PROJECTIONS



- Rising global demand, competitive new projects in diverse locations and robust trade will shape future natural gas supplies
- North America's abundant unconventional gas is expected to feed new LNG projects and meet growing local demand
- Africa's natural gas production, demand and exports are poised to accelerate, led by Mozambigue, Nigeria and Egypt
- Russia/Caspian and the Middle East together are anticipated to retain more than half of inter-regional gas trade by further investing in export projects; both regions are well positioned to expand pipeline exports in addition to LNG trade
- Europe is likely to increasingly rely on natural gas trade to meet consumer demand as local production declines
- In 2017, Asia Pacific's natural gas imports rivaled Europe's; by 2025, the region's total natural gas demand will likely surpass North America's; and in 2040, LNG trade is expected to meet nearly half of Asia Pacific's natural gas demand



Share of supply growth 2017-2040

NATURAL GAS – PROJECTIONS

Asia Pacific and Europe benefit from LNG imports BCFD LNG Imports



Diverse natural gas supplies underpin new LNG exports BCFD LNG Exports



- In 2017, LNG trade met about 10 percent of global natural gas demand; by 2040, LNG trade will meet nearly 20 percent of the world's natural gas needs
- Asia Pacific absorbs about 80 percent of the growth in LNG from 2017 to 2040, helping the region to reduce its carbon intensity while sustaining economic growth and improving lives
- China's 'war on smog' and 'blue-sky' policies have led to measurable improvements in urban air quality while boosting demand for LNG imports
- India and other Asia Pacific importers are expected to look to LNG to supplement domestic natural gas production, often leveraging existing natural gas infrastructure
- · Europe is expected to tap competitive LNG to diversify its natural gas import portfolio

- In 2017, 85 percent of LNG exports originated in Asia Pacific, the Middle East or Africa
- North America's LNG exports are projected to grow the most as low-cost unconventional gas production prompts investment
- · East Africa, Qatar and Russia projects are expected to expand and diversify LNG exports
- The LNG market is expected to remain highly competitive due to abundant natural gas resources and many aspiring exporters
- The diversity and reliability of LNG supplies combined with the flexibility to ship it where it is needed make LNG a favorable choice for nations needing dependable, lower-emissions energy sources to foster economic growth

NATURAL GAS - PROJECTIONS

Technology expands recoverable resources World – thousand trillion cubic feet (TCF) Remaining by type 40 Coalbed methane Shale 30 Conventional Tight 20 Remaining resource Remaining by region Asia Pacific North America 10 Latin America Cumulative production Russia/Caspian Europe 0 2000 2017 Africa Middle East Source: IEA 2001 & 2018 World Energy Outlook

- Natural gas resource estimates keep rising as technology unlocks resources previously considered too difficult or costly to produce
- Less than 15 percent of recoverable natural gas resources have been produced
- Remaining natural gas resources can provide about 200 years of supply at current demand
- About 45 percent of remaining natural gas resources are from unconventional sources like shale gas, tight gas and coalbed methane
- Natural gas resources are geographically widespread

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EMISSIONS

Providing reliable, affordable energy to support prosperity and enhance living standards is coupled with the need to do so in ways that reduce impacts on the environment, including the risks of climate change. This is society's dual challenge.

Billions of people need reliable, affordable energy every day, but their use of energy is contributing to CO₂ emissions. Progress on society's energy and climate objectives requires practical approaches and new technology solutions that enable human development and economic progress.

Governments bear a unique responsibility in this regard. A key challenge is to develop and implement policies that seek to address climate change risks in the most practical and cost-effective way. Policies that promote innovation can expand the available options society has for providing access to energy while reducing impacts on the environment. Additionally, policies that harness the flexibility of free markets and competition can quickly scale the best solutions for each sector within a country. Effective policy frameworks will be critical to reduce global GHG emissions and meet society's need for reliable and affordable energy.



EMISSIONS – PROJECTIONS

Energy-related CO₂ emissions peak **Billion tonnes** 40 Middle East Africa 30 Latin America Russia/Caspian Other Asia Pacific 20 China 10 Europe North America 0 2000 2010 2020 2030 2040

- Policy choices, consumer preferences and technology play a role in balancing energy supply and demand and the impacts on emissions.
- From 2000 to 2017 the economic expansion in Asia Pacific saw CO_2 emissions substantially rise, only partially offset by reductions in Europe and North America
- Global annual CO_2 emissions are likely to peak by 2035, at some 5 percent above 2017 levels, as various countries try to reduce the emissions intensity of their economies
- This emission projection in the chart above tracks within the estimated range of emissions implied by the NDCs for 2030 as currently submitted by the countries as part of the Paris Agreement. However, these NDCs are not on a 2°C pathway as confirmed by the United Nations Environment Programme (UNEP) 2018 report. Further discussion on decarbonization is covered in the next section, "Pursuing a 2°C pathway"

All sectors contributing to restrain CO₂ emissions growth Global energy-related CO₂ emissions - billion tonnes



- A shift to less carbon-intensive sources of electricity (e.g., renewables, nuclear and natural gas) will reduce the CO₂ intensity of delivered electricity in 2040 by more than 35 percent compared to 2017
- Efficiency gains and growing use of less carbon-intensive energy will help reduce industrial CO₂ emissions relative to GDP by about 50 percent over the *Outlook* period
- Transportation represents about 25 percent of CO₂ emissions today, and this share is likely to grow modestly to 2040 driven by expanding commercial transportation activity
- Global light-duty vehicle CO₂ emissions are expected to peak in the early 2020s before falling by more than 15 percent from that peak by 2040, as more efficient conventional vehicles and electric cars gain significant share

EMISSIONS – PROJECTIONS

Restraining global energy-related CO₂ emissions Billion tonnes



- The primary driver of increasing global CO₂ emissions between 2000 and 2017 was economic growth, as global GDP expanded about 60 percent
- Improving energy efficiency (energy use per unit of GDP) helped slow the growth in emissions, while global CO₂ intensity of energy use remained fairly constant, with increased coal use in some non-OECD countries offsetting improvements in the OECD countries
- As the world's economy nearly doubles by 2040, technology will be essential to mitigate emissions. Our *Outlook* projects a sustained improvement of CO₂ intensity (more solar, wind, nuclear, coal to gas switch, CCS) in addition to accelerated efficiency gains (double the historic rate from 2000 to 2017)
- By 2040 efficiency and emissions intensity reduction are expected to contribute to a nearly 45 percent decline in the carbon intensity of the global economy

Want to learn more about energy-related CO₂ emissions and ExxonMobil's views?

Download our latest Energy & Carbon Summary at:

exxonmobil.com/news/ newsroom/publicationsand-reports

PURSUING A 2°C PATHWAY

Many uncertainties exist concerning the future of energy demand and supply, including potential actions that societies may take to address the risks of climate change. The following analysis is a supplement to the base *Outlook* and is intended to provide a perspective on hypothetical 2°C scenarios, highlighting the roles of new technologies, as well as oil and gas.

Since 1992, when nations around the world established the United Nations Framework Convention on Climate Change (UNFCCC), there has been an international effort to assess the risks of climate change.

After more than two decades of international effort, in December 2015, nations convened in Paris and drafted an agreement that for the first time signaled that both developed and developing nations will strive to undertake action on climate change and report on related progress.

The Paris Agreement¹ "aims to strengthen the global response to the threat of climate change ... by: Holding the increase in the global average temperature to well below $2^{\circ}C$ above pre-industrial levels..."

Key elements of the agreement include:

- "Each party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve."
- "Each party shall communicate nationally determined contributions every five years."

The nationally determined contributions (NDCs) provide important signals on government expectations related to the general direction and pace of likely policy initiatives to address climate change risks.⁴ In this regard, the United Nations Environment Programme (UNEP) reported in November 2018 that, "Pathways reflecting current NDCs imply global warming of about 3°C by 2100, with warming continuing afterwards." Additionally, the report states, "The majority [of G20 countries] are not yet on a path that will lead them to fulfilling their NDCs for 2030."² In other words, the current NDCs are insufficient to meet the aim of the Paris Agreement, and moreover, not all countries are yet on track with their current policies to meet their NDCs for 2030.



THE CLIMATE CHALLENGE – CONSIDERING 2°C SCENARIOS

Exploring potential pathways to a 2°C world

According to the IEA, a "well below" 2°C pathway implies "comprehensive, systematic, immediate and ubiquitous implementation of strict energy and material efficiency measures." ⁵ Given a wide range of uncertainties, no single pathway can be reasonably predicted. A key unknown relates to advances in technology that may influence the cost and potential availability of certain pathways toward a 2°C scenario. Scenarios that employ a full complement of technology options are likely to provide the most economically efficient pathways.

Considerable work has been done in the scientific community to explore potential energy pathways. A comprehensive multi-model study coordinated by the Energy Modeling Forum 27 (EMF27) at Stanford University³ brought together many energy-economic models to assess possible technology and policy pathways associated with various climate stabilization targets (e.g., 450, 550 ppm CO_2 equivalent or CO_2 e), partially in support of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

Emission and energy profiles for assessed 2°C scenarios

The chart (top right) illustrates potential global CO_2 emission trajectories under EMF27 full-technology scenarios⁶ targeting a 2°C pathway (assessed 2°C scenarios) relative to the 2019 Outlook, and relative to the EMF27 baseline pathways with essentially no policy evolution beyond those that existed in 2010.

The chart (lower right) illustrates potential global energy demand in 2040 under the assessed 2°C scenarios. The scenarios suggest that predicting absolute 2040 energy demand levels in total and by energy type carries some uncertainty, with particular scenarios likely heavily influenced by technology and policy assumptions. Differences in these scenarios help put in perspective the uncertainty in the pace and breadth of changes in the global energy landscape.

For comparison purposes, the chart (lower right) also includes energy demand projections in 2040 based on the IEA's Sustainable Development Scenario (SDS) published as part of the 2018 WEO. The IEA specifically notes that its SDS projects global energy-related CO₂ emissions that are "fully in line with the trajectory required to meet the objectives of the Paris Agreement on climate change." In fact, the SDS projects global energy-related CO₂ emissions in 2040 at a level 50 percent lower than the IEA's New Policies Scenario (NPS), which projects emissions generally in line with the aggregation of national commitments under the Paris Agreement.



Assessed scenarios include CO₂ emissions from energy and industrial processes





THE CLIMATE CHALLENGE – CONSIDERING 2°C SCENARIOS continued

All energy types remain important in assessed 2°C scenarios

The EMF27 full-technology scenarios also show a range of possible growth rates for each type of energy. We have taken the average of the scenarios' growth rates in order to consider potential impacts on energy demand for this report.⁷

Based on this analysis, primary energy demand on a worldwide basis is projected to increase about 0.5 percent per year on average from 2010 to 2040. Expected demand and technologies deployed in 2040 vary by model and energy type (see 2°C chart on prior page and growth rates to the right):

- Oil demand is projected on average to decline by about 0.4 percent per year, while natural gas demand is expected on average to increase about 0.9 percent per year. Together their share of energy demand is projected on average to still be more than 40 percent by 2040
- The trend in demand for coal is the most negative, with an average decline of 2.4 percent per year, or about a 50 percent decline by 2040
- The projected growth for renewables and nuclear are quite strong, averaging 4.5 percent per year for non-bioenergy (e.g., hydro, wind, solar) and about 3 percent per year for nuclear
- Bioenergy demand is projected on average to grow at about 4.3 percent per year, the highest growth among all energy sources alongside non-bio renewables
- Carbon Capture and Storage (CCS) is a key technology to address CO₂ emissions, with its projected share of energy demand on average nearly double that of non-bio renewables by 2040

All energy sources remain important across all the assessed 2°C scenarios. Though the mix of energy and technology shifts over time, oil and natural gas remain important sources. Oil demand is projected to decline modestly on average, and much more slowly than its natural rate of decline from existing producing fields. Natural gas demand grows on average due to its many advantages, including lower GHG emissions as compared to coal.

EMF27-450-FT: Global demand by energy type Average annual growth rates 2010-2040



This chart shows the average growth rate and the range of growth rates for primary energy demand and each type of energy across the scenarios.

In addition to looking at average growth rates, low-side energy growth rates for the scenarios were also considered. The low-side by energy source sees oil dropping 1.7 percent per year, natural gas dropping 0.8 percent per year, and coal dropping 10.2 percent per year through 2040. This is compared with high-side growth rates for bioenergy, nuclear and non-bio renewables of 14.1, 4.8 and 6.3 percent per year, respectively. Even under these extremes, oil and gas remain important parts of the energy mix.

THE CLIMATE CHALLENGE – POTENTIAL INVESTMENT IMPLICATIONS

Investing to meet oil and gas demand

With oil and gas a key part of the future energy mix across all of the assessed 2°C scenarios, it is important to consider the investments needed to meet society's demand.

Without continued investment to sustain existing producing fields and develop new resources, the supply of oil and natural gas declines, with oil supply naturally declining at an estimated 7 percent per year, and natural gas declining at an estimated 5 percent per year. As shown in the charts on the right, these decline rates create a significant need for continuous investment just to sustain existing production levels observed in 2017.

The top chart shows that the natural rate of decline for oil far exceeds the range of demand projections in the assessed 2°C scenarios out to 2040. Similarly, the bottom chart shows that the natural rate of decline for gas also far exceeds the range of demand projections, which showed an average increase in demand over the period. Ceasing to invest in either oil or gas could lead to a significant supply shortfall versus what is needed to meet global demand, both for the near term and for the broad range of scenario demand projections.

The IEA's 2018 World Energy Outlook estimates that significant oil and gas investment is needed to meet growing demand across a broad range of scenarios out to 2040. They estimate more than \$13 trillion of investment is needed in their Sustainable Development Scenario, and almost \$21 trillion would be needed in their New Policies Scenario.





Excludes biofuels; Source: IEA, EM analyses Assessed 2°C scenarios based on EMF27 full technology/450ppm cases targeting a 2°C pathway



Natural gas demand and supply warrant investment $_{\mbox{World}\ -\ \mbox{BCFD}}$

THE CLIMATE CHALLENGE – SEEKING PRACTICAL SOLUTIONS

There are no easy answers to the dual challenge of simultaneously meeting global energy demand while addressing the risks of climate change. Billions of people still lack access to modern energy; they struggle to improve their living standards and reduce the negative health impacts of energy poverty. At the same time, there is growing recognition among parties that emission reductions are not yet sufficient to achieve a 2°C pathway.²

Effectively addressing this dual challenge will require practical, cost-effective solutions. Cost is an important consideration as it is estimated that currently nearly 2 billion people (~30 percent of the population), live on less than \$1,200 per year⁸. Even a minor increase in cost of living is problematic for this vulnerable population. Awareness of this enduring economic, energy and environmental disparity across the globe is a reminder of the need to develop practical and economic solutions for addressing the risks of climate change.

Opportunities exist worldwide across all sectors to reduce energy-related emissions. The chart on the lower right shows 2017 energy-related CO_2 emissions across the sectors and highlights where new solutions can have the largest impact in reducing emissions.

Addressing the dual challenge across all of these sectors requires progress in four key areas:

- 1. Boosting energy efficiency
- 2. Shifting the energy mix to lower-carbon sources
- 3. Adopting policies to promote cost-effective solutions
- 4. Investing in research and development to advance technology

Boosting energy efficiency

Capturing the most cost-effective efficiency gains will become even more important to spare society an unnecessary economic burden associated with high-cost options to reduce emissions. Boosting efficiency will require effective investments and sound policies to promote them. These investments often create a win-win situation because the lower energy consumption reduces both emissions and consumers' energy bills.

Opportunities to boost efficiency are many and varied, ranging from better equipment (e.g., light bulbs, vehicles, appliances) to improved building designs, to better manufacturing techniques in industrial applications. Importantly, not all of the same mechanisms apply across all energy sectors.

Shifting the energy mix to lower-carbon sources

Shifting the CO₂ emissions intensity of the energy mix to lower levels while keeping energy reliable and affordable also requires investment. Power generation has the most commercially developed lower-carbon alternatives: natural gas, bioenergy, renewables, nuclear, CCS. Options at commercial scale are currently more limited for the industrial and commercial transportation sectors, which represented nearly half of energy-related CO₂ emissions in 2017, and have projected strong demand growth out to 2040, making these sectors challenging to decarbonize. New technology solutions (such as advanced biofuels, hydrogen and novel batteries) will be required.

2017 global population and poverty Billions of people (poverty line at \$3.20 per day per person)





2017 energy-related CO_2 emissions by sector

THE CLIMATE CHALLENGE — SEEKING PRACTICAL SOLUTIONS continued

Adopting policies to promote cost-effective solutions

To help speed the application of practical and costeffective solutions across the energy system, open and informed discussions will help clarify the potential and relative value of available options. Further, policy frameworks that promote better transparency on costs and benefits of options and rely on market-based solutions are needed.

An economy-wide price on carbon, whether based on a tax, trading mechanisms or other market-based measures, can lead to cost-effective emissions reduction. As the IEA has noted, clear price signals have advantages, including that "higher prices stimulate consumers to reconsider their energy consumption and make savings where this can be done most cheaply, whereas regulation through mandatory standards may not be the least-cost or most effective approach." ⁹

Investing in research and development to advance technology

Technology advances will also be important to help minimize the costs of reducing emissions while also delivering increased access to reliable and affordable energy. However, the International Energy Agency in 2019 estimated in its Tracking Clean Energy Progress analysis that only 7 of 45 technologies are on track to help society reach the Paris Agreement climate goals¹⁰. Electric light-duty Vehicles, one technology highlighted by the IEA, are on track to meet the IEA's Sustainable Development target, but light-duty transportation is just one sector and represented less than 10 percent of global energy demand and emissions in 2017. Advancing technology for cost-effective solutions will be critical to pursue a 2°C pathway while helping keep energy reliable and affordable for a growing population.

As the graphic to the right shows, expanding technology options through research and development can play a role in reducing the costs borne by society to lower emissions while still meeting energy needs. Existing technologies, like wind, solar and natural gas with CCS, play important roles in hypothetical 2°C pathways, but advances are needed to further reduce their costs so that increased use does not raise electricity costs for consumers.

Further breakthroughs are needed to develop and deploy new solutions at commercial scale across all sectors. The table to the right highlights some areas where these breakthroughs are needed. For example, improving the design and function of power grids or achieving cost-effective long-duration storage (i.e., seasonal storage) could allow higher penetration of variable renewables like wind and solar.

For commercial transportation, advanced biofuels that do not compete with the food chain could provide a new lower carbon solution, but technology breakthroughs are needed to lower land-use and costs to produce.



Technology breakthrough opportunities

Power grid reliability & long-duration storage: Batteries, chemical storage, hydrogen Lower-carbon commercial transport: algae & cellulosic biofuels, fuel cells, batteries Lower-carbon industrial processes: carbon capture, hydrogen, process intensification Advanced, less carbon-intensive materials for efficient buildings and infrastructure Negative emissions: bioenergy with carbon capture, direct air capture, CO₂ utilization

THE CLIMATE CHALLENGE — SEEKING PRACTICAL SOLUTIONS continued

Technologies that could achieve "negative emissions," such as direct air capture or bioenergy with carbon capture, were found to be an important part of the assessed 2°C scenarios. Many of these scenarios employed negative emissions where possible to offset harder and more costly to decarbonize sectors like industrial and transportation.

Without expanding the existing technology options, the stringency of policies and their related costs to society could increase. If society pushes back on some of these policies, it could risk setbacks on climate progress. Technology advances combined with sound policies improve society's chances of achieving the goals of the Paris Agreement.

Keeping options open

Transformation of the world's energy system as envisioned by a 2°C scenario is unprecedented. Therefore, it is understandable that governments, businesses and individuals exercise care in weighing the potential implications. The world cannot afford to prematurely foreclose options or negate reliable, affordable and practical energy systems upon which billions of people depend. Practical solutions to the world's energy and climate challenges will benefit from market competition as well as well-informed, well-designed and transparent policy approaches that carefully weigh costs and benefits. Such policies are likely to help manage the risks of climate change while also enabling societies to pursue other high priority goals around the world – including clean air and water, access to reliable, affordable energy, and economic progress for all people.

Want to learn more about how ExxonMobil is working to advance technology and provide new solutions to address the dual challenge?

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ENERGY MATTERS

With the world's population estimated to reach more than 9 billion people in 2040, providing enough affordable energy to help improve global living standards is a significant challenge. We expect that continued progress, powered by human ingenuity and technology, will help make better lives possible, while appropriately addressing the risks of climate change.

Meeting energy demand safely, reliably and affordably – while also minimizing risks and potential environmental impacts – will require expanded trade and investment. It will require innovation and advanced technology. And it will require practical and robust solutions to meet the wide-ranging needs of individuals, businesses and governments. Understanding the factors that drive the world's energy needs – and likely solutions to meet those needs – is the mission of the *Outlook*.

By sharing the *Outlook* with the public, we hope to broaden that understanding among individuals, businesses and governments. Energy matters to everyone, and we all play a role in shaping its future. **9.2B** Global population is projected to grow

to 9.2 billion from today's 7.5 billion

2X

The world's economy is expected to grow faster than population, almost doubling by 2040

Energy demand (quadrillion BTUs, unless otherwise noted)									Average annual change	% change	Share	Share of total	
									2017	2017			
Regions	2000	2010	2017	2020	2025	2030	2035	2040	2040	2040	2017	2040	
World	405	513	562	581	609	636	658	675	0.8%	20%	100%	100%	
OECD	219	224	220	222	218	216	213	208	(0.2)%	(6)%	39%	31%	
Non-OECD	186	289	342	359	391	420	445	467	1.4%	37%	61%	69%	
Africa	22	29	35	37	42	47	52	58	2.2%	67%	6%	9%	
Asia Pacific	122	199	237	249	271	288	304	316	1.2%	33%	42%	47%	
China	46	99	123	128	137	142	14/	148	0.8%	21%	22%	22%	
India	18	27	35	39	46	53	60	66	2.8%	90%	6%	10%	
Europe	77	80	78	77	75	73	71	69	(0.5)%	(11)%	14%	10%	
European Union	/1	/2	68	6/	64	62	60	57	(0.7)%	(16)%	12%	9%	
Latin America	19	25	28	28	31	33	36	38	1.4%	37%	5%	6%	
Middle East	17	28	36	3/	40	43	45	48	1.2%	32%	6%	1%	
North America	111	109	108	110	110	111	110	108	-%	-%	19%	16%	
United States	94	91	88	91	90	90	89	87	(0.1)%	(2)%	16%	13%	
Russia/Caspian	37	42	42	42	42	41	40	40	(0.2)%	(5)%	7%	6%	
Energy by type - World	405	540	5/0	504	(00	(2)	(50	/75	0.007	2004	1000/	4000/	
Primary	405	513	562	581	609	636	658	6/5	0.8%	20%	100%	100%	
Oil	14/	164	180	187	195	201	204	205	0.6%	14%	32%	30%	
Natural gas	89	116	130	139	151	162	169	1//	1.3%	36%	23%	26%	
Coal	91	140	147	142	140	138	137	133	(0.4)%	(9)%	26%	20%	
Nuclear	2/	29	27	31	32	36	41	45	2.2%	66%	5%	7%	
Biomass/Waste	40	46	51	52	53	55	55	56	0.4%	9%	9%	8%	
Hydro	9	12	14	15	16	17	18	18	1.2%	30%	2%	3%	
Other Renewables	3	7	13	17	23	28	34	41	5.1%	213%	2%	6%	
End-use sectors - World													
Residential and commercial	• ·												
Iotal	96	110	116	120	127	131	136	139	0.8%	20%	100%	100%	
	14	12	12	12	11	11	10	10	(0.7)%	(15)%	10%	7%	
Natural gas	21	24	26	2/	28	28	29	29	0.5%	13%	22%	21%	
Biomass/Waste	29	30	30	30	31	31	30	30	-%	(1)%	26%	21%	
Electricity	23	32	3/	41	46	51	56	60	2.1%	63%	32%	43%	
Other	10	11	12	11	11	11	10	10	(0.6)%	(12)%	10%	/%	
		05	440	440	407	422	407	4.40	4.007	270/	1000/	4000/	
lotal	//	95	110	118	126	132	137	140	1.0%	27%	100%	100%	
	/5	91	104	110	116	120	121	121	0.7%	16%	94%	86%	
Biofuels	0	2	3	4	4	5	5	6	2.5%	77%	3%	4%	
Natural gas	0	1	2	3	3	4	5	6	5.7%	261%	2%	5%	
Other	1	I	l	I	2	3	5	/	8.0%	493%	1%	5%	
Total	1/2	10/	212	216	226	226	242	250	0.7%	17%	100%	100%	
	145	50	55	56	50	42	45	250	0.7%	720/	24%	27%	
Natural and	44	30	55	50	57	65	63	67	0.9%	25%	20%	2770	
	37	51	51	17	37	46	45	42	(0.7)%	(15)%	2470	17%	
Electricity	20	21	27	47	47	40	45	43	1.6%	(13)/0	1.9%	21%	
Other	14	10	20	20	43	20	20	20	0.1%	4376	0%	2170	
Power generation - World	14	10	20	20	20	20	20	20	0.170	270	770	070	
Primary	146	100	211	220	222	249	262	277	1 2%	210/	100%	100%	
Oil	140	170	10	0	235	240 g	7	6	(1.8)%	(34)%	5%	2%	
Natural das	31	16	52	56	63	68	72	76	1.6%	01(+C) %AN	25%	2/0	
Coal	61	84	91	91	90	89	89	88	(0.2)%	(4)%	43%	32%	
Nuclear	27	20	27	21	20	24	<u>л</u> 1	15	2 20%	(+)/0 660/	13%	140/	
Hydro	2/	∠7 12	27 17	15	16	17	18	40	1.2%	30%	7%	7%	
Wind	7	1	A 14	5	0	11	14	17	6.40/	330%	20/	×0/	
Other Penewahler	4	7	4	14	0	20	14	17	0.0%	1000/	∠ 70 ∠0/	109/	
Electricity demand (torowatt hours)	4	/	15	14	17	20	20	20	3.370	10770	0 %	1070	
World	12105	18602	22168	23005	26615	20163	32320	35277	2.0%	50%	100%	100%	
OFCD	85.21	9721	9852	10115	10//2	10923	11320	11766	0.8%	19%	44%	32%	
	1611	9,21	12215	13990	16170	18540	20001	22511	2 00/2	010/	540/	670/	
	4014	0001	12313	13000	101/5	10340	20171	20011	∠.770	7 1 70	2070	0/70	

Energy demand (quadrillion BTUs, unless ot	herwise noted)								Average annual change	% change	Share	of total
OECD									2017	2017		
Energy by type	2000	2010	2017	2020	2025	2030	2035	2040	2040	2040	2017	2040
Primary	219	224	220	222	218	216	213	208	(0.2)%	(6)%	100%	100%
Oil	92	86	85	86	84	81	78	75	(0.6)%	(12)%	39%	36%
Natural gas	47	55	58	62	64	66	66	67	0.6%	15%	26%	32%
Coal	43	42	34	29	24	20	17	13	(4.0)%	(61)%	16%	6%
Nuclear	23	24	20	21	20	19	19	19	(0.2)%	(4)%	9%	9%
Biomass/waste	7	9	10	10	11	11	11	11	0.3%	8%	5%	5%
Нуdго	5	5	5	5	5	5	5	5	0.5%	12%	2%	3%
Other renewables	2	4	7	9	11	13	15	17	3.9%	141%	3%	8%
End-use sectors Residential and commercial												
Total	46	50	47	48	48	47	46	45	(0.2)%	(4)%	100%	100%
Oil	9	7	5	5	4	3	3	2	(3.9)%	(60)%	11%	5%
Natural gas	16	17	16	17	16	16	15	15	(0.4)%	(9)%	34%	33%
Biomass/waste	2	3	3	3	3	2	2	2	(1.3)%	(26)%	6%	4%
Electricity	17	21	21	22	23	23	24	24	0.7%	17%	44%	54%
Other	2	3	2	2	2	2	2	2	(0.8)%	(17)%	5%	4%
Transportation												
Total	52	54	56	58	58	57	56	55	(0.1)%	(3)%	100%	100%
Oil	51	52	54	55	54	53	51	48	(0.5)%	(11)%	95%	88%
Biofuels	0	2	2	2	2	3	3	3	1.4%	37%	4%	5%
Natural gas	0	0	0	0	1	1	1	1	9.7%	736%	-%	3%
Other	0	0	0	0	1	1	2	2	8.1%	501%	1%	4%
Industrial												
Total	68	65	67	67	68	68	68	68	-%	1%	100%	100%
Oil	25	24	24	24	25	25	24	24	-%	-%	36%	36%
Natural gas	18	18	20	21	22	23	23	23	0.6%	15%	29%	33%
Coal	8	7	6	5	4	4	3	3	(3.5)%	(56)%	9%	4%
Electricity	12	12	12	12	12	13	13	14	0.4%	9%	18%	20%
Other	4	4	4	4	4	5	5	5	0.1%	2%	7%	7%
Power generation												
Primary	86	90	85	85	83	83	83	82	(0.2)%	(4)%	100%	100%
Oil	7	3	2	2	1	1	1	1	(5.8)%	(74)%	3%	1%
Natural gas	14	20	22	23	25	27	27	28	1.0%	26%	26%	34%
Coal	35	34	27	23	19	16	13	10	(4.1)%	(62)%	32%	13%
Nuclear	23	24	20	21	20	19	19	19	(0.2)%	(4)%	23%	23%
Hydro	5	5	5	5	5	5	5	5	0.5%	12%	6%	6%
Wind	0	1	2	3	4	6	7	8	5.4%	235%	3%	10%
Other renewables	3	4	7	8	9	10	10	11	2.2%	65%	8%	14%

General note on data tables: Rounding may lead to minor differences between totals and the sum of their individual parts.

Energy demand (quadrillion BTUs, unless otherwise	noted)								Average annual change	% change	Share o	of total
Non-OECD									2017	2017		
Energy by type	2000	2010	2017	2020	2025	2030	2035	2040	2040	2040	2017	2040
Primary	186	289	342	359	391	420	445	467	1.4%	37%	100%	100%
Oil	55	78	95	101	111	119	125	130	1.4%	37%	28%	28%
Natural gas	41	61	72	78	87	96	103	110	1.9%	53%	21%	24%
Coal	48	98	112	112	116	118	120	120	0.3%	6%	33%	26%
Nuclear	4	5	7	9	12	17	22	26	5.8%	268%	2%	6%
Biomass/waste	33	37	41	41	43	44	44	44	0.4%	9%	12%	9%
Hydro	4	7	9	10	11	12	12	13	1.5%	40%	3%	3%
Other renewables	1	3	6	8	12	15	19	24	6.2%	298%	2%	5%
End-use sectors												
Residential and commercial						• ·						
Total	50	60	68	72	79	84	89	94	1.4%	37%	100%	100%
Oil	5	5	6	7	7	7	8	8	0.8%	21%	9%	8%
Natural gas	5	7	9	10	12	13	13	14	1.8%	50%	14%	15%
Biomass/waste	26	27	27	27	28	28	28	28	0.1%	2%	40%	30%
Electricity	6	11	16	19	23	27	32	36	3.5%	122%	24%	39%
Other	8	8	9	9	9	9	8	8	(0.5)%	(11)%	13%	9%
Transportation												
Total	25	41	54	60	68	75	81	86	2.0%	59%	100%	100%
Oil	24	38	51	55	62	67	70	73	1.6%	45%	93%	86%
Biofuels	0	1	1	1	2	2	3	3	4.1%	150%	2%	3%
Natural gas	0	1	2	2	3	3	4	5	5.0%	208%	3%	6%
Other	0	1	1	1	1	2	3	5	8.0%	489%	1%	5%
Industrial												
Total	76	129	146	149	159	168	175	182	1.0%	25%	100%	100%
Oil	19	26	30	32	35	38	41	43	1.5%	42%	21%	24%
Natural gas	19	27	31	32	35	38	41	43	1.5%	40%	21%	24%
Coal	18	44	45	42	42	42	41	41	(0.4)%	(10)%	31%	22%
Electricity	9	19	25	28	31	34	37	40	2.1%	60%	17%	22%
Other	10	13	15	15	16	16	16	16	0.1%	3%	10%	9%
Power generation												
Primary	60	100	126	135	150	165	181	194	1.9%	55%	100%	100%
Oil	7	8	8	7	7	7	6	6	(1.1)%	(23)%	6%	3%
Natural gas	17	26	30	33	38	42	45	49	2.1%	60%	24%	25%
Coal	26	51	64	68	71	73	76	77	0.8%	20%	51%	40%
Nuclear	4	5	7	9	12	17	22	26	5.8%	268%	6%	13%
Hydro	4	7	9	10	11	12	12	13	1.5%	40%	7%	7%
Wind	0	0	1	2	4	5	7	9	8.1%	503%	1%	5%
Other renewables	1	3	6	7	9	10	13	15	4.2%	160%	5%	8%

Energy demand (quadrillion BTUs, unless otherwise	e noted)								Average annual change 2017	% change 2017	Share of total	
Regions	2000	2010	2017	2020	2025	2030	2035	2040	2040	2040	2017	2040
AFRICA												
Primary	22	29	35	37	42	47	52	58	2.2%	67%	100%	100%
Oil	5	7	8	9	10	12	14	16	2.8%	88%	24%	27%
Natural gas	4	5	6	7	9	10	12	14	3.7%	133%	17%	24%
Coal	3	4	4	4	4	4	4	4	0.2%	5%	11%	7%
Nuclear	0	0	0	0	0	0	1	1	7.3%	401%	-%	1%
Biomass/waste	10	13	16	16	18	19	20	21	1.2%	32%	45%	36%
Hydro	0	0	0	1	1	1	1	1	4.9%	199%	1%	2%
Other renewables	0	0	0	0	1	1	1	2	9.0%	633%	1%	3%
Demand by sector												
Total end-use (including electricity)	19	26	30	32	36	40	44	48	2.0%	59%	100%	100%
Residential and commercial	9	12	14	15	17	19	21	23	2.1%	61%	47%	48%
Transportation	3	4	5	6	7	8	9	10	2.5%	76%	18%	20%
Industrial	7	9	10	11	12	13	14	16	1.7%	49%	35%	32%
Memo: electricity demand	1	2	2	3	4	4	6	7	4.9%	203%	8%	14%
Power generation fuel ¹	4	6	7	8	9	12	14	17	4.0%	145%	19%	29%
ASIA PACIFIC												
Primary	122	199	237	249	271	288	304	316	1.2%	33%	100%	100%
Oil	40	52	63	67	73	77	79	80	1.0%	27%	27%	25%
Natural gas	11	21	29	33	39	44	48	52	2.6%	81%	12%	16%
Coal	43	94	109	107	110	112	114	114	0.2%	5%	46%	36%
Nuclear	5	6	5	8	11	15	19	22	6.5%	330%	2%	7%
Biomass/Waste	20	20	21	20	20	20	20	19	(0.3)%	(8)%	9%	6%
Hydro	2	4	6	6	7	7	7	8	1.3%	34%	2%	2%
Other Renewables	1	2	5	7	10	13	17	21	6.1%	294%	2%	7%
Demand by sector												
Total end-use (including electricity)	95	152	180	188	204	216	226	234	1.1%	30%	100%	100%
Residential and commercial	31	36	42	44	48	51	54	56	1.3%	34%	23%	24%
Transportation	17	26	35	40	45	49	53	55	2.0%	56%	20%	24%
Industrial	47	89	103	104	111	116	120	123	0.8%	19%	57%	53%
Memo: electricity demand	12	24	34	39	45	50	56	62	2.6%	81%	19%	27%
Power generation fuel ¹	40	74	96	104	116	127	139	149	1.9%	55%	40%	47%
EUROPE												
Primary	77	80	78	77	75	73	71	69	(0.5)%	(11)%	100%	100%
Oil	31	29	28	28	27	26	24	22	(1.0)%	(20)%	36%	33%
Natural gas	17	20	19	18	19	19	18	18	(0.1)%	(3)%	24%	26%
Coal	14	13	11	10	8	6	5	4	(4.5)%	(65)%	14%	6%
Nuclear	10	10	9	9	7	8	8	8	(0.6)%	(12)%	11%	11%
Biomass/Waste	3	5	6	6	7	7	7	7	0.8%	20%	8%	11%
Hydro	2	2	2	2	2	2	2	2	0.5%	13%	3%	3%
Other Renewables	0	2	3	4	5	6	6	7	3.6%	125%	4%	10%
Demand by sector												
Total end-use (including electricity)	59	62	61	61	60	59	57	55	(0.4)%	(9)%	100%	100%
Residential and commercial	18	21	20	19	19	18	18	17	(0.7)%	(14)%	32%	31%
Transportation	17	18	19	19	19	19	19	18	(0.2)%	(5)%	31%	33%
Industrial	25	23	22	22	22	21	21	20	(0.4)%	(9)%	37%	37%
Memo: electricity demand	10	12	12	12	12	13	13	14	0.8%	20%	19%	25%
Power generation fuel'	30	32	30	30	29	29	29	29	(0.2)%	(5)%	39%	42%

¹Share based on total primary energy

Energy demand (quadrillion BTUs, unlo	ess otherwise not	ed)							Average annual change	% change	Share	of total
									2017	2017		
Regions	2000	2010	2017	2020	2025	2030	2035	2040	2040	2040	2017	2040
LATIN AMERICA												
Primary	19	25	28	28	31	33	36	38	1.4%	37%	100%	100%
Oil	9	11	12	12	13	14	15	15	1.2%	31%	43%	41%
Natural gas	4	6	6	6	7	8	9	10	2.2%	65%	22%	27%
Coal	1	1	1	1	1	1	1	1	(1.2)%	(24)%	4%	2%
Nuclear	0	0	0	0	0	1	1	1	3.7%	132%	1%	1%
Biomass/waste	3	4	5	5	5	5	5	5	-%	-%	17%	12%
Hydro	2	2	2	3	3	3	3	3	1.5%	41%	9%	9%
Other renewables	0	1	1	1	2	2	2	3	3.9%	142%	4%	7%
Demand by sector												
Total end-use (including electricity)	17	22	23	25	26	29	31	33	1.5%	40%	100%	100%
Residential and commercial	3	4	4	5	5	5	6	6	1.3%	35%	19%	18%
Transportation	5	7	8	8	9	10	11	11	1.7%	46%	33%	35%
Industrial	9	12	11	12	12	13	14	15	1.4%	37%	48%	47%
Memo: electricity demand	2	3	4	4	5	5	6	6	2.4%	72%	16%	19%
Power generation fuel ¹	4	6	8	8	9	10	11	11	1.7%	46%	28%	30%
MIDDLE EAST												
Primary	17	28	36	37	40	43	45	48	1.2%	32%	100%	100%
Oil	10	14	17	17	17	19	19	19	0.6%	15%	46%	40%
Natural gas	7	13	19	19	21	23	25	26	1.5%	41%	52%	55%
Coal	0	0	0	0	0	0	0	0	(5.5)%	(73)%	1%	-%
Nuclear	0	0	0	0	0	1	1	1	11.8%	1189%	-%	2%
Biomass/Waste	0	0	0	0	0	0	0	0	7.4%	416%	-%	-%
Hydro	0	0	0	0	0	0	0	0	1.3%	35%	-%	-%
Other Renewables	0	0	0	0	0	0	1	1	12.6%	1445%	-%	2%
Demand by sector												
Total end-use (including electricity)	13	22	28	28	31	33	36	37	1.3%	36%	100%	100%
Residential and commercial	3	4	5	5	6	7	7	7	1.6%	43%	19%	20%
Transportation	4	6	8	8	9	10	10	11	1.3%	34%	29%	28%
Industrial	7	11	14	14	16	17	18	19	1.3%	34%	52%	52%
Memo: electricity demand	1	3	3	4	4	5	6	6	2.8%	88%	12%	17%
Power generation fuel ¹	5	9	12	12	13	15	16	16	1.5%	40%	33%	35%
NORTH AMERICA												
Primary	111	109	108	110	110	111	110	108	-%	-%	100%	100%
Oil	45	43	43	44	44	44	43	42	(0.1)%	(3)%	40%	38%
Natural gas	26	28	32	35	37	39	39	40	1.0%	25%	29%	37%
Coal	23	21	14	13	10	8	6	4	(5.1)%	(70)%	13%	4%
Nuclear	9	10	10	9	9	8	8	8	(0.6)%	(13)%	9%	8%
Biomass/Waste	4	3	3	3	3	3	3	3	(0.3)%	(6)%	3%	3%
Hydro	2	2	2	2	2	3	3	3	0.4%	10%	2%	3%
Other Renewables	1	2	3	4	5	6	7	8	3.9%	143%	3%	8%
Demand by sector												
Total end-use (including electricity)	82	82	84	87	88	90	90	89	0.3%	6%	100%	100%
Residential and commercial	22	23	22	23	23	23	23	22	0.1%	3%	26%	25%
Transportation	28	30	30	32	32	32	31	30	-%	-%	36%	34%
Industrial	32	30	32	32	34	35	36	36	0.6%	14%	38%	41%
Memo: electricity demand	14	16	16	16	17	18	19	19	0.8%	21%	19%	22%
Power generation fuel ¹	44	43	40	40	39	39	39	39	(0.2)%	(4)%	37%	36%

Energy demand (quadrillion BTUs, unless otherw	ise noted)								Average annual change	% change	Share	of total
Regions	2000	2010	2017	2020	2025	2030	2035	2040	2017	2040	2017	2040
RUSSIA/CASPIAN												
Primary	37	42	42	42	42	41	40	40	(0.2)%	(5)%	100%	100%
Oil	7	8	9	10	10	10	10	10	0.4%	8%	22%	26%
Natural gas	20	23	21	21	20	19	18	18	(0.7)%	(15)%	50%	45%
Coal	7	7	7	7	7	6	6	5	(1.1)%	(22)%	17%	14%
Nuclear Biomass/waste	2	3	3	3	4	4	4	4	0.9%	22%	7% 1%	2%
Hvdro	1	1	1	1	1	1	1	1	-%	1%	2%	2%
Other renewables	0	0	0	0	0	0	0	0	10.2%	824%	-%	1%
Demand by sector												
Total end-use (including electricity)	29	33	33	34	34	34	33	33	(0.1)%	(2)%	100%	100%
Residential and commercial	9	9	9	9	9	8	8	5	(0.7)%	(14)%	26%	23%
Industrial	17	20	20	20	20	20	20	20	-%	1%	60%	62%
Memo: electricity demand	3	4	4	5	5	5	5	5	0.9%	22%	13%	16%
Power generation fuel ¹	19	20	18	18	18	17	17	16	(0.5)%	(11)%	44%	41%
GDP by region (2010\$, trillions)												
World	50	66	80	88	101	116	133	151	2.8%	89%	100%	100%
OECD	38	45	51	54	60	65 51	/1	78	1.8%	52%	64%	51%
Africa	1	21	3	3	42	4	5	6	4.1%	144%	3%	47%
Asia Pacific	12	19	26	30	37	44	53	62	3.8%	138%	33%	41%
China	2	6	10	12	16	20	24	29	4.7%	189%	13%	19%
India	1	2	3	3	5	6	8	10	6.0%	279%	3%	7%
Europe	16	19	21	23	25	27	29	31	1.7%	47%	27%	21%
Latin America	15	17	19	20	22	23	25	2/	1.6%	43%	23%	18%
Middle Fast	1	2	3	3	3	4	5	5	3.1%	103%	3%	4%
North America	15	18	20	22	24	27	30	34	2.2%	64%	26%	22%
United States	13	15	17	19	21	23	25	28	2.2%	63%	22%	19%
Russia/Caspian	1	2	2	3	3	3	4	4	2.2%	65%	3%	3%
Energy intensity (thousand BTU per \$ GDP)	0.1	7.0	7.0		()		4.0	4.5	(2.0)0/	(2,1)07		
	8.I 5.7	7.8	7.0	0.0 / 1	6.U 3.7	5.5	4.9	4.5	(2.0)%	(36)%		
Non-OECD	15.9	13.5	11.7	10.8	9.4	8.2	7.2	6.3	(2.6)%	(46)%		
Africa	18.6	14.8	13.9	13.2	12.1	11.1	10.3	9.5	(1.6)%	(32)%		
Asia Pacific	10.1	10.4	9.0	8.3	7.4	6.5	5.7	5.1	(2.5)%	(44)%		
China	20.4	16.3	12.1	10.5	8.7	7.2	6.0	5.1	(3.7)%	(58)%		
India	21.2	16.1	12.8	11.5	9.9	8.6	7.4	6.4	(3.0)%	(50)%		
European Union	4.7	4.2	3.6	3.4	3.0	2.7	2.4	2.2	(2.2)%	(40)%		
Latin America	6.4	6.0	6.0	5.9	5.5	5.2	4.8	4.4	(1.3)%	(27)%		
Middle East	12.3	13.1	13.6	12.7	11.7	10.8	9.8	8.9	(1.8)%	(35)%		
North America	7.5	6.2	5.3	5.0	4.5	4.1	3.6	3.2	(2.1)%	(39)%		
United States	7.5	6.1	5.1	4.9	4.3	3.9	3.5	3.1	(2.2)%	(40)%		
Russia/Caspian	29.5	19.7	17.3	16.4	14.5	12.8	11.3	10.0	(2.4)%	(42)%		
World	23.8	31.0	33 /	33.7	34.6	35.1	35.3	35.0	0.2%	5%	100%	100%
OECD	13.0	12.8	12.1	11.8	11.2	10.7	10.1	9.4	(1.1)%	(23)%	36%	27%
Non-OECD	10.8	18.2	21.3	21.9	23.4	24.4	25.2	25.7	0.8%	21%	64%	73%
Africa	0.9	1.2	1.3	1.4	1.6	1.9	2.1	2.3	2.4%	74%	4%	7%
Asia Pacific	7.4	13.6	16.2	16.5	17.4	18.0	18.4	18.5	0.6%	14%	48%	53%
China	3.2	8.0	9.4	9.4	9.6	9.4	9.0	8.5	(0.4)%	(9)%	28%	24%
India Evene	0.9	1.6	2.2	2.5	2.9	3.4	3.9	4.3	3.0%	97%	7%	12%
European Union	4.4	4.3	4.0	3.8	3.0	3.3 2.7	3.0	2.8	(1.5)%	(30)%	12%	6%
Latin America	0.9	1.2	1.3	1.3	1.4	1.5	1.6	1.7	1.2%	32%	4%	5%
Middle East	1.1	1.8	2.2	2.2	2.4	2.5	2.6	2.7	0.8%	19%	7%	8%
North America	6.8	6.5	6.0	6.0	5.8	5.7	5.4	5.0	(0.8)%	(16)%	18%	14%
United States	5.9	5.5	5.0	5.0	4.8	4.7	4.4	4.0	(0.9)%	(20)%	15%	11%
Russia/Caspian	2.3	2.5	2.4	2.4	2.3	2.3	2.2	2.1	(0.7)%	(14)%	7%	6%
HOW WE DEVELOP OUR OUTLOOK

ExxonMobil uses a data-driven approach to understand potential future energy demand and supply.

MONITORING POLICY AND TECHNOLOGY TRENDS

Throughout the process, we monitor changes in technology, such as cost decreases for solar panels, improvements in battery technology and advances in well completion technology for tight oil. We also follow policy developments, such as adopted policies and ambitions formulated in context of the Paris Agreement, the European Union's recently adopted tailpipe emissions regulations and China's 'blue sky' policies.

HISTORICAL FOUNDATION¹¹

We use energy demand data from the International Energy Agency's (IEA's) World Energy Statistics and Balances data service and other credible third-party sources as the historical basis for the *Outlook*. For liquids supply, we use S&P Global Platts data as the historical basis. For natural gas, historical production and pipeline flows are based upon Wood Mackenzie, IHS, JODI Gas, S&P Global Platts (Eclipse) and other objective third-party sources; historical LNG production and trade flows are based upon IHS Markit (Waterborne) data. In this report, data for periods from 2017 and earlier are considered historical, while data for 2018 and later are ExxonMobil's modeled projections of expected energy demand, supply and trends through 2040.

FUNDAMENTALS¹¹

Because population and living standards drive energy demand, we compile demographic information and model economic trends for about 100 regions covering the world. The sources for historical data are primarily the U.N., World Bank, IMF and IHS. Estimates of future population are compiled from the U.N. and World Bank. We model economic trends (e.g., GDP) based on respected third-party views and ExxonMobil's own analysis.

DEMAND FOR SERVICES¹²

The work on fundamentals and data from the historical foundation, along with consumer preferences, form the basis to project energy demand across 15 sectors covering needs for personal mobility, residential energy, production of steel, cement and chemicals, plus many others.

ENERGY SOURCES¹²

We match the demand for energy services with about 20 types of energy (e.g., natural gas), taking into account the current use of each type of energy and the potential evolution of technology, policies, infrastructure and more.

LIQUID AND NATURAL GAS SUPPLY¹²

To meet the global demand for liquid fuels and natural gas, we project oil and gas production from key producing countries/ regions. For natural gas, we also project trade flows via pipeline and liquefied natural gas (LNG).

TESTING UNCERTAINTY

Sensitivities (i.e., changes to our base assumptions) are used to assess variations in our assumptions and their potential impact on our projections. These sensitivities are created to test alternative viewpoints from our *Outlook*. They do not represent our viewpoint or the likelihood of these alternatives, but can provide context to our analysis.

COMPARING TO OTHER VIEWS

We also compare the views and projections in our Outlook to a variety of publicly available third-party scenarios. These external model projections, formulated by credible sources within and outside of the oil and gas industry, also provide context to assess our modeling approaches and our perspective of future trends.



Glossary

Assessed 2°C scenarios: Technology and policy pathways associated with various climate stabilization targets (e.g., 450, 550 ppm CO₂ equivalent or CO₂e) from a comprehensive multi-model study coordinated by the Energy Modeling Forum 27 (EMF27)⁶ at Stanford University³, partially in support of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

CCS: Carbon capture and storage is a set of technologies to capture CO_2 and inject it into carefully selected geological formations for safe, secure and permanent storage. CCS is recognized as a key option for reducing CO_2 emissions.

 \mbox{CCU} : Carbon capture and utilization is a set of technologies to capture \mbox{CO}_2 and utilize it to make useable products and services.

Conventional vehicle: A type of light-duty vehicle with an internal combustion engine, typically either a gasoline-fueled spark ignition engine or a diesel-fueled compression ignition engine. Conventional includes vehicles with advanced technologies such as turbocharging and "mild hybrid" features such as a stop-start engine.

Electric vehicle (BEV): A type of light-duty vehicle that uses an electric motor exclusively. The motor is powered by a rechargeable electric battery.

Generation efficiency: The ratio of useful energy output to energy input in the generation of electricity from primary energy sources. Generation efficiency typically varies by generation type and region, however wind, solar PV and hydro are assumed to be 100 percent efficient.

Heavy-duty vehicle (HDV): A classification of road vehicles, primarily for commercial use, that include light, medium and heavy trucks, and buses. Heavy-duty fuel demand also includes other unclassified road fuel demand, such as 3-wheel vehicles.

Hybrid vehicle: A "full" hybrid is a type of light-duty vehicle that has a battery (usually a nickel metal hydride) and an electric motor, as well as a conventional internal combustion engine. When brakes are applied, the energy of the moving vehicle is stored in the battery and can be used later, thus saving fuel.

Hydrogen fuel cell vehicle: A type of light-duty vehicle for which hydrogen is the fuel and is stored onboard. This hydrogen is passed through a fuel cell that then provides electricity to power the vehicle.

Light-duty vehicle (LDV): A classification of road vehicles that includes cars, light trucks and sport utility vehicles (SUVs). Motorcycles are not included in the light-duty vehicle fleet size or fuel-economy, but the fuel used in motorcycles is included in light-duty transportation demand.

Liquefied natural gas (LNG): Natural gas (predominantly methane) that has been super-chilled for conversion to liquid form for ease of transport.

Liquefied petroleum gas (LPG): A classification of liquid hydrocarbon fuel including propane, butane and other similar hydrocarbons with low molecular weight.

Liquids: An energy classification that includes oil, liquid biofuels (such as ethanol and biodiesel) and derived liquids (e.g., gas-to-liquids)

Natural gas: An energy classification that includes natural gas (primarily methane) and synthetic gas (e.g., from coal-to-gas). Natural gas demand includes flared gas.

Natural gas liquid (NGL): A liquid fuel produced chiefly in association with natural gas. NGLs are components of natural gas that are separated from the gaseous state into liquid form during natural gas processing. Ethane, propane, butane, isobutane and pentane are all NGLs.

Oil: Oil supply includes crude oil (such as that coming from conventional, tight oil, deepwater and oil sands developments), condensate and natural gas liquids. Oil demand includes products such as gasoline, diesel, naphtha, kerosene/jet fuel, fuel oil, ethane, LPG, lubricants, asphalt, pet coke and refinery gas produced in oil refineries, natural gas processing plants or derived liquids plants (e.g., gas-to-liquids). Oil demand also includes crude oil and condensate that is used directly (e.g., for electricity generation). Oil excludes liquid biofuels.

Organisation for Economic Co-operation and Development (OECD): A forum for about 36 nations from across the world that work with each other, as well as with many more partner nations, to promote policies that will improve the economic and social well-being of people around the world. In this Outlook, **OECD** is referring to the 36 nations that are members of the forum; **Non-OECD** is a term used collectively for countries other than the 36 OECD nations.

"Other [geography]" / "Rest of [geography]": Used in chart labels to cover the remaining geography referenced less any regions or countries independently plotted and/or represented on the chart.

Plug-in hybrid electric vehicle (PHEV): A type of light-duty vehicle that typically uses an electric motor. Unlike other electric vehicles, a PHEV also has a conventional internal combustion engine that can charge its battery using petroleum fuels if needed, and in some cases power the vehicle.

Primary energy: Includes energy in the form of oil, natural gas, coal, nuclear, hydro, geothermal, wind, solar and bioenergy sources (biofuels, municipal solid waste, traditional biomass) consumed as a fuel or used as a feedstock (i.e., for the production of chemicals, asphalt, lubricants, waxes and other specialty products). Coal demand includes metallurgical coal. Gas demand includes flared gas. To avoid double counting, derived liquids (e.g., gas-to-liquids) and synthetic gas (e.g., from coal-to-gas) are only accounted for in their final form (i.e., liquid or gas) and not in the energy type from which they were derived (i.e., gas or coal). The fuel and loss involved in the conversion process is accounted for in the energy industry subsector. Primary energy does not include electricity, market heat or hydrogen, which are secondary energy types reflecting conversion /production from primary energy sources.

Secondary energy: Energy types, including electricity, market heat and hydrogen, that are derived from primary energy sources. For example, electricity is a secondary energy type generated using natural gas, wind or other primary energy sources.

Glossary (continued)

Unit	Description	Unit Type	Approximate conversion 1 QUAD =
Quadrillion BTU (QUAD) ⁽¹⁾	Quadrillion (10^{15}) British thermal units	Energy	1
Exajoule	Exa (10 ¹⁸) joules	Energy	1.05
MBDOE (2)	Million (10 ⁶) barrels per day oil equivalent	Energy	0.49
TWh	Tera (10 ¹²) watt-hours	Energy	293
BCFD	Billion (10°) cubic feet per day	Gas volume	2.9
TCF	Trillion (10 ¹²) cubic feet	Gas volume	1.06
GW	Giga (10 ⁹) watts	Power	N/A
Billion Tonnes CO_2 ⁽³⁾	Billion (10°) metric tons energy-related CO_2 emissions	Emissions	N/A

Table notes:

(1) For oil products, energy content is based on the specific energy density of each product (e.g., gasoline, diesel, LPG, etc.).

(2) MBDOE - Oil products are reported in physical barrels; all other energy types are reported on an oil-equivalent energy basis.

(3) CO_2 emissions from the combustion of fossil fuels.

In the 2019 Energy Outlook, the combustion of biofuels is assumed to have zero net CO_2 emissions (i.e., CO_2 emissions from combustion exactly balances against the photosynthetic update of CO_2 in the growth of biomass used in biofuels), consistent with traditional biomass. This change is intended to bring estimation of energy-related CO_2 emissions from biofuels in line with the method used for other fuel types and is consistent with the methodology used by the IEA. Previous *Outlooks* attributed to biofuels the net carbon emissions over the full land-use cycle.

Update:

The chart on page 6, depicting the Human Development Index, was updated on September 11th, 2019. The x-axis is now shifted to the left. The relative depiction of the various countries, their HDI, their energy consumption and the relation between progress and energy consumption remains unchanged.

Publication footnotes:

¹ http://unfccc.int/paris_agreement/items/9485.php

² UNEP (2018). The Emissions Gap Report 2018. United Nations Environment Programme, Nairobi, page XIV and XV, http://wedocs.unep.org/bitstream/handle/20.500.11822/26895/EGR2018_FullReport_EN.pdf?sequence=1&isAllowed=y

³ EMF was established at Stanford in 1976 to bring together leading experts and decisionmakers from government, industry, universities, and other research organizations to study important energy and environmental issues. For each study, the Forum organizes a working group to develop the study design, analyze and compare each model's results and discuss key conclusions. https://emf.stanford.edu/about. EMF is supported by grants from the U.S. Department of Energy, the U.S. Environmental Protection Agency as well as industry affiliates including ExxonMobil. https://emf.stanford.edu/industry-affiliates

⁴ UNFCC website: https://unfccc.int/process/the-paris-agreement/nationally-determined-contributions/ndc-registry

⁵IEA, Perspectives for the Energy Transition, page 57

⁶To understand some of the characteristics of future transition pathways, we analyzed energy and emissions data from a range of EMEZ7 stabilization, policy and technology targets, primarily focusing on 450 and 550 stabilization targets, as well as no policy cases that utilize a full suite of technology targets, primarily focusing on 450 and 550 stabilization targets, as well as no policy efficiency, nuclear, carbon capture and storage (CCS), biofuels and non-bio renewables such as solar and wind. The EMEZ7 study considered other technology-limited scenarios, but a key finding was that the unavailability of carbon capture and storage and limited availability of bioenergy had a large impact on feasibility and cost. Given the potential advantages to society of utilizing all available technology options, we focused on capturing the results of different EMEZ7 models that ran 450-FT cases; we were able to download data for 13 such scenarios, and utilized that data as provided for analysis purposes (most of the scenarios had projections extending to 2100). Data downloaded from: https://secure.iiasa.ac.at/web-apps/ene/AR5DB

⁷The assessed 2°C scenarios produce a variety of views on the potential impacts on global energy demand in total and by specific types of energy, with a range of possible growth rates for each type of energy as illustrated in this report. Since it is impossible to know which elements, if any, of these models are correct, we used an average of all 13 scenarios to approximate growth rates for various energy types as a means to estimate trends to 2040 indicative of hypothetical 2°C pathways.

⁸ Poverty rates by region at \$3.20/day in 2011 Purchasing Power Parity pulled from the World Bank's 2018 report on *Poverty and Shared Prosperity.* These rates were applied to 2017 population to estimate population below the poverty line.

⁹ IEA, World Energy Outlook 2016, page 290

¹⁰ International Energy Agency, Tracking Clean Energy Progress, Retrieved from https://www.iea.org/tcep/ on July 15, 2019

¹¹ Historical data profiles for energy demand, liquids and gas supply, demographic and economic trends are based upon publicly available third-party data. The historical data may be converted into different scientific metrics, or aggregated or disaggregated by regions, sectors or fuels where necessary to complete our analysis. Where there are differences, imbalances or gaps in reported historical data among credible third-parties, professional judgment is applied. 2018 is treated as a projection year because analysis and modeling for this report was conducted in 2018 and early 2019 before a comprehensive set of reliable historical data was available for 2018. Historical data compiled from third-party sources can be subject to later revision as new information becomes available.

¹² Proprietary, internally-developed models are used to model future (1) demand for energy services and energy sources, (2) oil and gas production and (3) natural gas trade flows via pipeline and liquefied natural gas. In addition to the historical foundation and projections of fundamental drivers, these proprietary models use our internal assumptions on many variables such as expected efficiency improvements, the pace of deployment of technology advances, costs, consumer preference and much more. Our internal assumptions are informed by our own proprietary data and analysis, publicly available data and the views of credible third-party consultants, academics and think-tanks. Estimates of energy-related CO₂ emissions from the combustion of fossil fuels are derived from the historical and projected energy demand by applying an emissions factor for each fossil fuel type.

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The Outlook for Energy includes Exxon Mobil Corporation's internal estimates of both historical levels and projections of challenging topics such as energy demand, supply, and trends through 2040 based upon internal data and analyses as well as publicly available information from many external sources including the International Energy Agency. Separate from ExxonMobil's analysis, we include a number of third-party scenarios such as the EMF 27 scenarios and the IEA's Sustainable Development Scenario. Third-party scenarios discussed in this report reflect the modeling assumptions and outputs of their respective authors, not ExxonMobil, and their use and inclusion herein is not an endorsement by ExxonMobil of their likelihood or probability. Work on the Outlook and report was conducted during 2018 and the first half of 2019. The report contains forward looking statements, including projections, targets, expectations, estimates and assumptions of future behaviors. Actual future conditions and results (including energy demand, energy supply, the growth of energy demand and supply, the impact of new technologies, the relative mix of energy across sources, economic sectors and geographic regions, imports and exports of energy) could differ materially due to changes in economic conditions, the ability to scale new technologies on a cost-effective basis, unexpected technological developments, the development of new supply sources, changes in law or government policy, political events, demographic changes and migration patterns, trade patterns, the development and enforcement of global, regional or national mandates, and other factors discussed herein and under the heading "Factors Affecting Future Results" in the Investors section of our website at www.exxonmobil.com. This material is not to be used or reproduced without the permission of Exxon Mobil Corporation. All rights reserved.

Exhibit 21



2019 ENERGY & CARBON SUMMARY



Statements of future events or conditions in this report, including projections, targets, expectations, estimates, future technologies, and business plans, are forward-looking statements. Actual future results or conditions, including: demand growth and energy source mix; the impact of new technologies; production rates and reserve growth; efficiency gains and cost savings; emission reductions; and results of investments, could differ materially due to, for example, changes in the supply and demand for crude oil, natural gas, and petroleum and petrochemical products and resulting price impacts; the outcome of exploration and development projects; the outcome of research projects and ability to scale new technologies on a cost-effective basis; changes in law or government policy, including environmental regulations and international treaties; the actions of competitors and customers; changes in the rates of population growth, economic development, and migration patterns; trade patterns and the development of global, regional and national mandates; military build-ups or conflicts; unexpected technological developments; general economic conditions, including the occurrence and duration of economic recessions; unforeseen technical difficulties; and other factors discussed in this report and in Item 1A of ExxonMobil's most recent Form 10-K. Third-party scenarios discussed in this report reflect the modeling assumptions and outputs of their respective authors, not ExxonMobil, and their use or inclusion herein is not an endorsement by ExxonMobil of their likelihood or probability. References to "resources," "resource base," and similar terms include quantities of oil and gas that are not yet classified as proved reserves under SEC definitions but that are expected to be ultimately moved into the proved reserves category and produced in the future. For additional information, see the "Frequently Used Terms" on the Investors page of our website at exxonmobil.com. References to "oil" and "gas" include crude, natural gas liquids, bitumen, synthetic oil, and natural gas. Prior years' data have been reclassified in certain cases to conform to the 2017 presentation basis. The term "project" as used in this publication can refer to a variety of different activities and does not necessarily have the same meaning as in any government payment transparency reports.



2019 ENERGY & CARBON SUMMARY

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COVER PHOTO:

LNG ship, Gaslog Savannah, delivers gas from the Gorgon project in Western Australia to customers in Asia. ExxonMobil has a 25 percent interest in the Gorgon project.



There are few challenges more important than meeting the world's growing demand for energy while reducing environmental impacts and the risks of climate change.

ExxonMobil is committed to doing our part to help society meet this dual challenge.

Energy underpins modern life. People around the world rely on energy to cook their meals, heat their homes, fuel their cars, and power their hospitals, schools and businesses. Our industry plays a critical role in fulfilling society's economic needs and providing the foundation for a healthier and more prosperous future.

We also play an essential role in protecting the environment and addressing the risks of climate change. ExxonMobil is taking significant steps to minimize the greenhouse gas (GHG) emissions from our own operations. For example, we have committed to reducing methane emissions from our operations by 15 percent and flaring by 25 percent by 2020*, as well as reducing the GHG intensity at our operated Canadian oil sands facilities by 10 percent by 2023*.

Since 2000, we have invested more than \$9 billion in our facilities and research to develop and deploy lower-emission energy solutions such as cogeneration, algae biofuels, and carbon capture and storage (CCS). We have partnered with more than 80 universities around the world to support emerging energy research.

At the same time, we help our customers reduce their emissions through the use of our energysaving technologies and sustainable products. We also actively engage in climate-related policy discussions. We understand that dealing successfully with climate change risks will require a coordinated effort involving individuals, governments and industry leaders around the world. ExxonMobil supports the 2015 Paris Agreement. In 2017 we became a founding member of the Climate Leadership Council to help promote a revenue-neutral carbon tax. And last year we joined the Oil and Gas Climate Initiative (OGCI), a voluntary collaboration of leading companies in our industry aimed at reducing climate-related risks.

Together with our Board of Directors and senior management team, we regularly review our efforts to address climate-related matters.

This year's Energy & Carbon Summary details some of these efforts. It is aligned with the core elements of the framework developed by the Financial Stability Board's Task Force on Climate-related Financial Disclosures, designed to encourage the informed conversation society needs on these important issues. Through our active participation in this conversation, and our ongoing actions to meet energy needs and environmental expectations, ExxonMobil will continue to take a leadership role in meeting the world's dual challenge.



Darren Woods, Chairman and CEO



*when compared to 2016

Our Company has a proven record of successfully responding to changes in society's needs. With long-standing investments in technology, we are well-positioned to meet the demands of an evolving energy system.

Our annual Outlook for Energy provides a view of energy demand and supply through 2040, incorporating important fundamentals including population growth, economic conditions, policy developments and technology advances.

The 2018 *Outlook for Energy* anticipates global energy needs will rise about 25 percent over the period to 2040, led by non-OECD⁽¹⁾ countries. While the mix shifts toward lower-carbon-intensive fuels, the world will need to pursue all economic energy sources to meet this need.

- Efficiency gains and growing use of less-carbon-intensive energy sources will contribute to a nearly 45 percent decline in the carbon intensity of global GDP
- · Worldwide electricity from solar and wind will increase about 400 percent
- Natural gas will expand its role, led by growth in electricity generation and industrial output
- Rising oil demand will be driven by commercial transportation and the chemical industry. Road fuel demands for cars and heavy-duty vehicles reflect efficiency improvements and growth in alternative fuels
- According to the International Energy Agency (IEA), cumulative investments in oil and natural gas supplies could approach \$21 trillion from 2018 to 2040

The *Outlook* includes sensitivities to illustrate how changes to base *Outlook* assumptions might affect the energy landscape. In this report, we highlight sensitivities related to lightduty vehicle fuel economy gains and electric vehicle penetration, and also introduce new sensitivities tied to efficiency and alternative fuel use potentially affecting the heavy-duty vehicle sector.

Relative to our Outlook, a theoretical 2°C pathway would generally lower demand for oil, natural gas and coal, and increase use of nuclear and renewables.

- Signposts in the energy system provide indicators on the world's progress toward a 2°C pathway
- Even under a 2°C pathway, significant investments will be required in oil and natural gas capacity. In this scenario, according to the IEA, cumulative oil and natural gas investments could exceed \$13 trillion by 2040

• Production from our proved reserves and investment in our resources continue to be needed to meet global requirements and offset natural field decline

Our businesses are well-positioned for the continuing evolution of the energy system.

Near-term actions, consistent with society's energy requirements and environmental objectives, include:

- Expanding the supply of cleaner-burning natural gas
- Transitioning our refining facilities to growing higher-value distillates, lubricants and chemical feedstocks
- Mitigating emissions from our own facilities through energy efficiency, cogeneration and reduced flaring, venting and fugitive emissions, including GHG intensity reduction in Imperial Oil Limited's (Imperial) operated oil sands facilities
- Supplying products that help others reduce their emissions, such as premium lubricants and fuels, lightweight materials, and special tire liners
- Engaging on policy to address the risks of climate change at the lowest cost to society

Importantly, on a longer-term horizon, we are pursuing technologies to enhance existing operations and develop alternative energy technologies with lower carbon intensity, including:

- Researching breakthroughs that make CCS technology more economic for power generation, industrial applications and hydrogen production
- Developing technologies to reduce energy requirements of refining and chemical manufacturing facilities
- Progressing advanced biofuels for transportation and chemicals

GOVERNANCE

nMobil

ExxonMobil's Board of Directors and Management Committee work together to oversee and address risks associated with our business, including risks related to climate change. Structured risk management is interwoven into ExxonMobil's corporate governance framework to ensure risks are appropriately identified and addressed.

Climate change risk oversight

ExxonMobil's Board of Directors provides oversight of Company risks, including climate change risks. These risks have the potential to manifest in a variety of ways, including through strategic, financial, operational, reputational and legal compliance matters. Effectively managing these risks is essential to the long-term success of the Company.

Board committees conduct deeper reviews and provide additional insight on important topics. For example, the ExxonMobil Board Audit Committee assesses ExxonMobil's overall risk management approach and structure to confirm that enterprise-level risks are being appropriately considered by the Board. The Public Issues and Contributions Committee (PICC) regularly reviews ExxonMobil's safety, health and environmental performance, including actions taken to address climate change risks (see page 5).

The potential for changes in demand for ExxonMobil's products for any reason, including climate change, technology or economic conditions, is considered a key strategic risk. The full Board annually considers this risk as part of its review of the *Outlook for Energy*, the Company's long-term supply and demand forecast, in addition to the Board's regular reviews and discussions of the Company's strategies and business plans.

ExxonMobil's corporate and environmental strategy, and performance, are reviewed and discussed by the Board at multiple points throughout the year. The Board provides oversight of ExxonMobil's strategy to research, develop and implement technology to address GHG emissions by reviewing the Company's technology portfolio, including ExxonMobil's low-emissions technologies, and long-range research and development programs.

To learn about and discuss the latest developments in climate science and policy, the Board engages with subject matter experts, and holds briefings and discussions on the Company's public policy positions and advocacy.

Risk management starts at the top, with oversight from the Board of Directors, and leadership from the CEO and the rest of the ExxonMobil management team. However, management does not act alone. Risk management occurs at multiple levels of the business as part of ExxonMobil's risk management framework (see page 32). This framework provides a structured approach to managing risk while ensuring the Company is able to provide reliable and affordable energy to meet rising global energy demand. This framework ensures that key risks, including climate change risks, are incorporated and considered at all levels of the business.

нівнывнт: Integrating risk management into executive compensation

ExxonMobil's compensation of senior executives is determined by the Board Compensation Committee, which is comprised entirely of independent directors. The compensation program is specifically designed to incentivize effective management of all operating and financial risks associated with ExxonMobil's business, including climate change risks.

Features of the program include the long-term vesting of performance shares and the linkage of compensation to overall company performance, including all aspects of risk management. Executive remuneration is designed to support sustainability of our operations and management of climate-related risks. Performance in managing climate change risks is further emphasized under Strategic Objectives and Operations Integrity performance metrics. ExxonMobil's executive compensation program requires that these longer-term risks be considered carefully at all levels of the organization, ensuring that the stewardship does not stop at the Board or executive level, but is required for success throughout the Company. Further details on compensation can be found in our annual Proxy Statement and the 2018 *Executive Compensation Overview*.



Q UP CLOSE: Public Issues and Contributions Committee (PICC)

The Board appoints committees to help carry out its duties. In particular, Board committees work on key issues in greater detail than would be possible at full Board meetings. The PICC's primary duties are to review and provide advice, as the committee deems appropriate, regarding the Corporation's policies, programs and practices on public issues of significance, including their effects on safety, health and the environment; and to review and provide advice on the Corporation's overall objectives, policies and programs.

To accomplish this, the PICC regularly reviews ExxonMobil's safety, health and environmental performance, including actions taken to identify and manage climate change risks and opportunities. The PICC is comprised of four independent directors who are appointed by the Board. A broad range of backgrounds and areas of expertise for individual PICC members ensures that the PICC is able to effectively evaluate and inform the Board on dynamic and complex issues such as climate change risks that span a range of disciplines.

In addition, the PICC, along with other members of the Board of Directors, makes annual site visits to ExxonMobil operations to observe and provide input on current operating practices and external engagement. In 2018, the PICC traveled to ExxonMobil's Permian operations near Carlsbad, New Mexico. The visit included a tour of a well site where directional drilling and hydraulic fracturing technologies are being employed, as well as a production site where oil and gas are separated and stabilized prior to transport and use. Through these field visits, the PICC is able to see first-hand and validate that the risk management process and operations integrity management system (OIMS) are effective at protecting the Corporation's employees, the community and the environment. The PICC utilizes this information, along with reports on the safety and environmental activities of the operating functions throughout the year, to provide recommendations to the full Board.



The Board of Directors, Chairman and senior executives toured XTO operations near Carlsbad, N.M., in September 2018 as part of the annual PICC trip.



Our business strategies are underpinned by a deep understanding of global energy system fundamentals. These fundamentals include the scale and variety of energy needs worldwide; capability, practicality and affordability of energy alternatives; carbon emissions; and government policy. We consider these fundamentals in conjunction with our Outlook to help inform our long-term business strategies and investment plans. We are committed to providing affordable energy to support human progress while advancing effective solutions. Our actions to address the risks of climate change, which are prioritized under the four pillars below, position ExxonMobil to meet the demands of an evolving energy system.





DEVELOPING SCALABLE TECHNOLOGY SOLUTIONS ENGAGING ON CLIMATE-RELATED POLICY



PROVIDING PRODUCTS TO HELP OUR CUSTOMERS REDUCE THEIR EMISSIONS



Highlights from the 2018 Outlook for Energy

The *Outlook* is ExxonMobil's global view of energy demand and supply through 2040. ExxonMobil uses a data-driven, bottom-up approach to help produce a comprehensive view of future energy demand and supply that recognizes the dual challenge of providing affordable energy to support prosperity while reducing environmental impacts.

Energy supports rising prosperity

Access to modern technologies and abundant energy – including oil and natural gas – continues to enable substantial gains in living standards. Over the period to 2040, the world population is expected to reach 9.2 billion people, while global GDP likely will double. Billions of people are expected to join the middle class. Energy demand is likely to rise about 25 percent over the period to 2040, while efficiency gains and a shift in the energy mix – including rising penetration of wind and solar – are likely to enable nearly a 45 percent fall in the carbon intensity of global GDP.

While overall energy demand is likely to be fairly stable in OECD nations, demand in non-OECD nations will likely grow about 40 percent, led by expanding economies in the Asia Pacific region, such as China and India. Meeting growing demand for reliable, affordable energy to support prosperity and enhanced living standards is coupled with the need to do so in ways that reduce potential impacts on the environment, including those relating to air quality and the risks of climate change. Accordingly, the *Outlook* anticipates significant changes through 2040 to reshape the use of energy through efficiency gains and a shift in the energy mix. In this regard, nationally determined contributions (NDCs)⁽²⁾ related to the Paris Agreement provide important signals on government intentions related to the general direction and pace of policy initiatives to address climate change risks.

Electrification and a gradual shift to lower-carbon energy sources are expected to be significant global trends. Renewables and nuclear energy see strong growth, contributing nearly 40 percent of incremental energy supplies to meet demand growth through 2040. Natural gas grows the most of any energy type, reaching a quarter of all demand. Oil will continue to play an important role in the world's energy mix, as commercial transportation (e.g., trucking, aviation, marine) and chemical sectors lead to demand growth. Coal's share will fall as the world shifts to lower-emission energy sources, helping enable a peak in global energy-related CO₂ emissions by 2040.



Growth led by natural gas & non-fossil energy sources (Quadrillion BTUs)







Considering 2°C scenarios

According to the IEA, a "well below" 2°C pathway implies "comprehensive, systematic, immediate and ubiquitous implementation of strict energy and material efficiency measures."⁽³⁾ Given a wide range of uncertainties, no single pathway can be reasonably predicted. A key unknown relates to advances in technology that may influence the cost and potential availability of certain pathways toward a 2°C scenario. Scenarios that employ a full complement of technology options are likely to provide the most economically efficient pathways.

Considerable work has been done in the scientific community to explore potential energy pathways. A comprehensive multi-model study coordinated by the Energy Modeling Forum 27 $(EMF27)^{(4)}$ at Stanford University brought together many energy-economic models to assess possible technology and policy pathways associated with various climate stabilization targets (e.g., 450, 550 ppm CO₂ equivalent or CO₂e), partially in support of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

The chart (top right) illustrates potential global CO₂ emission trajectories under EMF27 fulltechnology scenarios⁽⁵⁾ targeting a 2°C pathway relative to our 2018 *Outlook*, and baseline pathways with essentially no policy evolution beyond those that existed in 2010.

The chart (lower right) illustrates potential global energy demand in 2040 under the assessed 2°C scenarios. As the chart illustrates, the scenarios suggest that predicting absolute 2040 energy demand levels in total and by energy type carries some uncertainty, with particular scenarios likely heavily influenced by technology and policy assumptions.

For comparison purposes, the chart (lower right) also includes energy demand projections in 2040 based on the IEA's Sustainable Development Scenario (SDS), which is designed to meet certain outcomes. The IEA specifically notes that its SDS projects global energy-related CO₂ emissions that are "fully in line with the trajectory required to meet the objectives of the Paris Agreement on climate change." In fact, the SDS projects global energy-related CO₂ emissions generally in line with the aggregation of national commitments under the Paris Agreement. As recognized by the United Nations Framework Convention on Climate Change, the estimated aggregate annual global emissions levels resulting from the implementation of intended NDCs do not fall within least-cost 2°C scenarios.⁽⁷⁾ Differences in the global energy landscape.



2040 global demand by energy type by model in the EMF27 assessed 2°C scenarios and the IEA SDS



IEA WEO 2018 SDS includes CCS but breakdown by energy type is not readily identifiable

Considering 2°C scenarios, continued

The assessed 2°C scenarios produce a variety of views on the potential impacts on global energy demand in total and by specific types of energy. The scenarios also show a range of possible growth rates for each type of energy. We have taken the average of the scenarios' growth rates in order to consider potential impacts on energy demand for this report.⁽⁸⁾

Based on this analysis, primary energy demand on a worldwide basis is projected to increase about 0.5 percent per year on average from 2010 to 2040. Expected demand in 2040 varies by model and energy type (see 2°C chart on prior page):

- · Oil demand is projected on average to decline by about 0.4 percent per year
- · Natural gas demand is expected on average to increase about 0.9 percent per year
- The outlook for coal is the most negative, with diverse projections showing an average decline of about 2.4 percent per year, or about a 50 percent decline by 2040
- The projected growth rates for renewable energies and nuclear are generally quite strong, averaging between 4 and 4.5 percent per year for non-bioenergy (e.g., hydro, wind, solar) and bioenergy respectively, and about 3 percent per year for nuclear

All energy sources remain important across all the assessed 2°C scenarios, though the mix of energy and technology shifts over time. Oil and natural gas remain important sources, even in models with the lowest level of energy demand. Oil demand is projected to decline modestly on average, and much more slowly than its natural rate of decline from existing producing fields. Natural gas demand grows on average due to its many advantages, including lower GHG emissions. As a result, new investments are required in both oil and natural gas capacity to meet demand, even under the assessed 2°C scenarios.

Low-side energy growth rates for the above scenarios were also considered. The low-side by energy source sees oil dropping 1.7 percent per year, natural gas dropping 0.8 percent per year, and coal dropping 10.2 percent per year through 2040. This is compared with high-side growth rates for bioenergy, nuclear and non-bio renewables of 14.1, 4.8 and 6.3 percent per year, respectively. Even under these extremes, significant investments in oil and natural gas capacity are required to offset natural field decline.

World energy-related \mbox{CO}_2 emissions relative to energy intensity and \mbox{CO}_2 emissions intensity



This chart shows global energy intensity (left axis) and CO₂ emissions intensity (bottom axis).

From 1980 to 2015, there have been large gains in efficiency, though energy-related CO_2 emissions rose from 18 billion to 33 billion tonnes. The blue circle shown for 2040 indicates these emissions are projected to be about 36 billion tonnes even with significant gains in efficiency and CO_2 emissions intensity.

To be on a 450 ppm, or hypothetical 2°C pathway, the performance in 2040 likely needs to be significantly closer to the purple line, implying faster gains in efficiency and/or faster reductions in CO_2 emissions per unit of energy. This would increase the chance of reaching a 2°C pathway, with further gains required between 2040 and 2100.

Technology advances are expected to play a major role in accelerating progress toward a 2°C pathway. However, the International Energy Agency in 2018 estimated in its *Tracking Clean Energy Progress* analysis that only four of 37 technologies are on track to help enable reaching the Paris Agreement climate goals.

Sensitivities included in our Outlook projections

Light-duty sensitivities

We use sensitivity analyses to provide greater perspective on how changes to our base *Outlook* assumptions could affect the energy landscape. The charts below depict potential impacts to demand related to fuel economy and electric vehicle (EV) penetration (sensitivity #1), as well as a potential impact on demand assuming full EV penetration in light-duty vehicles (sensitivity #2) along with an associated possible impact on electricity generation requirements. Further discussion on sensitivities can be found in the *Outlook*.

LIGHT-DUTY SENSITIVITY #1





- Shaded ranges are indicative of potential shifts in global demand relative to base *Outlook*
- Liquids demand could fall about 1.2 million barrels per day for every additional 100 million electric vehicles on the road in 2040
- Trends in fuel economy gains lower than the *Outlook* basis could add more than 2 million barrels per day of liquids demand by 2040

LIGHT-DUTY SENSITIVITY #2



- Sensitivity assumes the global light-duty vehicle fleet is 100 percent electric by 2040, requiring all new lightduty vehicle sales to be electric by 2025
- Battery manufacturing capacity for electric cars would need to increase by more than 50 times from recent levels by 2025
- Total liquids demand in 2040 could be in line with levels seen in 2013



- Electricity to power an all-electric light-duty vehicle fleet could increase electricity demand by about 15 percent in 2040 relative to the base *Outlook*
- About 25 percent of the additional electricity would be sourced by natural gas assuming a fuel mix for electricity generation consistent with the *Outlook*
- Under a 100 percent light-duty EV sensitivity, total energy-related CO₂ emissions in 2040 could be reduced by about 5 percent

Outlook projections and potential sensitivities

Heavy-duty sensitivities

As a sensitivity analysis to our base *Outlook*, the left chart below depicts potential impacts to heavy-duty vehicle liquid demand related to changes in efficiency assumptions as well as changes in the pace of alternative fuels penetration (sensitivity #1). The middle and right charts below depict a much deeper penetration of alternative fuels (sensitivity #2). Note that because light-duty and heavy-duty fuels are produced from different segments within a barrel of oil, the impacts of light-duty and heavy-duty sensitivities on total liquids demand are independent and not necessarily additive.

HEAVY-DUTY SENSITIVITY #1



HEAVY-DUTY SENSITIVITY #2

Heavy-duty fuels demand



- Shaded ranges are indicative of potential shifts in global demand relative to the base *Outlook*, which includes faster energy intensity gains versus recent global average
- Liquids demand (including biofuels) in 2040 could fall about 0.5 million barrels per day for every percent of alternative fuels
- Slower than expected efficiency improvements could add about 7 million barrels per day of liquids demand versus the base *Outlook* in 2040
- Hypothetical sensitivity to explore deep penetration of alternative fuels; transition of the global vehicle fleet and infrastructure build-out would need to accelerate significantly in the early 2020s
- Sensitivity assumes 2040 share of alternative fuels such as electricity, biofuels, gas and hydrogen about three times the level in 2040 compared with the base *Outlook* at ~12%
- Transition assumes nearly 100% electrification of light commercial vehicles, about 70% alternative fuels in medium commercial vehicles, and about 20% penetration of alternative fuels in heavy-duty commercial vehicles



- Under sensitivity #2, total oil demand in the heavyduty sector could peak prior to 2025, declining by 2040 to levels observed in the mid-2000s
- Total liquids demand could peak by 2040 if this penetration of alternative fuels in the heavy-duty sector were realized
- Increased electrification would likely drive increased demand for natural gas for both electricity and hydrogen production

Signposts for the evolving energy landscape

Changes in the relative cost of new technology when compared against existing or alternative energy sources may further increase shifts in the global energy mix. Utilizing Company and external sources, we monitor a variety of indicators that may serve as signposts for potential acceleration in shifts to the energy landscape, such as:

- New NDCs and significant policy initiatives broadly implemented, such as carbon pricing
- Increasing electrification of energy systems
- Increasing penetration of renewables with technology developments that reduce costs and increase reliability of energy storage
- Development of scalable alternative energy technologies such as advanced biofuels, leading to displacement of gasoline and distillate in the fuels market
- Advances in CCS technology to lower cost
- Advances in significant new capacity expansions of multiple technologies, as well as the associated financing that support these expansions
- Energy efficiency gains exceeding historical trends
- Change in consumer preferences and growth in acceptance
 of alternative energy technologies including potentially
 higher costs

Further details and discussion of assessed 2°C scenarios can be found in the special section of the 2018 *Outlook for Energy – Pursuing a 2°C pathway.*

C Indicators for a 2°C pathway

The continued evolution of the energy system will provide important indicators on whether society is moving toward a 2°C scenario. The following would demonstrate progress toward that objective by 2040 compared to 2010:



Potential impact on proved reserves and resources considering 2°C scenarios

Over the coming decades, oil and natural gas will continue to play a critical role in meeting the world's energy demand, even considering the 2°C scenarios assessed in the previous section. The following analysis is intended to address the potential impacts to the Company's proved reserves⁽¹⁷⁾ and resources⁽¹⁸⁾ through 2040 and beyond, considering the average of the assessed 2°C scenarios' oil and natural gas growth rates (2°C scenarios average).⁽¹⁹⁾

At the end of 2017, ExxonMobil's proved reserves totaled about 21 billion oil-equivalent barrels, of which 57 percent were oil and 43 percent were natural gas. These proved reserves are assessed annually and reported in our annual report on Form 10-K in accordance with the U.S. SEC rules. Proved reserves are the main driver of intrinsic value of an integrated oil and gas company's upstream operations.⁽²⁰⁾ Based on currently anticipated production schedules, we estimate that by 2040 a substantial majority of our year-end 2017 proved reserves will have been produced. Since the 2°C scenarios average implies significant use of oil and natural gas through the middle of the century, we believe these reserves face little risk from declining demand.

For the remaining year-end 2017 proved reserves that are projected to be produced beyond 2040, the reserves are generally associated with assets where the majority of development costs are incurred before 2040. While these proved reserves may be subject to more stringent climate-related policies in the future, targeted investments could mitigate production-related emissions and associated costs. In addition, these assets have generally lower risk given the technical knowledge that accumulates over many decades of production. Accordingly, the production of these reserves will likely remain economic even under the 2°C scenarios average.

For producing assets that do not currently meet the SEC's definition of proved reserves, we expect to continue producing these assets through the end of their economic lives. We continue to enhance the long-term viability of these assets through increased efficiency, cost reductions, and the deployment of new technologies and processes.

UP CLOSE: Significant investment still needed in 2°C scenarios

Considering the 2°C scenarios average, global liquids demand is projected to decline from 95 million barrels per day in 2016 to about 78 million barrels per day in 2040. Using the lowest liquids demand growth rate among the assessed 2°C scenarios, liquids demand would still be 53 million barrels per day in 2040, as seen in the left chart below.⁽²¹⁾ However, absent future investment, world liquids production to meet demand would be expected to decrease from 95 million barrels per day in 2016 to about 17 million barrels per day in 2040. This decrease results from natural field decline, and the associated decline rate is expected to greatly exceed the potential decline rate in global oil demand even under the lowest 2°C demand scenarios assessed. Natural gas natural field decline rates are generally similar to liquids.

With the potential 2040 imbalance (absent future investment), the substantial majority of our proved reserves that are projected to be produced by 2040 are clearly supported by ample demand, and therefore face little risk related to the 2°C scenarios average.

Natural gas reserves face even less risk, as demand in 2040 is expected to increase under the 2°C scenarios average versus 2016 demand levels.

Considering the IEA's Sustainable Development Scenario (a 2°C scenario), the IEA estimates that more than \$13 trillion of investment will be needed for oil and natural gas supply for 2018-2040.⁽²²⁾

Global liquids supply estimates (Million oil-equivalent barrels per day)



Global natural gas supply estimates (Billion cubic feet per day)

Additional natural gas to

demand based on

demand

meet average estimated

assessed 2°C scenarios

Potential impact on proved reserves and resources considering 2°C scenarios, continued

Resources

At the end of 2017, ExxonMobil's non-proved resources totaled about 76 billion oilequivalent barrels. The size and diversity of this undeveloped resource base provide us with considerable flexibility to profitably develop new supplies to meet future energy demand and replenish our proved reserves. We also continue to enhance the quality of our resources through successful exploration drilling, acquisitions, divestments, and ongoing development planning and appraisal activities.

The underlying economics of commercializing and producing resources are dependent on a number of factors that are assessed using a dynamic resource development process, as highlighted further in the box on the following page. We seek to advance the best resource opportunities and monetize or exit lower potential assets. As noted before, the world will continue to require significant investment in both liquids and natural gas, even under the assessed 2°C scenarios. Under the 2°C scenarios average, ExxonMobil still would need to replenish approximately 35 billion oil-equivalent barrels of proved reserves by 2040, assuming the Company retains its current share of global production over that time period.⁽²³⁾

In light of the multiple factors that will influence decisions to commercialize undeveloped resources, it is not possible to identify which specific assets ultimately will be commercialized and produced. As we consider the implied oil and natural gas demand to 2040 under the 2°C scenarios average, it is possible that some higher-cost assets, which could be impacted by many factors including future climate-related policy, may not be developed. We are confident, however, that the size, diversity and continued upgrading of our undeveloped resources, along with technology developments, will enable the ongoing replenishment of our proved reserves for decades to come under a range of potential future demand scenarios.

We test our investments over a wide range of commodity price assumptions and market conditions. Notably, the IEA's estimates of future prices under its 2°C pathway fall within the range we use to test our investments.^[24] Additionally, over our long history we have successfully competed in periods where supply exceeds demand. In such a business environment, the lowest cost of supply will be advantaged. ExxonMobil's long-standing focus on efficiency and continuous improvement will position us to compete successfully.

Reducing costs using technology to compete

Trillions of dollars of investment in oil and natural gas will be needed, even considering a 2°C scenario. By leveraging high-impact technologies from our research organization, we can reduce costs and environmental impacts. This positions our portfolio to continue to compete successfully.

Examples of technology-enabled cost and environmental footprint reductions:

- Record-setting extended-reach wells in Sakhalin to significantly reduce drilling costs and environmental footprints
- Full-physics modeling and next-generation completion designs for unconventional developments to reduce drilling and improve recovery
- Combination of horizontal drilling with hydraulic fracturing to significantly reduce land surface footprint and cost

Drilling and completion cost reduction operated Midland Basin horizontal wells

(\$/Oil-equivalent barrel)



Potential impact on proved reserves and resources considering 2°C scenarios, continued

Lastly, a portion of our non-proved resources represent unconventional liquids assets in the United States. These assets have shorter development cycles than other capital-intensive resources, which we believe make this class of assets resilient under the 2°C scenarios average. Natural gas assets form another portion of our non-proved resources. The 2°C scenarios average anticipates demand growth of this cleaner-burning fuel in the future, making these assets resilient under the 2°C scenarios average. Our remaining undeveloped liquids resources, in some cases, may not be attractive investments under the 2°C scenarios average, assuming no advances in technology, processes or designs. However, the carrying value of these undeveloped liquids resources is less than 5 percent of ExxonMobil's total net book value of property, plant and equipment as of September 30, 2018.⁽²⁵⁾



Q UP CLOSE: Dynamic resource development planning

This process considers a wide range of variables over time, including as appropriate: the extent and quality of the resource, development concepts, fiscal terms, regulatory requirements, proximity to existing infrastructure, market conditions, enabling technologies, and policy developments, including climate-related policy.

We optimize our resource development plans in line with these variables and prioritize developments that are competitively advantaged in delivering long-term shareholder value. Decisions can range from developing the resource (which eventually moves to proved reserves), monetizing the resource by selling it to others, or exiting the acreage.

With a very large resource base, this process can take decades as technologies are developed, market conditions change and competition evolves. Two examples illustrate this:

Hebron

The Hebron field in Eastern Canada was originally discovered in 1980. Continuous reoptimization of the development concept over multiple decades allowed this field to be brought on line in 2017.

Scarborough

In contrast, we monetized Scarborough through sale of the asset, which was originally discovered in 1979. After an evaluation of our portfolio, we sold it in 2018 to enable ExxonMobil to focus on more profitable LNG opportunities.



Positioning for a lower-carbon energy future

Strengthened by integration across our businesses, we are well-positioned to capture value across the entire supply chain, from well to customer, and throughout the commodity price cycle. Our proven business strategy, underpinned by leading-edge technology, has allowed ExxonMobil to transition our products over time to meet demand while maintaining our competitiveness as a low cost supplier and efficient operator. Our success is predicated on relentlessly operating safely and responsibly, taking care of people and the environment, while addressing the risks of climate change.

Upstream

Even in the assessed 2°C scenarios, oil and natural gas remain important energy types over time. By 2040, oil demand is projected to decline modestly, while natural gas demand is projected to grow. Upstream's focus on leading-edge technologies, coupled with industry-leading financial capacity, has enabled ExxonMobil to capture our best investment portfolio in decades. Our growth opportunities are geographically diverse and are expected to yield attractive returns, even in a low-price environment. As one of the largest natural gas producers in the United States, and a significant producer of liquefied natural gas around the world, we are well-positioned for the demand shift from coal to natural gas for power generation and industrial use.

Fuels & Lubricants

Decrease in demand for certain products may result in capacity rationalization, which our industry has experienced for decades. For example, over the past 20 years the global refining sector has continued to add new large, highly efficient capacity, leading to shutdown of smaller, less-efficient capacity. During this period, we have strengthened our refining business by divesting less competitive facilities (we divested 22 of 43 refinery sites since 2000) and redeploying resources and capital to more efficient sites that are integrated with chemical and lubricant manufacturing facilities. ExxonMobil refining is a leader in energy efficiency.⁽²⁶⁾ In addition, we continue to deploy technologies in our refineries to improve the mix of products consistent with demand trends (see top right chart). This continuous high-grading of our portfolio has positioned our Fuels & Lubricants business to remain competitive across a wider range of potential future scenarios.

Chemical

ExxonMobil Chemical Company's annual earnings have grown from less than \$1 billion USD in 1987 to more than \$4 billion USD in 2017. Demand for our products has doubled since 2000, outpacing GDP growth in many regions. Over the next few decades, we expect this demand to continue to grow at about 4 percent annually. Investment in technology and new capacity enables us to support the growing demand for chemical products worldwide. We have a strong market position in every business line we operate, particularly in high-performance products such as advanced materials that make cars lighter and more fuel efficient, and materials for packaging that reduces the energy needed to ship goods around the world. And we are committed to helping our customers reduce their GHG emissions while meeting the growing demand for these products.





2017 prices source: Platts, Argus and IHS



ExxonMobil Chemical average earnings⁽²⁷⁾ (Billion USD)



ExxonMobil has been at the forefront of many technologies that have enabled energy to be produced and delivered in a safe, affordable and sustainable manner. Our ability to reliably provide for society's energy needs today were unimaginable when the industry first emerged. Over the past century, we have seen firsthand how technology has enabled us to respond to the ever-changing energy landscape (see our innovation timeline below, noting significant innovation by our scientists and engineers). As the world demands more energy and fewer emissions, we are well-positioned to develop scalable, high-impact solutions to reduce emissions in power generation, industry and transportation. Our work with university energy centers enables us to extend the technical capabilities of our 2,200 scientists and 5,000

employees working in our R&D organizations around the world to potentially accelerate the delivery of new technologies.

We are advancing fundamental science and applying technologies in a number of areas that could lead to breakthroughs, redefining our manufacturing processes and products. We have ongoing work in advanced biofuels, catalysts, materials and manufacturing processes. Successful developments here could change our future and our impact on the environment. We are excited about the promise of this portfolio and have devoted the next few pages to elaborate on each program's criticality in addressing the Paris Agreement goals.





Since 1970, ExxonMobil has cumulatively captured more CO_2 than any other company – accounting for more than 40 percent of cumulative CO_2 captured.⁽²⁸⁾ We have a working interest in more than one-fifth of the world's carbon capture capacity, capturing nearly 7 million tonnes of CO_2 in 2017. While a leader in CCS, we are looking to expand our capacity and are evaluating multiple opportunities that have the potential to be commercially viable through the convergence of advantaged technologies and a supportive policy environment.

ExxonMobil is working to develop new CO₂ capture technologies with a goal of reducing costs, complexity of operation and need for large initial capital investments. For example, ExxonMobil and FuelCell Energy, Inc. have partnered to develop CO₂ capture technologies using carbonate fuel cells. This novel approach has the potential to be less costly and easier to operate than existing technologies, while being deployable in a modular fashion with applicability to multiple industry settings.

ExxonMobil is also researching subsurface CO_2 storage capability by leveraging decades of experience in the exploration, development and production of hydrocarbon resources. This expertise is key to permanently storing CO_2 deep underground safely and securely. For example, we are collaborating with leading universities around the world to better characterize subsurface storage capacity and develop improved CO_2 monitoring technologies and techniques.

Advancing scalable technologies is only one part of achieving large-scale deployment of CCS. Equal policy treatment of CCS, relative to other low-carbon energy solutions, is also needed. While policies will need to create financial drivers, measures to create favorable regulatory and legal environments are also needed. These measures will need to address a wide range of issues, such as potential legal uncertainty of storage space ownership, and reasonable measurement, reporting and verification standards for injected CO₂. ExxonMobil actively advocates for appropriate policy measures to encourage the large-scale deployment of CCS.

"Without CCUS as part of the solution, reaching our climate goals is almost impossible."

- Fatih Birol, Executive Director of IEA, Twitter on November 26, 2018







The Shute Creek Gas Plant in Wyoming. CCS will be an important long-term technology to reduce emissions.



Advanced biofuels

ExconMobil continues to progress research on advanced biofuels to produce fuels from algae and cellulosic biomass with the potential to reduce GHG emissions by 50 percent or more compared to today's transportation fuels. Our advanced biofuels research portfolio includes joint research collaborations focused on algae-based biofuels with Synthetic Genomics, Inc. (SGI), Colorado School of Mines and Michigan State University. Our partnership with Renewable Energy Group (REG) has demonstrated the ability to convert sugars from a variety of non-edible biomass sources into biodiesel by utilizing REG's patented bio-conversion technology. ExconMobil and REG signed a joint research agreement with Clariant to evaluate the potential to combine Clariant's and REG's processes into an integrated cellulosic biomassto-biodiesel technology. These programs on advanced biofuels will lead to a better understanding of new technologies with the transformative potential to increase supplies of high-quality, low-carbon diesel while reducing GHG emissions.

Targeting technical capability to produce 10 KBD by 2025

ExxonMobil and SGI have been working together to turn algae into a low-emission transportation fuel for almost a decade. We are applying our fundamental understanding to develop strains of algae that convert CO₂ into a large amount of energy-rich fat, which can then be processed (similar to crude oil) into renewable diesel. It is an ambitious project that has already achieved important breakthroughs. The research now also involves an outdoor field study in California. There, researchers are growing algae at a much larger scale than the sample-size quantities used in our labs. ExxonMobil is targeting technical capability to produce 10 KBD of algae biofuels by 2025.

Fuel of the future

Currently in the United States, the average corn ethanol plant capacity is 5 KBD⁽²⁹⁾ and the average yield is 400 gallons per acre.⁽³⁰⁾ This compares to 650 gallons per acre for palm oil and only 50 gallons per acre for soybean oil.⁽³¹⁾ Biofuel yields from algae are potentially much higher – currently 2,000 gallons or more per acre.⁽³²⁾⁽³³⁾ or more than five times the yield of corn ethanol and 40 times the yield of soybean oil. This level of productivity for algae has been demonstrated outdoors on a small-scale pilot (< 0.25 acres),⁽³⁴⁾ indicating that, for a given quantity of biofuel, algae should require much less land area than traditional biofuels. Therefore, we are working to improve algae productivity, which could result in even less land usage than technically achievable today (see right chart). Algae can also be grown on marginal lands and in brackish water, thus reducing the overall environmental footprint, making algae an attractive, viable low-emissions biofuel. Researchers are working to understand fundamental engineering parameters, including pond design and mixing, as well as strain performance. The algae field study will lead to an improved understanding of how to globally scale the technology.

ExxonMobil advanced biofuels program



HIGHLIGHT: Significant productivity from algae

In the future, algae should require significantly less land usage to produce the same amount of biofuels compared to traditional biofuels today. Conceptual comparison of land usage required to produce biofuels



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Process intensification

Taking the emissions out of manufacturing

The manufacturing sector of the economy – which produces fuel, plastic, steel, cement, textiles and other building blocks of modern life – accounts for about one-third of the world's energy-related CO_2 emissions – more than transportation and second only to power generation. Demand for industrial products is expected to grow as economies expand and standards of living rise in the developing world.

To meet this demand, the world will need manufacturing solutions that are more energyand GHG-efficient than those currently used. Significant emissions savings would be possible if the manufacturing processes could be redesigned to require much less heat and energy than they currently do, via advanced separations, catalysts and process configurations. That's why ExxonMobil is targeting breakthrough research in these technologies as part of our broader effort in process intensification.

Highlights of process intensification efforts include:

Advanced separations: New materials and processes may provide a step-change reduction in energy use by augmenting conventional separations processes, such as distillation.

ExxonMobil and Georgia Tech are advancing a "reverse osmosis" membrane (see left diagram) that could be 50 times more efficient than today's separation techniques. In addition, with Spain's Instituto de Tecnología Química (ITQ), we are developing shape-selective zeolites that can separate ethylene from ethane using adsorption rather than via cryogenic distillation, which is more energy intensive.

Catalysts: Drawing upon decades of leadership in catalysis and newer tools such as 3D printing, ExxonMobil is developing state-of-the-art catalysts and fabrication methods, which can greatly improve the efficiency of the chemical reactions used to produce transportation fuels and petrochemicals.

High efficiency reactors: ExxonMobil is working to transform how hydrocarbons are processed and turned into other useful products. By focusing on thermal efficiency, modern reactor design and process miniaturization, we are developing novel solutions to make products far more efficiently than with traditional manufacturing technologies. Our research also focuses on reactors that can expand the options for using natural gas, an abundant, lower-carbon fuel.



A new organic solvent reverse osmosis process with a novel carbon-based membrane to separate liquid hydrocarbons with much less energy is under development.



This new material, in conjunction with other separation technologies, could reduce the amount of energy needed for light hydrocarbon purification.



The modern oxo alcohol reactor in Singapore (on the far right) has the same reactor volume as four large loop reactors combined (to the left), but with a much smaller footprint.



ExxonMobil believes that the long-term objective of effective policy should be to reduce the risks of climate change at the lowest societal cost, while balancing increased demand for affordable energy and better addressing poverty, education, health and energy security concerns.

Climate change is a global issue that requires the collaboration of governments, private companies, consumers and other stakeholders to create meaningful solutions. We engage with stakeholders directly and through trade associations around the world to encourage sound policy solutions for addressing climate change risks. Our scientists have contributed climate research and related policy analysis in more than 50 papers in peer-reviewed publications, collaborated with top universities and national labs, and participated in the IPCC since its inception in 1988, including co-authoring chapters of IPCC scientific reports.

For more than a decade, ExxonMobil has supported an economy-wide price on CO₂ emissions as an efficient policy mechanism to address GHG emissions. Consistent with this position, ExxonMobil is also a founding member of the Climate Leadership Council (CLC). Formed in 2017, the CLC calls for the adoption of a carbon fee with the revenues returned to Americans coupled with regulatory simplification.

ExxonMobil has also provided financial support for the 501(c)(4) organization "Americans for Carbon Dividends," a national education and advocacy campaign launched in 2018 to promote the policy pillars of the CLC.

Cil and Gas Climate Initiative

ExxonMobil is part of the Oil and Gas Climate Initiative (OGCI), a voluntary initiative representing 13 of the world's largest oil and gas producers working collaboratively toward solutions to mitigate the risks of climate change.

This CEO-led organization focuses on developing practical solutions in areas including carbon capture and storage, methane emissions reductions, and energy and transportation efficiency. As part of the initiative, ExxonMobil will support its investments in technology development and deployment of long-term solutions to reduce GHG emissions, and participate in partnerships and multi-stakeholder initiatives that will pursue lower-emission technologies.





Attributes of sound policy

- Promote global participation
- Let market prices drive the selection of solutions
- Ensure a uniform and predictable cost of GHG emissions across the economy
- · Minimize complexity and administrative costs
- Maximize transparency
- Provide flexibility for future adjustments to react to developments in technology, climate science and policy



Providing products to help our customers reduce their emissions

Over the next few decades, population and income growth – and an unprecedented expansion of the global middle class – are expected to create new demand for energy and hydrocarbon-based products. Meeting these demands will require not just more energy, but will also require energy to be used more efficiently across all sectors. ExxonMobil is delivering solutions that enable our customers to reduce their emissions and improve their energy efficiency.



Natural gas

Natural gas emits up to 60 percent fewer GHG emissions and produces significantly less air pollutants than coal for power generation. It is an ideal source of reliable power and can supplement intermittent renewable energy. In 2016, natural gas overtook coal as the leading energy source for electricity generation in the U.S., which is one of the drivers in reducing CO₂ emissions to 25-year lows.⁽³⁵⁾ ExxonMobil is one of the largest natural gas producers in the U.S. and is a leader in liquefied natural gas.



Lightweight materials and packaging

Demand for auto parts, housing materials, electronics and other products made from petrochemicals continues to grow. We produce weight-reducing materials that result in an estimated 7 percent fuel economy improvement for every 10 percent reduction in vehicle weight. At current volumes, the materials produced by industry could potentially result in 40 million tonnes per year CO₂ savings.⁽³⁶⁾ We also provide lightweight packaging materials that result in less transportationrelated energy use and GHG emissions. Advanced packaging also helps extend the shelf life of fresh food by days or even weeks, improving safety and reducing food waste and agricultural inputs.



Butyl rubber

ExxonMobil is the global leader in producing advanced halobutyl rubber, which is used to make tire innerliners. A synthetic innerliner keeps tires inflated for longer and prevents oxygen from entering and degrading the tire. By improving air retention, halobutyl innerliners increase fuel economy and lower emissions. This application in motor vehicles could avoid up to 30 million tonnes per year CO₂ emissions.⁽³⁷⁾



Advanced fuels and lubricants

Our integrated Fuels & Lubricants business produces differentiated fuels and lubricants to meet evolving consumer needs. We leverage our competitive manufacturing assets to produce high-quality products such as Synergy-brand gasoline, Diesel Efficientbrand diesel fuel, marine fuels and aviation fuels. Our lubricants help minimize operational costs through improved energy efficiency and extended equipment life. Synergy fuels yield better gas mileage, reduce emissions and improve engine responsiveness.

Mitigating emissions in our operations

As we seek to produce oil and natural gas to meet growing global energy demand, we are committed to mitigating GHG emissions within our operations.

ExxonMobil has a robust set of processes to improve energy efficiency and mitigate emissions. These processes include, where appropriate, setting tailored objectives at the business, site and equipment level, and then stewarding progress toward meeting those objectives. We believe this rigorous approach is effective to promote efficiencies and reduce GHG emissions in our operations.

In the near term, we are working on increasing energy efficiency while reducing flaring, venting and fugitive emissions in our operations. We also leverage monitoring technology to minimize and reduce GHG emissions. We continue to grow our capacity in cogeneration and carbon capture. Since 2000, these programs have eliminated or captured 400 million tonnes of CO₂, which is equivalent to the energy-related CO₂ emissions associated with about 55 million U.S. homes.

ExxonMobil and our subsidiary XTO Energy have established a methane management program that exceeds current applicable regulations. The program prioritizes actions at the highest-volume production and midstream sites and includes efforts to develop and deploy new, more efficient technologies to detect and reduce facility emissions.

In 2017, along with several industry peers, we signed a Methane Guiding Principles document that provides a framework for continually reducing methane emissions, improving accuracy of methane emissions data, and advocating for sound policies and regulations. In 2018, we joined the Oil and Gas Climate Initiative (OGCI), working with other industry members collaboratively toward solutions to mitigate the risks of climate change.

We continue to actively pursue economic opportunities to deploy proven technologies, such as CCS and cogeneration, to improve energy efficiency and emissions performance.

ExxonMobil GHG emissions reductions⁽³⁸⁾

(Net equity, CO2 equivalent emissions cumulative since 2000, millions tonnes)



GHG emissions reduction from carbon capture (Net equity, CO₂ equivalent emissions

Million tonnes per year)



GHG emissions reduction from cogeneration

(Net equity, CO2 equivalent emissions Million tonnes per year)



ExxonMobil has established programs to drive improvements in energy efficiency and mitigate GHG emissions. These programs are supported by key performance metrics, which are utilized to identify and prioritize opportunities to drive progress.

NIZ

Tracking our GHG emissions performance

At ExxonMobil, we are committed to mitigating emissions from our operations and helping consumers reduce their emissions by providing efficient fuels, lubricants and lightweight materials.

In 2018 we announced GHG emissions reduction measures that are expected to lead to considerable improvements in emissions performance when compared with 2016 levels. These included:

- 15 percent reduction in methane emissions by 2020 compared with 2016 (see page 26)
- 25 percent reduction in flaring by 2020 compared with 2016
- 10 percent GHG emissions intensity reduction at Imperial operated oil sands by 2023 compared with 2016 (see page 27)

ExxonMobil invests heavily in lower-emission energy solutions such as cogeneration, flare reduction, energy efficiency, biofuels, carbon capture and storage and other technologies. Since 2000 we have spent more than \$9 billion on lower-emission energy solutions.

Over the past several years, ExxonMobil's GHG emissions have remained relatively flat as a result of efficiency improvements that have offset increases in production intensity. We have made great progress toward offsetting emissions resulting from implementation of our growth plans by working to reduce emissions from our operations.

Our commitment to mitigating emissions from our operations is unwavering. That said, it is important to understand that while ExxonMobil continues to strive to mitigate emissions, our absolute emission levels are impacted by the size and composition of our asset portfolio.

While we have made progress in reducing emissions, we will continue to apply new thinking and new technologies to successfully meet the energy and environmental challenges of the future. We will also continue to explore opportunities to lower GHG emissions across the energy value chain.





Reduce Imperial operated oil sands GHG intensity



Improve energy efficiency in our facilities



 Advance carbon capture and storage deployment

ExxonMobil GHG Emissions⁽³⁸⁾







ExxonMobil Operated GHG Emissions Sources

(2015-2017 average)



Reduce methane emissions

and flaring

Taking actions to reduce methane emissions

In 2017, ExxonMobil subsidiary XTO Energy Inc. (XTO) reduced methane emissions from its operations by 9 percent since 2016, demonstrating significant progress in its emissions reduction program and other initiatives.

In 2017, XTO implemented a methane management program to mitigate emissions associated with its operations. The program includes a leak detection and repair program, a commitment to phase out high-bleed pneumatic devices over three years, extensive personnel training, and facility design improvements for new operations. Additionally, an extensive research program seeks to increase understanding of facility and basin methane emissions, and develop improved detection, measurement and mitigation technologies. XTO has gained significant insight from the data collected through the program and is building on past learnings to make continued progress in reducing emissions and identifying areas for further improvement.

High-bleed pneumatic device phase-out

As of June 2018, XTO has phased out approximately two-thirds of existing high-bleed pneumatic devices across its U.S. operations.

Improved facility design

Low-emission design technologies are also being deployed in new developments, such as in the Permian Basin in West Texas and New Mexico. These technologies include improved tank emission control design and the installation of instrument air packages, which use compressed air instead of natural gas to actuate pneumatic controllers at new tank batteries and compressor stations.

Leak detection and repair

Through the company's expanded leak detection and repair program, progress has been made in verifying data and identifying components with a high potential to leak. This data will be used to prioritize equipment for replacement or implementation in new designs.

Research

In April 2018, XTO began a pilot program at its James Ranch facility in New Mexico to evaluate new technologies in its efforts to reduce emissions. The facility incorporates low-emission technologies and will serve as a model for future development. ExxonMobil remains active in ongoing methane research. ExxonMobil and other leading energy companies formed a new industry-led research consortium, the Collaboratory to Advance Methane Science (CAMS), to better understand global methane emissions, and identify additional solutions.

Advocacy

We are also active in pursuing sound policies, and we support reasonable, cost-effective regulations. For example, ExxonMobil submitted a letter to the EPA rulemaking docket indicating support for reasonable, cost-effective regulations to manage methane emissions from new and existing sources. We have also engaged with states advancing their own regulatory programs, most recently in New Mexico and Pennsylvania.

XTO PROGRESS



2/3 HIGH-BLEED PNEUMATIC DEVICES PHASED OUT



UP CLOSE: Imperial oil sands GHG intensity reduction

ExxonMobil's Canadian affiliate Imperial is working to apply advanced technologies and improvements in efficiency to reduce the GHG emissions intensity of its operated oil sands facilities. Its work builds on a long-standing commitment to improve the environmental footprint and economics of production associated with its oil sands operations.

In 2016, Imperial opened a new, state-of-the-art research center dedicated to advancing oil sands innovation. The facility, located in southeast Calgary, is home to a team of researchers pursuing technological breakthroughs that are anticipated to deliver significant environmental and economic benefits for Imperial's oil sands operations.

The application of next-generation oil recovery technology at Imperial's Cold Lake in-situ operations, improvements in reliability at its Kearl mining facility, and continuous improvements in energy efficiency are expected to be key drivers behind the reductions, which are anticipated to result in a 10 percent decrease in GHG emissions intensity by 2023⁽³⁹⁾, compared with 2016 levels.

Imperial is accelerating the pace of innovation as it transitions from using steam to light hydrocarbon for in-situ oil sands recovery. One new technology, solvent-assisted steam-assisted gravity drainage (SA-SAGD), could reduce both GHG emissions intensity and water use intensity by up to 25 percent through lower energy utilization per barrel, compared with traditional SAGD technology.

In addition, following a \$100 million, multi-year pilot at its Cold Lake facility, Imperial is evaluating a commercial application of its breakthrough cyclic solvent process, which could dramatically reduce the use of steam and reduce emissions intensity by up to 90 percent in certain areas of Imperial's Cold Lake field.

10%

Decrease in GHG emissions intensity at Imperial's operated oil sands facilities by 2023, compared to 2016 level

NEXT-GENERATION TECHNOLOGIES



D 90% Reduction in GHG emissions intensity and elimination of steam for recovery through cyclic solvent process technology

Production well-

Steam and solvent (diluent) injection well -

Next-generation in-situ oil sands recovery technology – how it works

Light oils can be used along with, or to replace, steam to mobilize heavy oil so it can be brought to the surface.

This approach recovers heavy oil using less energy, significantly reducing GHG emissions intensity. Glacial till Colorado shale Grand rapids Steam and solvent (diluent) Heated bitumen flows to well Clear water

Photo illustration based on Imperial's Cold Lake location, using SA-SAGD technology.

Cogeneration

Cogeneration (also referred to as combined heat and power) is the simultaneous generation of both electricity and useful heat from a heat engine or a power station.

ExxonMobil employs cogeneration in its operations to increase energy efficiency and reduce emissions while also reducing the need to import power. Currently, ExxonMobil's global gross capacity for cogeneration is approximately 5.4 gigawatts, enough to meet the annual electricity needs of 4.3 million U.S. homes. ExxonMobil continues to grow cogeneration capacity in our operations globally.



Q UP CLOSE: ExxonMobil Singapore Jurong cogeneration plant

In 2017, ExxonMobil started a 84-megawatt cogeneration plant at its Singapore Refinery's Jurong site. This plant increases the refinery's energy efficiency, helps reduce emissions and strengthens the facility's long-term competitiveness.

With completion of the plant, ExxonMobil now has more than 440 megawatts of cogeneration capacity in Singapore and is able to meet the majority of its power and steam needs for the integrated refining and petrochemical complex.

The cogeneration plant is expected to improve the Singapore Refinery's energy efficiency, resulting in a net reduction of 265,000 tonnes per year of CO_2 equivalent emissions. This emissions reduction is equivalent to removing more than 90,000 cars from roads.

This additional cogeneration capacity builds on ExxonMobil's interests in about 100 cogeneration installations at more than 30 locations around the world.

Typical facility with cogeneration




Through partnerships, ExxonMobil is working to research, develop, and deploy technologies needed for sustainable, clean energy.

Purchase of ERCOT wind and solar power

Under 12-year agreements with Lincoln Clean Energy, ExxonMobil will purchase 500 megawatts (MW) of wind (anticipated start-up in 2020) and solar (anticipated start-up in 2021) power for operations in Texas. This project will substitute 70 percent of power purchased from the Electric Reliability Council of Texas (ERCOT) with wind and solar and is expected to avoid an estimated 0.8 million tonnes of CO₂ per year. With these purchases, ExxonMobil is ranked among the top 10 global corporate wind and solar buyers in 2018 (see top chart).

Partner with Aera on solar thermal power

Bakersfield-based Aera Energy, a joint venture between ExxonMobil and Shell, and GlassPoint Solar are set to build California's largest solar energy project. The integrated project will be the first of its kind in the world to use solar-generated steam and electricity to power oil field operations and is expected to start producing 26.5 MW electricity and 12 million barrels of steam per year as early as 2020.

Partner with City of Baton Rouge to utilize landfill offgas

At our Baton Rouge Polyolefins Plant, approximately 850 million standard cubic feet of reclaimed landfill gas is used yearly for fuel to produce steam instead of burned as a waste stream by the City of Baton Rouge. Using this biogas as fuel for the plant steam boilers results in approximately 30,000 tonnes of CO_2 equivalent (CO_2e) reduction per year. This facility has been operating since 2010.

Collaborate with Energy Centers

ExxonMobil has been engaged with more than 80 universities and five energy centers to support emerging research. Some examples of research area are show below.

 CO_2 utilization — Developing more efficient CO_2 conversion technology to make useful chemical and fuel products through improved understanding at the molecular level. Advances in efficiency will enable broad and earlier deployment of carbon capture, utilization and storage.

Carbon-based materials for solar photovoltaics — Using a combined experimental and computational approach to explore new applications for carbon-based electronic materials and discover new routes to high-efficiency, low-cost and low-carbon intensity photovoltaics.

Lithium-sulfur batteries — Exploring step-change improvements in volumetric energy density in Lithium-sulfur batteries to extend driving range of electric vehicles. Lithium-Sulfur batteries may offer improved storage capacity and lower cost than today's lithium-ion batteries.

Top global corporate wind and solar buyers, 2018⁽⁴⁰⁾



GHG Emissions Performance Data

We assess our performance at many levels of the organization, from individual operational sites to the business line level, to support continual improvement. Starting in 2011, performance data includes XTO Energy information. As part of our commitment to transparently communicate our performance, in 2014 we started reporting our data over a 10-year period to demonstrate performance trends over time. Data included in the performance table is guided by the reporting guidelines and indicators of IPIECA's Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (2015).

Managing the risks of climate change⁽⁴¹⁾

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
$^{\rm (42)}{\rm GHG}$ emissions, absolute (net equity, CO2-equivalent emissions), millions of tonnes	126	123	126	128	126	127	123	122	123	122
(43)Direct (excluding emissions from exported power and heat)	117	114	117	119	118	119	115	114	115	114
(44)Emissions associated with imported power	9	9	9	9	8	8	8	8	8	8
CO_2 (excluding emissions from exported power and heat)	122	119	122	124	120	119	116	115	116	115
Methane (CO ₂ equivalent)	3	3	3	3	5	7	6	6	7	7
Other gases (CO ₂ -equivalent)	1	1	1	1	1	1	1	1	<1	<1
Emissions from exported power and heat	13	14	13	15	15	16	7	4	3	3
⁽⁴²⁾ GHG emissions, normalized (net equity, CO ₂ -equivalent emissions), tonnes per 100 tonnes of throughput or production										
Upstream	21.0	20.1	20.5	20.7	22.3	23.2	23.9	23.9	24.3	24.6
Downstream	21.0	21.0	20.8	20.0	19.6	19.7	19.2	18.9	19.5	18.6
Chemical	59.8	60.7	57.9	57.2	56.3	57.0	53.4	53.6	52.2	53.3
By-region GHG emissions (net equity, CO ₂ -equivalent emissions), millions of tonnes										
Africa/Europe/Middle East	45	43	45	45	44	44	43	44	44	43
Americas	62	62	64	66	68	70	66	65	63	63
Asia Pacific	19	18	17	17	14	13	14	13	16	16
By-division GHG emissions (net equity, CO_2 -equivalent emissions), millions of tonnes										
Upstream	49	47	50	54	56	58	56	56	57	58
Downstream	57	56	55	54	51	49	47	45	45	43
Chemical	20	20	21	20	19	20	21	21	21	21
Carbon dioxide - captured for storage, millions of tonnes	4.4	4.6	4.8	5.0	4.8	5.9	6.9	6.9	6.3	6.6
Energy use (billion gigajoules)	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.5	1.5	1.5
Upstream (gigajoules per tonnes production)	1.7	1.9	2.0	2.0	2.0	2.1	2.3	2.4	2.4	2.5
Refining (gigajoules per tonnes throughput)	3.0	3.0	3.0	3.0	3.0	3.0	2.9	2.9	3.0	2.9
Chemical (gigajoules per tonnes product)	10.1	9.8	9.5	11.4	12.0	10.9	10.7	10.9	10.6	10.5
Hydrocarbon flaring (worldwide activities), millions of tonnes	5.7	4.4	3.6	4.0	3.5	3.7	4.5	5.3	5.0	3.8
⁽⁴⁵⁾ Cogeneration capacity in which we have interest, gigawatts	4.6	4.9	4.9	5.0	5.2	5.3	5.5	5.5	5.3	5.4

MANAGEMENT

RISK

ExxonMobil utilizes a risk management framework based on decades of experience to identify, manage and address risks associated with our business, from operational to financial to strategic.

ExxonMobil's approach to risk management

ExxonMobil's corporate risk framework provides a structured, comprehensive way to identify, prioritize and manage risks across the Company. It is designed to drive consistency across risk type, from strategic, to financial, to operations and safety; and monitor that key risks, including climate change risks, are appropriately incorporated and considered across ExxonMobil. The framework includes four elements: (1) a way to organize and aggregate risks (illustrated at the right); (2) a prioritization method; (3) an inventory of systems and processes to manage risk; and (4) risk governance.

ExxonMobil's approach to risk governance includes clearly defined roles and responsibilities for managing each type of risk, utilizing a multi-layered approach. This multi-layered approach includes a definition of the responsibilities of risk owners, functional experts and independent verifiers. Each risk type is managed and supported by functional organizations that are responsible for specifying corporate requirements and processes, appropriate to the risk being managed. Each of these processes includes the critical elements of leadership, people, risk identification and management, and continuous improvement. Oversight responsibilities by the Management Committee and the Board and it's committees, as described on page 4, are a key part of risk governance.

Managing long-term risks associated with climate change is an integral part of managing strategic risks at ExxonMobil. A core element of our management of strategic risks is our annual *Outlook for Energy*. The *Outlook* reflects a long-term, data-driven approach to help promote a deeper understanding of global trends and projections related to population and economic growth, energy demand and supply options, as well as assessments of key uncertainties and potential impacts of alternative assumptions. Uncertainties include changes in economic growth, the evolution of energy demand and/or supply, emerging and disruptive technologies, and policy goals and actions, in part to address climate change risks. The *Outlook* helps inform our business strategies and our assumptions and processes for evaluating our investment opportunities. Managing risk associated with climate change is an integral part of that work, helping to ground our choices related to long-term strategies and individual investments.

ExxonMobil enterprise risk categories

Risk type	Examples of potential risks
1 Strategic	Energy transition, supply/demand, disruptive technology, geopolitical and government changes, climate change
2 Reputational	Industry reputation, corporate reputation
3 Financial	Price volatility, foreign exchange fluctuations, customers' credit risk, insurance
4 Operational	Extreme weather, geological risk, project risk, product quality and brand, cybersecurity, talent, supplier
5 Safety, Security, Health & Environment	Process safety, well control events, environmental incidents
6 Compliance & Litigation	Litigation risks, regulatory compliance

Resiliency: Protection of our assets, the community and the environment

ExxonMobil has long operated facilities in a wide range of challenging physical environments around the globe. Our history of design, construction and operations provides us with a solid foundation to address risks associated with different physical environments. The Company assesses the risks posed by weather and other natural elements, and designs its facilities and operations in consideration of these risks.

When considering physical environmental risks, we evaluate the type and location of our current and planned facilities. As an example, offshore facilities could be impacted by changes in wave and wind intensity as well as by changes in ice floe patterns, while onshore facilities could be vulnerable to sea level rise, changes in storm surge or geotechnical considerations. Environmental assessments are conducted in advance to ensure that protective measures and procedures are in place prior to building and start-up of the facilities.

Our facilities are designed, constructed and operated to withstand a variety of extreme weather and environmental conditions. We use historical experience with additional safety factors to cover a range of uncertainties. After construction of a facility, we monitor and manage ongoing facility integrity, such as through periodic checks on key aspects of the structures. In addition, we regularly participate with major engineering societies and industry groups to assess and update engineering standards.

Once facilities are in operation, we maintain disaster preparedness, response and business continuity plans. Detailed, well-practiced and continuously improved emergency response plans tailored to each facility help ExxonMobil prepare for unplanned events, including extreme weather. Regular emergency drills are practiced in partnership with appropriate government agencies and community coalitions to help ensure readiness and minimize the impacts of such events.

ExxonMobil remains steadfast in our commitment to excellence in safety, security, health and environmental performance, referred to collectively as operations integrity. We believe the best way to manage the integrity of our business is through a capable, committed workforce coupled with policies, practices and management systems designed to enable safe, secure and environmentally responsible operations.

ExxonMobil's comprehensive approach and established systems enable us to manage a wide variety of possible outcomes, including risks associated with climate change.



Design standards provide for resiliency and environmental protection



Design standards ensure resiliency of assets



Supporting recovery efforts in our communities



Proactive monitoring and surveillance to protect the environment

ExxonMobil is committed to providing our shareholders with disclosures that impart meaningful insights about our business, including how we manage climate-related risks. This report, along with the rest of our comprehensive set of disclosures, relating to climate-related matters, follow the framework established by IPIECA, including IPIECA's Climate Change Reporting Framework⁽⁴⁶⁾. In addition, this year's report is further enhanced by aligning with the core elements of the TCFD framework. IPIECA members represent a significant portion of the world's oil and natural gas production, including state oil companies, and is the industry's principal channel of communication with the United Nations. This broad, global membership enables a reporting framework that is tailored to the petroleum industry and better permits comparisons of member companies on a more consistent and standardized basis.

Web links to our other various climate-related disclosures are highlighted below:

- Sustainability Report (exxonmobil.com/sustainabilityreport)
- Outlook for Energy (exxonmobil.com/energyoutlook)
- Technology (exxonmobil.com/technology)
- Enhanced Methane Emissions Reduction Program (exxonmobil.com/methanereduction)
- Climate-related materials (exxonmobil.com/climate)
- SEC Form 10-K (exxonmobil.com/secfilings)
- Executive Compensation Overview (https://cdn.exxonmobil.com/~/media/global/files/summary-annual-report/2018-executive-compensation-overview.pdf)

Existing policy frameworks (including the Paris NDCs), financial flows, and the availability of cost-effective technologies indicate that society is not currently on a 2°C pathway. Should society choose to more aggressively pursue a 2°C pathway, we will be positioned to contribute through our engagement on policy, development of needed technologies, improved operations, and customer solutions.

(1) OECD – Organisation for Economic Co-operation and Development.

(2) Article 4 paragraph 2 of the Paris Agreement https:// unfccc.int/files/meetings/paris_nov_2015/application/pdf/ paris_agreement_english_.pdf

(3) IEA, Perspectives for the Energy Transition, page 57.

(4) "EMF was established at Stanford in 1976 to bring together leading experts and decision makers from government, industry, universities, and other research organizations to study important energy and environmental issues. For each study, the Forum organizes a working group to develop the study design, analyze and compare each model's results and discuss key conclusions." https://emf.stanford.edu/about

EMF is supported by grants from the U.S. Department of Energy, the U.S. Environmental Protection Agency as well as industry affiliates including ExxonMobil. https://emf.stanford.edu/industry-affiliates

(5) To understand some of the characteristics of future transition pathways, we analyzed energy and emissions data from a range of EMF27 stabilization, policy and technology targets, primarily focusing on 450 and 550 stabilization targets, as well as no-policy cases that utilize a full suite of technologies. The suite of full technologies (FT) includes a range of options, including: energy efficiency, nuclear, carbon capture and storage (CCS), biofuels and non-bio renewables such as solar and wind. The EMF27 study considered other technologylimited scenarios, but a key finding was that the unavailability of carbon capture and storage and limited availability of bioenergy had a large impact on feasibility and cost. Given the potential advantages to society of utilizing all available technology options, we focused on capturing the results of different EMF27 models that ran 450-FT cases; we were able to download data for 13 such scenarios, and utilized that data as provided for analysis purposes (most of the scenarios had projections extending from 2010 to 2100). Data downloaded from: https://secure.iiasa.ac.at/web-apps/ene/AR5DB

(6) EMF27 cases include CO_2 emissions from energy and industrial process.

(7) Excerpt from Adoption of the Paris Agreement Proposal by the President dated December 12, 2015, Article II, paragraph 17, 'Notes with concern that the estimated aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the intended nationally determined contributions do not fall within least-cost 2°C scenarios but rather lead to a projected level of 55 gigatonnes in 2030, and also notes that much greater emission reduction efforts will be required than those associated with the intended nationally determined contributions in order to hold the increase in the global average temperature to below 2°C above pre-industrial levels by reducing emissions to 40 gigatonnes or to 1.5°C above pre-industrial levels by reducing to a level to be identified in the special report referred to in paragraph 21 below'.

(8) The assessed 2°C scenarios produce a variety of views on the potential impacts on global energy demand in total and by specific types of energy, with a range of possible growth rates for each type of energy as illustrated in this report. Since it is impossible to know which elements, if any, of these models are correct, we used an average of all 13 scenarios to approximate growth rates for various energy types as a means to estimate trends to 2040 indicative of hypothetical 2°C pathways.

(9) Based on the average of assessed 2°C scenarios' CO₂ emissions (~20 billion tonnes including energy and industrial processes), ExxonMobil GDP assumptions are consistent with 2018 *Outlook for Energy*.

(10) Based on the average of the assessed 2°C scenarios referenced in this report, the combination of renewables, nuclear and fossil fuels using CCS is estimated in these scenarios to increase significantly as a percentage of total primary energy demand, rising from approximately 10% in 2010 to roughly 40% in 2040.

(11) Electricity delivered from fossil fuels without CCS as a percentage of total electricity delivered decreases from 66% to 20% on average from 2010 to 2040 under the assessed 2°C scenarios. Share of electricity from non-bioenergy renewables (e.g., wind, solar, hydro) increases from less than 20% to ~35%. Share of electricity generation utilizing CCS increases to about 20%. Share of electricity from nuclear increases from ~15% to ~20% (implies double the level of nuclear capacity from 2016 to 900 GW).

(12) Total electricity delivered as a percentage of total final energy demand increases from 18% to 28% on average across the 13 assessed 2°C scenarios referenced in this report.

(13) Under the assessed 2°C scenarios, the average growth rate for oil demand is -0.36% from 2010 to 2040, which implies a decrease in absolute level of demand in 2040 by ~10% relative to 2010 levels, which is near 2000 levels. Oil demand has increased about 9% since 2010, hence it would require a demand decrease of ~20% to reach the same 2040 level relative to today's demand. Trends toward a level close to 2000 would imply oil used in road transportation trends toward 30 Moebd, and oil used for aviation and marine trends toward 9 Moebd.

(14) Based on average global demand growth rates under assessed 2°C scenarios.

(15) Based on average global demand growth rates under assessed 2°C scenarios.

(16) PwC: Time to Get on With it, The Low Carbon Economy Index 2018, page 2. Figure 1: Low Carbon Economy Index 2018: Transition pathways.

(17) For the purposes of this report, proved reserves are year-end 2017 proved oil and gas reserves for consolidated subsidiaries and equity companies as reported in the Corporation's Annual Report on Form 10-K. Proved oil and gas reserves are determined in accordance with Securities and Exchange Commission (SEC) requirements. Proved reserves are those quantities of oil and gas which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be economically producible under existing economic and operating conditions and government regulations. Proved reserves are determined using the average of first-of-month oil and natural gas prices during the reporting year.

(18) For the purposes of this disclosure, resources are total remaining estimated quantities of discovered quantities of oil and gas that are expected to be ultimately recoverable. The resource base includes proved reserves and quantities of oil and gas that are not yet classified as proved reserves. At year-end 2017, the total resource base totaled approximately 97 billion of oil-equivalent barrels including 21 billion oil-equivalent barrels of proved reserves.

(19) To estimate global demand in 2040 for oil and natural gas, the average of the assessed 2°C scenarios' growth rates for oil and natural gas covering the period 2010-2040 have been applied to standard baseline estimates of oil and natural gas demand in 2010.

(20) IHS: Climate-Related Financial Risk and the Oil and Gas Sector, page 23.

(21) The assessed 2°C scenarios growth rates imply a range in 2040 global oil demand from about 53 to 103 Moebd and for 2040 global natural gas demand from about 265 to 625 BCFD.

(22) IEA: World Energy Outlook 2018.

(23) Hypothetical cumulative production determined by proportioning ExxonMobil's 2016 average daily production (Form 10-K, page 8) and 2016 average daily global oil and gas production to estimated 2040 average daily production (assuming ExxonMobil's current market share and 100% proved reserves replacement to maintain its proved reserves consistent with its production ratio at the end of 2016) and implied oil and gas demand from the 2°C scenarios average. Assumed linear decline of estimated average daily production through 2040.

(24) IEA: Perspectives for the Energy Transition, page 56. Estimate for IEA crude oil and natural gas and future prices for 2020, 2030 and 2040.

(25) As used here "carrying value" is our property, plant and equipment (PPE) net of accumulated depreciation. ExxonMobil's carrying value of property, plant and equipment as of September 30, 2018, was approximately \$249 billion. The reference to "less than 5 percent of ExxonMobil's total carrying value of property, plant and equipment" is calculated by taking the PPE carrying value of ExxonMobil's resource base and subtracting from it the PPE carrying values of ExxonMobil's proved reserves, its producing assets that do not currently meet the SEC's definition of proved reserves, its unconventional liquids assets and its natural gas assets, and comparing this resulting value against ExxonMobil's total PPE carrying value as of September 30, 2018.

(26) Solomon Associates. Solomon Associates fuels and lubes refining data available for even years only.

(27) Exxon only before 1999. The average is based upon a 10-year interval.

(28) Source: Global CCS Institute. Data updated as of April 2018 and based on cumulative anthropogenic carbon dioxide capture volume. Anthropogenic CO_2 , for the purposes of this calculation, means CO_2 that without carbon capture and storage would have been emitted to the atmosphere, including, but not limited to: reservoir CO_2 from gas fields; CO_2 emitted during production and CO_2 emitted during combustion. It does not include natural CO_2 produced solely for enhanced oil recovery.

(29) U.S. Energy Information Administration, U.S. Nameplate Fuel Ethanol Plant Production Capacity as of January 1, 2018.

(30) "In 2007, the United States harvested 86.5 million acres of corn at a yield of 151.1 bushel per acre (http://www.nass.usda.gov/QuickStats/). Based on these figures, one acre of corn would produce about 423 gallons per acre." https://articles.extension.org/pages/14044/cornethanol-production

(31) Chisti Y (2007) Biodiesel from microalgae. Biotechnology Adv 25:294-306.

(32) Nelson VC, Starcher KL. Introduction to renewable energy (energy and the environment). 2015; page 243.

(33) "Algae store energy in the form of oils and carbohydrates, which, combined with their high productivity, means they can produce from 2,000 to as many as 5,000 gallons of biofuels per acre per year." http://allaboutalgae.com/benefits/

(34) National Renewable Energy Laboratory: A Look Back at the U.S. Department of Energy's Aquatic Species Program: Biodiesel from Algae; Close-Out Report. 1998. https://www.nrel.gov/docs/legosti/fy98/24190.pdf

(35) API: Natural gas and industry innovation continues to help drive US GHG emissions reductions.

(36) Ecofys: Greenhouse gas emission reductions enabled by products from the chemical industry, page 68, table 53, annual realized avoided emissions – current implementation level.

(37) ExxonMobil estimates.

(38) Our calculations are based on the guidance provided in API's Compendium of Greenhouse Gas Emission Estimation Methodologies for the Oil and Gas Industry and IPIECA's Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions. We report GHG emissions on a net equity basis for our business operations, demonstrating a share of emissions from any facility or operation in which ExxonMobil holds a financial interest, with the share reflecting the equity interest.

(39) Governmental, legal or regulatory changes could directly or indirectly delay or otherwise impact GHG emission intensity reduction measures.

(40) Source: BloombergNEF. The data were downloaded from BloombergNEF on Dec 13, 2018 and based on total wind and solar power purchase agreements signed in 2018.

(41) Some uncertainty exists in performance data, depending on measurement methods. Data in the report and performance data table represent best available information at the time of publication. Performance data are reported for our affiliates and those operations under direct ExxonMobil management and operational control. Includes XTO Energy performance beginning in 2011.

(42) The net equity GHG emissions metric was introduced in 2011 as a replacement for the direct equity GHG emissions metric. Information has been restated back to 2005 according to the new metric. The net equity GHG emissions metric includes direct and imported GHG emissions and excludes emissions from exports (including Hong Kong Power through mid-2014). ExxonMobil reports GHG emissions on a net equity basis for all our business operations, reflecting our percent ownership in an asset.

(43) The addition of direct emissions and emissions associated with exported power and heat is equivalent to World Resources Institute (WRI) Scope 1.

(44) These emissions are equivalent to WRI Scope 2.

(45) Cumulative figure.

(46) IPIECA climate change reporting framework: Supplementary guidance for the oil and gas industry on voluntary sustainability reporting. Published by IPIECA in 2017.



Exxon Mobil Corporation

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Exhibit 22



2020 ENERGY & CARBON SUMMARY





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Statements of future events or conditions in this report, including projections, sensitivities, targets, expectations, estimates, future technologies, and business plans, are forward-looking statements. Actual future results or conditions, including: demand growth and relative energy mix across sources, economic sections and geographic regions; the impact of new technologies, production rates and reserve growth; efficiency gains and cost savings; emission reductions; and results of investments, could differ materially due to, for example, changes in the supply and demand for crude oil, natural gas, and petrochemical products and results of investments and international interactions; the actions of competitors and esis; changes in law or government policy; including environmental regulations and international treaties; the actions of competitors and customers; changes in the rates of population growth, economic development, and migration patterns; trade patterns and the development and enforcement of global, regional and national mandates; military build-ups or conflicts; unexpected technological developments; general economic conditions, including the occurrence and duration of economic recessions; unforeseen technical difficulties; and other factors discussed in this report and in item 1A of ExonMobil's most recent Form 10-K. This document is a shareholder requested publication and is purposefully focused on unknown future events. The statements and analysis in this document represent a good faith effort by the Company to address this request despite significant unknown variables as well as incomplete and, at times, inconsistent market and government policy signals. See the 2019 Outlook for Energy for further details on the processes, challenges and assumptions underlying this analysis. Third-party scenarios discussed in this report reflect the modeling assumptions and outputs of their respective authors, not ExconMobil, and their use or inclusion herein is not an endorsement by ExonMobil of their likelihood or probability. Any reference to ExonMobil's support of a third-party organization within this document does not constitute or imply an endorsement by ExonMobil of any or all of the positions or activities of such organization. References to "resources," "resources," and similar terms refer to the total memaning estimated quantities of all and natural gas that are expected to be ultimately recoverable resources," and similar terms refer to the total memaning estimated quantities of all and natural gas that are expected to be ultimately endorsement by ExonMobil's free sources," and similar terms refer to the total memaning estimated quantities of all and natural gas that are expected to be ultimately recoverable resources as a "resource base is not intended to correspond to SEC definitions such as "probable" or "possible" reserves. For additional information, see The "project" as used in this publication can refer to a variety of different activities and does not necessarily have the same meaning as in any government payment transparency reports.



COVER PHOTO: FuelCell Energy / Bridgeport, Connecticut.

Energy is essential. Accessible and affordable supplies of energy support our ability to meet the basic requirements of life, and fuel society's progress around the world.

As the world's population grows to more than 9 billion in the next two decades, rising prosperity will increase energy demand, particularly in developing countries. Stable and affordable energy supplies will make it possible for more people to access the health care, transportation and education that contribute to quality of life and improved living standards.

With this increased energy demand comes the potential for greater environmental impacts, including greenhouse gas (GHG) emissions and the risks of climate change. As a global community, we need to manage environmental impacts as we meet this growth in demand. This is society's dual challenge.

This Energy & Carbon Summary describes how we at ExxonMobil are doing our part in addressing the dual challenge. It describes the steps we are taking to responsibly develop new resources to ensure the world has the energy it needs while also minimizing environmental impacts. It also provides detailed information on how we view and manage the risks associated with GHG emissions and climate change.

Under the governance of ExxonMobil's Board of Directors, we routinely evaluate business risks and strategies, which are based on our *Outlook for Energy* (*Outlook*). The *Outlook* aligns with the existing Nationally Determined Contributions (NDCs) that form part of the Paris Climate Agreement and contains sensitivities on the rate of penetration of wind, solar and battery technologies. The *Outlook* also assumes continued progress on policy and advancements in technology. Since 2000, our company has invested nearly \$10 billion to research, develop and deploy lower-emission energy solutions. In the past year, we have meaningfully advanced research and technology initiatives designed to meet society's call for lower emissions. A few examples detailed in this report include:

- Launching an innovative relationship with the U.S.
 Department of Energy's National Laboratory network to bring low-emission energy breakthroughs to commercial scale.
- Collaborating with the Indian Institute of Technology to research biofuels and bio-products, gas transport and conversion, and low-emission technologies for the power and industrial sectors.
- Evaluating the potential use of agricultural waste and residues to produce biofuels.
- Working to develop strains of algae that will convert CO₂ and sunlight into energy-rich bio-oil.
- Advancing our carbon capture and storage (CCS) research portfolio.
- Expanding academic collaborations, now working with more than 80 universities and five energy centers around the world.

In this report, we provide specifics on mitigating emissions from our operations, including our goals to reduce methane emissions and flaring. We also describe how we support customers in reducing their emissions by providing advanced fuels, lubricants and lightweight plastics to improve end-user efficiency.

The ExxonMobil Energy & Carbon Summary is aligned with the core elements of the framework developed by the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD), designed to encourage informed conversations.



We advocate for sound public policy that can help facilitate advances in low-emission technology. We engage with governments around the world, as well as experts and other stakeholders, to help support policies, such as a price on carbon and effective regulations to reduce methane emissions. These engagements include Board-level dialogue with our shareholders.

Meeting the world's growing demand for energy while reducing environmental impacts is one of society's most significant challenges. I am confident that, by working together, we can develop the necessary technologies and solutions to meet this challenge. We at ExxonMobil are committed to doing our part.

Darren Woods, Chairman and CEO

ExxonMobil has a long history of successfully meeting society's evolving demand for energy. With a steadfast commitment to investments in technology and the ingenuity of our people, we are well positioned to continue to meet the demands of a more prosperous world.

The 2019 Outlook provides a view of energy demand and supply through 2040, based on likely trends in population growth, economic conditions, policy developments and technology advancements.

The Outlook anticipates global energy needs will increase 20 percent between today and 2040, led by non-OECD⁽¹⁾ countries. While the energy mix shifts toward lower-carbon-intensive fuels, the world will still need to pursue all economic energy sources to meet demand growth by 2040. Key trends through 2040 include:

- Efficiency gains and growing use of less-carbon-intensive energy sources will contribute to a nearly 45 percent decline in energy-related CO₂ emissions per unit of global GDP.
- Worldwide electricity from solar and wind will supply about 10 percent of all primary energy used in power generation.
- Natural gas will expand its role to more than 25 percent of total primary energy, led by growth in electricity generation and industrial output.
- Rising oil demand will be driven by commercial transportation and the chemical industry; fuel demand for cars and heavy-duty vehicles reflects efficiency improvements and growth in alternative fuels.

The Outlook includes sensitivities to illustrate how changes to the base Outlook assumptions might affect the energy landscape. In this report, we highlight sensitivities related to transportation and variations in supplies for the power sector.

Relative to the Outlook, a theoretical 2°C pathway would generally lower demand for oil, natural gas and coal, and increase use of nuclear and renewables.

- Because oil and natural gas production naturally declines, continued investment is needed, even under a 2°C pathway. The International Energy Agency's (IEA's) Sustainable Development Scenario (SDS), consistent with a 2°C target, suggests cumulative oil and natural gas investments could exceed \$13 trillion (vs. \$20 trillion under IEA's Stated Policies Scenario (STEPS)) by 2040.⁽²⁾
- Production from ExxonMobil's proved reserves and investment in our resources are needed to meet global demand and offset natural decline.

ExxonMobil's businesses are well positioned for the continuing evolution of the energy system.

Near-term actions, consistent with society's energy requirements and environmental objectives, include:

- · Expanding the supply of cleaner-burning natural gas.
- Increasing production of chemicals, distillates and lubes needed under a broad range of demand scenarios including 2°C scenarios.
- Mitigating emissions from our own operations through energy efficiency, cogeneration, CCS, and reduced flaring, venting and fugitive emissions, including GHG intensity reduction in Imperial Oil Limited's (Imperial) operated oil sands facilities.
- Supplying products that help consumers reduce their emissions, such as natural gas, premium lubricants and fuels, lightweight materials, and special tire liners.
- Engaging in policy discussions to address the risks of climate change at the lowest cost to society, including support for well-designed carbon pricing mechanisms.

Longer term, our business strategies are consistent with the evolving energy landscape. We are pursuing technologies to enhance existing operations and developing alternative energy solutions with lower-carbon intensity, including:

- Researching breakthroughs that make carbon-capture technology more economic for power generation, industrial applications and hydrogen production.
- Developing technologies to reduce energy requirements of refining and chemical manufacturing facilities.
- Progressing advanced biofuels for transportation and chemicals.
- Advancing fundamental knowledge and capabilities with organizations strategically to achieve technology breakthroughs for scalable GHG emission reductions.



A rigorous risk management approach is integral to ExxonMobil's governance framework and ensures risks are appropriately identified and addressed. ExxonMobil's Board of Directors oversees risks associated with our business, including the risks related to climate change.

Climate change risk oversight

ExxonMobil's Board of Directors (Board) provides oversight of key risks, including strategic, reputational, financial, operational, SSHE (safety, security, health and environment) and legal compliance matters. It has a well-established and rigorous enterprise risk framework in place to oversee risks faced by the Company, including those related to climate change.

The Board routinely reviews environmental stewardship and discusses issues related to climate risks. The process includes briefings on scientific and technical research, public policy positions and analysis, and ongoing progress on Company initiatives and actions with internal and external subject-matter experts. It also includes at least one session each year when the full Board engages on the latest developments in climate science and policy. In addition, directors engage directly with shareholders to gather insights and share perspectives on issues of importance to the Company, including discussions regarding risks related to climate change.

The Board assesses the Company's management of and response to climate change through its review of the *Outlook for Energy, Energy & Carbon Summary*, and other publications and regulatory filings.

As appropriate, the Board also considers climate change as it assesses research and development efforts, operating strategies, business and corporate planning, technology, current events, shareholder engagements, and Company performance.

The Board evaluates climate risks in the context of other operational, market, and financial risks and considers the interactions with these additional factors. To assist it, the Board is supported by its committees, which take more in-depth reviews of the context and interdependencies in risk evaluation. We describe the role of these committees in greater detail on the following page.

Beyond the Board, the Management Committee, including the Chief Executive Officer (CEO), provides oversight of strategic risks faced by the Company. To steward these strategic risk evaluations, the Management Committee and senior executives participate in briefings on technology developments and environmental topics throughout the year. This helps to broaden understanding of implications of the risks and assess safeguards and options to mitigate those risks, guided by the Board's oversight.



Coordination and support of board committees

As described on the previous page, ExxonMobil's Board oversees a broad spectrum of interrelated risks with assistance from its committees. This integrated risk management approach facilitates recognition and oversight of important risk interdependencies, more effectively than relying on risk-specific committees.

- Audit Committee oversees risks associated with financial and accounting matters. It also periodically reviews ExxonMobil's overall risk management approach and structure, which is applied to risks related to climate change, among other business risks.
- Board Affairs Committee oversees matters of corporate governance, including Board evaluation and director refreshment. It also coordinates identification of external experts to address the Board and sets the criteria for shareholder engagement with directors.
- Compensation Committee reviews executive compensation, which is designed to incentivize executives to maximize long-term shareholder value, requiring a long-term view in decision-making that includes careful consideration of current and future risks, such as those related to climate change.
- Public Issues and Contributions Committee (PICC) oversees operational risks such as those relating to safety, security, health and environmental performance, including actions taken to address climate-related risks.

Board composition and evaluation

The Board is comprised of independent directors and the CEO. All members of the committees described above are independent. Each highly qualified director brings a diverse perspective. The majority have scientific, technical and/or research backgrounds, creating a collective skillset that is well qualified to oversee climate-related issues. In addition, the Board benefits from the experience of a director who is a recognized expert in climate science.

The Board acts as a collective body, representing the interests of all shareholders. While individual directors leverage their experience and knowledge in Board and committee deliberations, Board decisions and perspectives reflect the collective wisdom of the group. ExxonMobil values diverse experience and long-term service by directors due to the complexity of our business.

At least annually, the Board and each of the Board committees conducts a robust and thorough evaluation of their performance and effectiveness, as well as potential changes to the committees' charters.

HIGHLIGHT:

Integrating risk management into executive compensation

Senior executive compensation is determined by the Compensation Committee. The compensation program is designed such that it incentivizes effective management of all operating and financial risks associated with ExxonMobil's business, including risks related to dimate change.

Performance shares with long vesting periods and a strong tie to company performance are among the key design features to support this objective. Executive compensation is designed to support sustainability of our operations and management of all aspects of risk. Specifically, performance in managing risks related to climate change and environmental impacts is recognized in both the Progress Toward Strategic Objectives and as part of the Safety and Operations Integrity metrics outlined in the schematic below. The executive compensation program requires that these longer-term risks be considered carefully at all levels of the organization, ensuring stewardship continues beyond the Board and executive level, and is required for success throughout the Company. Details on compensation can be found in the annual Proxy Statement.



UP CLOSE:

Public Issues and Contributions Committee

The PICC plays an integral role in the Board's oversight of climate-related risks. Like other committees, the PICC is able to work on key issues in greater detail than would be possible by the full Board.

The PICC, which is comprised of four independent directors who are appointed by the Board, reviews and provides guidance on the Corporation's policies, programs and practices on key public issues of significance. It regularly reviews ExxonMobil's safety, security, health and environmental performance, including actions taken to identify and manage risks related to climate change. The broad and diverse set of backgrounds and areas of expertise of the individual PICC members ensures the committee is able to effectively evaluate and inform the Board on dynamic and complex issues.

The PICC, along with the full Board of Directors, makes annual site visits to operating locations to observe and provide input on operating practices and external engagement. The Board and PICC visited ExxonMobil's largest manufacturing complex, the integrated refining and petrochemical facilities on Jurong Island, Singapore, in 2019.

The visit included an overview of operations, including the fuels, lubricants and chemicals value chains, and the gas and power marketing business. The directors also met with employees responsible for operations and other commercial and business support activities. Additionally, directors met with senior government officials to discuss issues important to the Company and the country of Singapore, including risks related to climate change. In April 2019, the Board of Directors traveled to the Company's Spring, Texas, campus to review advances in subsurface technology and gain useful insights from employees.

The PICC and Board reviewed the effectiveness of the Company's risk management process through these visits and received additional insight into how the Operations Integrity Management System (OIMS) protects the Corporation's employees and physical assets, as well as communities and the environment. The PICC uses this information, along with reports on safety and environmental activities of the operating functions, to provide recommendations to the full Board.



The Board of Directors, including the Chairman, and senior executives toured the petrochemical facilities on Jurong Island, Singapore, in June 2019 as part of the annual Board trip.



Our business strategies are underpinned by a deep understanding of global energy system fundamentals. These fundamentals include the scale and variety of energy needs worldwide; capability, practicality and affordability of energy alternatives; GHG emissions; and government policies. We consider these fundamentals in conjunction with our *Outlook* to help inform our long-term business strategies and investment plans. We are committed to providing reliable and affordable energy to support human progress while implementing and advancing effective solutions for the evolving energy landscape. Our actions to address the risks related to climate change, depicted in the pillars below, position us to responsibly meet the growing energy demand of a more prosperous world.



DEVELOPING AND DEPLOYING SCALABLE TECHNOLOGY SOLUTIONS ENGAGING ON CLIMATE-RELATED POLICY



PROVIDING PRODUCTS TO HELP OUR CUSTOMERS REDUCE THEIR EMISSIONS

MITIGATING EMISSIONS IN OUR OPERATIONS

2019 Outlook for Energy Highlights

The Outlook is ExxonMobil's global view of energy demand and supply through 2040. ExxonMobil uses a data-driven approach to inform our long-term business strategies, investment plans and research programs.

Energy supports rising prosperity

Access to modern technologies and abundant energy – including oil and natural gas – enables substantial gains in living standards around the world. Between now and 2040, the world population is expected to grow from 7.5 billion to 9.2 billion, with global GDP nearly doubling.

Billions of people are expected to see their incomes grow to levels considered middle class.⁽³⁾ Energy demand is likely to rise about 20 percent over this same time period. Efficiency gains and a shift in the energy mix – including rising penetration of wind and solar – are likely to enable nearly a 45-percent improvement in the carbon intensity of global GDP. Primary energy demand is likely to decrease in OECD (developed) nations, while demand in non-OECD (developing) nations will likely increase by almost 40 percent, led by expanding economies in the Asia Pacific region, including China and India.

 Electrification and a shift to lower-carbon energy sources are expected to be significant global trends.

- Renewables and nuclear energy see strong growth, contributing nearly 40 percent of incremental energy supplies to meet demand growth through 2040.
- Coal's share will likely decrease as the world shifts to lower-emission energy sources, helping enable a peak in global energy-related CO₂ emissions by 2040.
- Natural gas is expected to grow the most of any energy type, reaching a quarter of all demand.
- Oil will continue to play an important role in the world's energy mix, as commercial transportation (e.g., trucking, aviation, marine) and chemical sectors support demand growth.

Consistent with third-party reports, we expect the world to meet, in aggregate, the Nationally Determined Contributions⁽⁴⁾ of the 2030 Paris Agreement pledges. However, more effort is needed for the world to accelerate progress toward a 2°C pathway.⁽⁵⁻⁶⁾ Further breakthroughs and technology advances are required across all sectors to achieve the Paris Agreement objectives and continue to deliver reliable and affordable energy.

Global fundamentals impact Outlook for Energy (Percent change)



Growth led by natural gas & non-fossil energy sources (Quadrillion BTUS)



2017 global energy-related CO₂ emissions by sector (Billion tonnes)



Considering 2°C scenarios

According to the IEA, a "well below" 2°C pathway implies "comprehensive, systematic, immediate and ubiquitous implementation of strict energy and material efficiency measures."⁽⁷⁾ Given a wide range of uncertainties, no single pathway can be reasonably predicted. A key unknown relates to yet-to-be-developed advances in technology and breakthroughs that may influence the cost and potential availability of certain pathways toward a 2°C scenario. Scenarios that employ a full complement of technology options are likely to provide the most economically efficient pathways.

Considerable work has been done in the scientific and economic community to explore potential energy pathways. A comprehensive multi-model study coordinated by the Energy Modeling Forum 27 (EMF27)⁽⁸⁾ at Stanford University brought together many energy-economic models to assess possible technology and policy pathways associated with various climate stabilization targets, partially in support of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

The chart (top right) illustrates potential global CO₂ emission trajectories under EMF27 full-technology scenarios⁽⁹⁾ targeting a 2°C pathway relative to the *Outlook*, and baseline pathways, with essentially no policy evolution beyond those that existed in 2010. The *Outlook* emission projection tracks within the estimated range of emissions implied by the NDCs for 2030 as currently submitted by the signatory countries of the Paris Agreement. These NDCs are not on a 2°C pathway as confirmed by the 2019 United Nations Emissions Gap report.⁽⁵⁻⁶⁾

The chart (lower right) illustrates potential global energy demand in 2040 under the assessed 2°C scenarios. As the chart illustrates, the scenarios suggest that predicting absolute 2040 energy demand levels in total and by energy type carries some uncertainty, with particular scenarios likely heavily influenced by technology and policy assumptions.

For comparison purposes, the chart (lower right) also includes energy demand projections in 2040 based on the IEA's SDS. The IEA specifically notes that its SDS projects global energy-related CO_2 emissions that are "fully in line with the trajectory required to meet the objectives of the Paris Agreement on climate change." In fact, the SDS projects global energy-related CO_2 emissions in 2040 at a level 55 percent lower than the IEA's STEPS,⁽¹¹⁾ which projects emissions generally in line with the aggregation of current national commitments under the Paris Agreement.







IEA World Energy Outlook (WEO) 2019 SDS includes CCS; however, breakdown by energy type is not readily identifiable.

Considering 2°C scenarios, continued

The assessed 2°C scenarios produce a variety of views on the potential impacts on global energy demand in total and by specific types of energy. The scenarios also provide a range of possible growth rates for each type of energy. We have taken the average of the scenarios' growth rates in order to consider potential impacts on energy demand for this report.⁽¹²⁾

Based on this analysis, primary energy demand on a worldwide basis is projected to increase about 0.5 percent per year on average from 2010 to 2040. Expected demand and technologies deployed in 2040 vary by model and energy type (see bottom chart on prior page):

- Natural gas demand is expected on average to increase about 0.9 percent per year, while oil
 demand is projected on average to decline by about 0.4 percent per year. Together their share of
 energy demand is projected on average to still be more than 40 percent by 2040.
- The projected growth for renewables and nuclear averages 4.5 percent per year for nonbioenergy (non-bio) (e.g., hydro, wind, solar) and about 3 percent per year for nuclear.
- The trend in demand for coal is the most negative, with an average decline of 2.4 percent per year, or about a 50-percent decrease by 2040.
- Bioenergy demand is projected on average to grow at about 4.3 percent per year, the highest growth among all energy sources alongside non-bio renewables.
- CCS is a key technology to address CO₂ emissions, enabling low emissions from industrial and power sectors. The projected energy demand that would be decarbonized by CCS would on average be nearly double that of non-bio renewables by 2040.

All energy sources remain important across all the assessed 2°C scenarios, though the mix of energy and technology shifts over time. Oil and natural gas remain foundational, even in models with the lowest level of energy demand. Oil demand is projected to decline modestly on average, and much more slowly than its natural rate of decline from existing producing fields. Natural gas demand grows on average due to its many advantages, including lower GHG emissions. As a result, substantial new investments are required in both oil and natural gas capacity to meet demand, even under the assessed 2°C scenarios.

Low-side energy growth rates for the above scenarios were also considered. The low-side scenarios see oil dropping 1.7 percent per year on average, natural gas dropping 0.8 percent per year, and coal dropping 10.2 percent per year through 2040. This is compared with high-side growth rates for bioenergy, nuclear and non-bio renewables of 14.1, 4.8 and 6.3 percent per year, respectively. Even under these extremes, significant investments in oil and natural gas capacity are required to offset the natural decline of producing fields.⁽¹³⁾ See UP CLOSE discussion on page 14 for more information.

World energy-related CO $_2$ emissions relative to energy intensity and CO $_2$ emissions intensity

(kBTU of energy used per dollar of global GDP)



As shown in the chart above, from 1980 to 2015 there were large gains in efficiency, though energy-related CO_2 emissions rose. The blue circle shown for 2040 indicates that emissions are projected to be about 35 billion tonnes even with significant gains in efficiency and CO_2 emissions intensity.

To be on a 450 ppm, or hypothetical 2°C pathway, the performance in 2040 likely needs to be significantly closer to the purple line. This would increase the chance of reaching a 2°C pathway, with further gains required between 2040 and 2100.

Technology advances are expected to play a major role in accelerating progress toward a 2°C pathway. However, the IEA in 2019 estimated in its *Tracking Clean Energy Progress* analysis that only seven of 45 technologies and sectors assessed are on track to help reach the Paris Agreement climate goals.⁽¹⁵⁾

Sensitivities included in the Outlook projections

We use sensitivity analyses to provide greater perspective on how changes to our base Outlook assumptions could affect the energy landscape. The following sensitivities are independent of each other and are not necessarily additive.

Light-duty vehicles sensitivity (*)

The top chart depicts the potential impact of full electric vehicle (EV) penetration in light-duty transportation.

- Sensitivity assumes the global light-duty vehicle fleet is 100-percent electric by 2040, requiring all new light-duty vehicle sales to be electric by 2025.
- Battery manufacturing capacity for EVs would need to increase by more than 50x from recent levels by 2025.
- Total liquids demand in 2040 could be in line with levels seen in 2013.
- Total energy-related CO₂ emissions in 2040 could be reduced by about 5 percent.

(*) Further discussion on light-duty vehicles sensitivities can be found in the 2018 Outlook and 2019 Energy & Carbon Summary.

Heavy-duty vehicles sensitivities (**)

The heavy-duty vehicle fleet is comprised of light commercial vehicles (e.g., postal trucks), medium commercial vehicles (e.g., regional buses) and heavy commercial vehicles (e.g., long-haul trucks). Fuel economy and distance traveled for these vehicles range widely, such that heavy commercial vehicles accounted for about 15 percent of the fleet in 2015, but used about 55 percent of the fuel, due to the miles driven with heavy loads.⁽¹⁶⁾

The base 2019 *Outlook* assumes that future efficiency gains are on average double those experienced from 2000 - 2016 for heavy-duty fuels, and alternative fuels grow to about 13 percent of heavy-duty energy demand in 2040. The bottom chart depicts the impacts of changes to these key base assumptions on heavy-duty fuels demand.

- The low-demand sensitivity assumes triple the penetration of alternative fuels with accompanying efficiency gains. By 2040, oil would still represent about 60 percent of the heavy-duty fuel demand, despite an adoption of alternative fuels by 85 percent of the fleet. This highlights the difficulty of decarbonizing heavy-duty transportation and the need for further technology development of economic, lower-carbon solutions such as biofuels.
- This sensitivity would require a rapid acceleration in the early 2020s of alternative fuels into the heavy-duty fleet as well as
 infrastructure build-out to support the alternatives.
- This low-demand sensitivity would result in a 6-percent reduction of total liquids demand and approximately a 1-percent reduction of total energy-related CO₂ emissions in 2040.
- The high-demand sensitivity shows that if future efficiency gains occur only at the historical rate, demand may increase about 30 percent versus the base 2019 Outlook and highlights the need for continued technology investments in efficiency.
- This high-demand sensitivity would lead to a total liquids demand of approximately 7 percent above the base 2019 Outlook.

(**)Further discussion on heavy-duty vehicles sensitivities can be found in the 2019 Outlook.

Liquids demand by sector

World - million oil-equivalent barrels per day



ExxonMobil 2018 Outlook for Energy.

Heavy-duty fuels demand

World - million oil-equivalent barrels per day



Sensitivities on natural gas for electricity and power generation (*)

Similar to the transportation sector, we use sensitivity analyses to provide greater perspective on how changes to the base *Outlook* assumptions in the power-generation sector could affect the energy landscape.

Power-generation modeling is complex and raises a number of questions regarding both demand growth and supply mix, including:

- How will electricity access expand in developing nations?
- How will technology evolve to enable more electricity use in other sectors (e.g., EVs for personal mobility instead of gasoline-fueled cars or mass transit)?
- How will developing nations transition off coal if it is the most affordable supply today?
- · Will perceptions about nuclear safety challenge new builds in some countries?
- What is the optimum penetration of variable renewables before intermittency challenges create reliability and cost impacts for power grids?

There are a number of different potential outcomes for each of these questions that could yield different projections as illustrated in the top chart.

These results describe a range of potential outcomes with some common trends:

- Electricity demand grows significantly from today to 2040.
- Zero-carbon power generation grows 2-3x due to cost competitiveness and policies.
- Natural gas use for electricity grows in all cases except the IEA SDS, accompanied with coal's decline, primarily in developed countries.

The bottom chart is a sensitivity to test the impact of alternate assumptions on natural gas:

- Lower-cost wind and solar with efficient storage to manage inherently variable production could increase penetration to 50 percent of supply (more than 2x the base Outlook). Ratable reductions in both coal and natural gas by region could reduce global natural gas demand by approximately 115 billion cubic feet per day (BCFD).
- Decline in coal-fired generation occurs predominantly in developed countries to 2040. Switching 50
 percent of the remaining coal to natural gas to address issues such as air quality and emissions
 could increase natural gas demand by more than 20 percent.

Monitoring technology advancements, market behavior and evolving policy can identify signposts related to cost reduction, technology deployment and policy targets indicating how a different outcome may materialize.

(*)Further discussion on sensitivities can be found in the 2019 Outlook.





Source: IHS Markit, IEA World Energy Outlook 2018, McKinsey Global Energy Perspective, 2019





Natural gas volume represents both power generation and non-power sector demand Shaded ranges are indicative of potential shifts in demand relative to base Out/ook

Signposts for the evolving energy landscape

Changes in the relative cost of new technology when compared against existing or alternative energy sources may further increase shifts in the global energy mix. Using Company and third-party sources, we monitor a variety of indicators that serve as signposts for potential acceleration in shifts to the energy landscape, such as:

- New, more ambitious NDCs and significant policy initiatives broadly implemented, such as carbon pricing
- Increasing electrification of energy systems
- Increasing penetration of intermittent renewables with technology developments that reduce costs and increase reliability of energy storage
- · Development of scalable alternative energy technologies such as advanced biofuels, leading to displacement of gasoline and distillate in the fuels market
- Advances in CCS technology to lower cost
- Advances in significant new capacity expansions of multiple technologies, as well as the associated financing
- Energy efficiency gains exceeding historical trends
- · Change in consumer preferences and growth in acceptance of alternative energy technologies - including potentially higher consumer costs

Further details and discussion of assessed 2°C scenarios can be found in the special section of the 2019 Outlook for Energy -Pursuing a 2°C pathway.

2010 1 out of 10

2017

2040

Oil

Increased electrification

2 out of 10

Indicators for a 2°C pathway

The continued evolution of the energy system will provide important indicators on whether society is moving toward a 2°C scenario. The following illustrates the progress made from 2010 to 2017 toward that objective by 2040.

Renewables, nuclear and fossil fuels with CCS rise to 40% of primary energy demand (12)

4 out of 10

Oil demand falls⁽²⁾

Low-carbon power generation (including CCS) grows to 80% of total supply (18



stay within G20 NDCs

carbon

budget

2°C global (2015-2030)

Global electricity generation shifts (21)



Natural gas Coal (2.4)% ▼ (0.2)% ▲ 0.3% Nuclear 3.0% 1.5% ▼ (0.6)% 4 4.3% 0.8% Bioenergy . . 1.8% ▲ 5.1% Non-bio renewables A 4.5% ▲ 4.1%

Potential impact on proved reserves and resources considering 2°C scenarios

Over the coming decades, oil and natural gas will continue to play a critical role in meeting the world's energy demand, even considering the 2°C scenarios assessed. The following analysis is intended to address the potential impacts to the Company's proved reserves⁽²⁴⁾ and resources⁽²⁵⁾ through 2040 and beyond, considering the average of the assessed 2°C scenarios' oil and natural gas growth rates (2°C scenarios average).⁽²⁶⁾

Proved reserves

At the end of 2018, ExxonMobil's proved reserves totaled about 24 billion oil-equivalent barrels, comprised of 64 percent oil and 36 percent natural gas. These proved reserves are assessed annually and reported in our annual report on Form 10-K in accordance with the U.S. SEC rules. Proved reserves are the main driver of intrinsic value of an integrated oil and gas company's upstream operations.⁽²⁷⁾ Based on currently anticipated production schedules, we estimate that by 2040 a substantial majority of our year-end 2018 proved reserves will have been produced. Since the 2°C scenarios average implies significant use of oil and natural gas through the middle of the century, we believe these reserves face little risk from declining demand.

For the remaining year-end 2018 proved reserves that are projected to be produced beyond 2040, the reserves are generally associated with assets where the majority of development costs are incurred before 2040. While these proved reserves may be subject to more stringent climaterelated policies in the future, targeted investments could mitigate production-related emissions and associated costs. In addition, these assets have generally lower risk given the technical knowledge that accumulates over many decades of production. Accordingly, the production of these reserves will likely remain economic even under the 2°C scenarios average.

Significant investment still needed in 2°C scenarios

Considering the 2°C scenarios average, global liquids demand is projected to decline from 97 million barrels per day in 2017 to about 78 million barrels per day in 2040. Using the lowest liquids demand growth rate among the assessed 2°C scenarios, liquids demand would still be 53 million barrels per day in 2040, as seen in the left chart below.⁽²⁸⁾ However, absent future investment, world liquids production to meet demand would be expected to decrease to about 19 million barrels per day in 2040. This decrease results from natural field decline, and the associated decline rate is expected to greatly exceed the potential decline rate in global oil demand even under the lowest 2°C demand scenarios assessed. Natural gas natural field decline rates are generally similar to liquids.

With the potential 2040 imbalance (absent future investment), the substantial majority of our proved reserves that are projected to be produced by 2040 are clearly supported by ample demand, and therefore face little risk related to the 2°C scenarios average. Natural gas reserves face even less risk, as demand in 2040 is expected to increase under the 2°C scenarios average versus 2017 demand levels. Considering the IEA's SDS (a 2°C scenario), the IEA estimated that more than \$13 trillion of investment will be needed for oil and natural gas supply for 2019-2040.⁽²⁾



Global oil supply estimates

Global natural gas supply estimates (Billion cubic feet per day)



Assessed 2[°]C scenarios based on EMF27 full technology/450ppm cases targeting a 2[°]C pathway

Excludes biofuels; Source: IEA, EM analyses Assessed 2°C scenarios based on EMF27 full technology/450ppm cases targeting a 2°C pathway

Potential impact on proved reserves and resources considering 2°C scenarios, *continued*

Resources

ExxonMobil maintains a large and diverse portfolio of undeveloped resources that provide considerable flexibility to develop new supplies to meet future energy demand and replenish our proved reserves. We also continue to enhance the quality of this resource base through successful exploration, acquisitions, divestments, and ongoing development planning and appraisal activities.

The underlying economics of commercializing resources are dependent on a number of factors that are assessed using a dynamic resource development process, as highlighted further on the following page. We advance the best resource opportunities and monetize or exit assets offering lower potential. The world will continue to require significant investment in both liquids and natural gas, even under the assessed 2°C scenarios. Under the 2°C scenarios average, ExxonMobil still would need to replenish approximately 32 billion oil-equivalent barrels of proved reserves by 2040, assuming the Company retains its current share of global production.⁽²⁹⁾

In light of the multiple factors that influence decisions to commercialize undeveloped resources, it is not possible to identify which specific assets ultimately will be commercialized. It is possible that some higher-cost assets, which could be impacted by many factors including future climate-related policy, may not be developed. We are confident, however, that the size, diversity and continued upgrading of our undeveloped resources, along with technology developments, will enable the ongoing replenishment of our proved reserves under a range of potential future demand scenarios.

We test investments over a wide range of commodity price assumptions and market conditions. Notably, the IEA's estimates of future prices under its 2°C pathway fall within the range we use to test our investments.⁽³⁰⁾ In a commodity business, the lowest cost of supply will be advantaged. ExxonMobil's long-standing focus on efficiency and continuous improvement positions us to compete successfully.

UP CLOSE:

Reducing costs using technology to improve competitive position

Trillions of dollars of investment in oil and natural gas will be needed, even considering a 2°C scenario. By leveraging high-impact technologies from our research organization, we reduce costs and environmental impacts. This positions our portfolio to compete successfully.

Examples of technology-enabled cost and environmental footprint reductions:

- Record-setting extended-reach wells in Sakhalin to significantly reduce drilling costs and environmental footprints
- Full-physics modeling and next-generation completion designs for unconventional developments to reduce drilling and improve recovery
- Combination of horizontal drilling with hydraulic fracturing to significantly reduce land surface footprint and cost



Potential impact on proved reserves and resources considering 2°C scenarios, continued

A portion of our non-proved resources represent unconventional liquids assets in the U.S. These assets have shorter development cycles than other capital-intensive resources, which we believe make this type of asset resilient under the 2°C scenarios average. Natural gas forms a significant portion of our non-proved resources. The 2°C scenarios average anticipates demand growth of this cleaner-burning fuel, making these assets resilient under the 2°C scenarios average. Our remaining undeveloped liquids resources, in some cases, may not be attractive investments under the 2°C scenarios average, assuming no advances in technology, processes or designs. However, the carrying value of these undeveloped liquids resources is less than 5 percent of ExxonMobil's total net book value of property, plant and equipment as of Sept. 30, 2019.⁽³¹⁾



LIP CLOS

Dynamic resource development planning

This process considers a wide range of variables over time, including as appropriate: the extent and quality of the resource, development concepts, fiscal terms, regulatory requirements, proximity to existing infrastructure, market conditions, enabling technologies, and policy developments, including climate-related policy.

We optimize resource development plans in line with these variables and prioritize developments that are competitively advantaged in delivering long-term shareholder value. A rigorous Decision Quality Framework is employed to inform development decisions ranging from developing the resource (which eventually moves to proved reserves), monetizing the resource by selling it to others, or exiting the asset.

With a very large resource base, this process can take decades as technologies are developed, market conditions change and competition evolves. Two examples illustrate this:

LIZA PHASE 1 DEVELOPMENT

The Liza field was discovered in May 2015 offshore Guyana. Our approach to development planning enabled an industry leading start-up in less than five years post-discovery.

NORWAY SALE

In contrast, we monetized our Norway upstream assets through a December 2019 sale. After an evaluation of our portfolio, we divested the asset to enable ExxonMobil to focus on investments with higher long-term strategic value.



2020 ENERGY & CARBON SUMMARY | STRATEGY

Positioning for a lower-carbon energy future

Upstream

Oil and natural gas remain important energy sources, even in the assessed 2°C scenarios. Natural gas demand is expected to grow more than 35 percent from 2017 to 2040, largely from expanding industrial activity and increasing use in power generation as utilities switch to lower-emission fuels. We are progressing 12 million tonnes per year of low-cost liquefied natural gas (LNG) supply opportunities to meet the growing global demand. This includes potential projects in Papua New Guinea (PNG), Mozambique and the U.S. As one of the largest natural gas producers in the U.S. and a significant producer of LNG around the world, we are well positioned to support the projected demand shift from coal to natural gas for power generation and industrial use.

Downstream

Global demand for commercial transportation fuels, finished lubricants and higher-value grades of lube basestocks is expected to grow, while worldwide gasoline demand will likely peak and then begin declining. Over the past several decades, through application of advantaged technologies, capital redeployment and divestment, we have created a resilient portfolio of manufacturing sites. Since 2000, we have divested 22 of 43 refinery sites. Approximately 80 percent of our refining capacity is co-located with chemical or lube basestock manufacturing. Our average refinery capacity is 75-percent larger than industry. ExxonMobil is investing \$9 billion in six major Downstream projects that will leverage our integrated manufacturing footprint, scale and proprietary process and catalyst technology to improve the mix of products consistent with demand trends. This continuous high-grading of our portfolio has positioned our Downstream business to remain competitive across a wide range of future scenarios (see top chart).

Chemical

Chemical industry growth is forecast to outpace growth in global GDP and energy demand for the next two decades. We are progressing 13 new facilities that are expected to support a 30-percent growth in sales, and also anticipate performance products to deliver approximately 60 percent of earnings by 2025.⁽³²⁾ Many of our chemical products help our customers reduce their GHG emissions, particularly in high-performance products such as advanced materials that make cars lighter and more fuel efficient, and packaging materials that extend products' shelf life and reduce the energy needed to ship goods around the world.

Potential new areas of investment

In addition to major capital investments in our base business lines, we are also investing in major research and development (R&D) programs that will create potential opportunities to enhance and expand our portfolio. These programs are discussed further in the sections ahead and include R&D efforts in CCS, advanced biofuels and energy-efficient manufacturing.



Growth in ExxonMobil Chemical average earnings⁽³³⁾ (Billion USD)



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DEVELOPING AND DEPLOYING SCALABLE TECHNOLOGY SOLUTIONS

"ExxonMobil is one of the most innovative companies."

- The Wall Street Journal, November 2019

The products we provide help meet the evolving needs of societies worldwide. Natural gas provides power and heat to homes and businesses; liquid fuels enable clean and efficient transportation; and chemical products improve agriculture, automotive and consumer goods.

ExxonMobil's sustained investment in R&D plays an important role in positioning us to develop next generation solutions across our portfolio. We are progressing fundamental science in pursuit of breakthroughs in areas such as carbon capture, biofuels and energyefficient process technology.

ExxonMobil's unique and sustained approach to R&D

All disciplines of science and engineering are needed to provide affordable and scalable energy. ExxonMobil is a technology company. We employ 20,000 scientists and engineers, including more than 2,200 Ph.D.s, who have a wide range of capabilities. We have authored more than 1,000 peer-reviewed publications and been awarded more than 10,000 patents over the past decade. Our patent portfolio is overseen by management to ensure an efficient and effective process is utilized to steward intellectual property.

We collaborate with more than 80 universities, including five global energy centers, to progress proof of principle experiments in emerging technologies. Our recently formed collaboration with the U.S. national laboratories will help advance technologies such as carbon capture and biofuels. Our collaboration with Synthetic Genomics Inc. (SGI) on biofuels and FuelCell Energy on carbon capture will facilitate first commercial deployment of new technologies. We can then utilize our project and engineering expertise to advance solutions to scale. Our unique approach to research, working across all parts of the innovation pipeline, puts us in an advantaged position to progress energy solutions from lab to scale. We actively monitor the broad landscape of emerging technologies including solar, wind, nuclear and natural sinks (a natural means of removing carbon from the atmosphere). Much of this is done through academic collaborations that provide portfolio optionality.

ExxonMobil has demonstrated its commitment to R&D through various price cycles and delivered a number of energy innovations. While deployment at full scale takes time, we are confident ExxonMobil will be at the forefront of many of the future innovations to meet growing demand for energy with lower emissions.

CORE R&D CAPABILITIES

BIOLOGY DATA SCIENCE CLIMATE SCIENCE PRODUCT TECHNOLOGY GEOSCIENCE EMERGING TECHNOLOGY ENGINEERING CHEMISTRY ENERGY MODELING MATERIAL SCIENCE PHYSICS MATHEMATICS PROCESS TECHNOLOGY



EXXONMOBIL COLLABORATIONS



Carbon capture and storage

CCS is a technology that captures CO₂ emissions from industrial processes and the production or use of fossil fuels or biomass, and stores them deep underground in dedicated geological storage, preventing the CO₂ from entering the atmosphere. It is an important GHG emissions reduction technology that has wide applicability in the oil and natural gas production, power and industrial sectors. The IEA, in its SDS, projects a rapid deployment of carbon capture, from more than 25 million tonnes captured in 2019⁽³⁴⁾ to almost 2,800 million tonnes per year by 2050.⁽³⁵⁾ CCS can also be used to achieve carbon removal or "negative emissions" when CO₂ is captured from burning biomass or directly from the atmosphere.

ExxonMobil is a leader in CCS, with more than 30 years of experience in developing and deploying CCS technologies. In recent years, we have expanded our CCS R&D portfolio. In November 2019, we extended our more than 5-year relationship with FuelCell Energy to further enhance carbonate fuel cell technology for the purpose of capturing CO₂ from power plants and industrial facilities. This technology potentially has significantly higher efficiency than conventional technology. Current efforts are focused on further understanding the fundamentals, expanding process integration options, and developing the pathway to large-scale deployment. ExxonMobil is exploring options to conduct a first demonstration of this technology at one of our operating sites.

In addition, we are progressing research in developing new materials for CO₂ capture that may offer advantages over conventional technology. In 2019, ExxonMobil and Mosaic Materials (Mosaic) entered into an agreement to evaluate Mosaic's novel materials that may offer the potential to capture and separate CO₂ with increased energy efficiency. Also in 2019, ExxonMobil and Global Thermostat signed a joint development agreement to evaluate the ability of their direct air capture technology to capture CO₂ from the atmosphere.



Advanced biofuels

Fuels for heavy-duty transportation (trucking, aviation and marine) require an energy density that liquid hydrocarbons provide. Biofuels have the potential to meet this need. ExxonMobil continues to progress research to transform algae and cellulosic biomass into liquid fuels (biofuels) for the transportation sector. These advanced biofuels have the potential to reduce GHG emissions by more than 50 percent compared to today's transportation fuels.⁽³⁶⁾ They also offer advantages versus other biofuels by not competing with food and reducing fresh water use. ExxonMobil is making progress toward first demonstrations of advanced biofuels production in the next decade.

Cellulosic biodiesel program

We have made significant progress through collaborations to convert cellulosic sugars (made from sources like agricultural waste and wood) to biodiesel. To advance this technology, we are working with two companies; one focused on converting cellulosic biomass to cellulosic sugar and one focused on converting sugar to biofuel. Genomatica has developed microbes that can potentially convert cellulosic sugars to biofuel through a single bio-conversion step. We have doubled the yield of biodiesel from a variety of cellulosic sugars over the past few years, successfully validating Genomatica's process in the lab. In early 2019, we began collaborating with Clariant, which is able to commercially produce cellullosic sugars with its sunliquid[®] technology. We are testing sugars made with Clariant's process with the Genomatica microbes to understand the commercial viability of this novel integration. ExxonMobil's unique science and engineering capabilities are critical to integrating the two technologies into a potentially more affordable and scalable option.

Algae program

We have been working with SGI for a decade to develop strains of algae that will convert CO_2 and sunlight into energy-rich bio-oil, which can then be processed at existing refineries (similar to crude oil) into renewable fuels. To increase the speed of development, we are progressing two tasks in parallel. We continue to progress needed biology modifications to the algae in the lab, while working on outdoor algae ponds to understand the process engineering aspects of growing algae in real-world environments. We are making progress on both fronts with a target to be technically ready to produce 10,000 barrels per day of biofuel by 2025. This first proof of production is a critical step towards full-scale deployment which is likely decades away.

Genomatica single process step for conversion of cellulosic sugars to biodiesel

ExxonMobil - SGI Algae Pond Research in Calipatria, CA



Energy-efficient manufacturing

Taking the emissions out of manufacturing

The manufacturing sector of the economy – which produces fuel, plastic, steel, cement, textiles and other building blocks of modern life – accounts for about one-third of the world's energy-related CO_2 emissions.

Demand for industrial products is expected to grow as economies expand and standards of living rise in the developing world. To meet this demand, the world will need manufacturing solutions that are more energy- and GHG-efficient than those currently available. ExxonMobil is targeting research in equipment design, advanced separations, catalysts and process configurations as part of our broader effort to develop energy-efficient manufacturing.

Energy-efficient manufacturing efforts

Rethinking equipment design: New equipment design may provide a step-change reduction in energy use and equipment size even in traditional separation processes like distillation. For instance, use of Divided Wall Columns (DWCs) – a concept discovered and developed by ExxonMobil – can combine a series of distillation towers into one, thereby providing significant energy and capital cost savings. Energy savings on the order of 50 percent were demonstrated at ExxonMobil's Fawley Refinery xylenes tower based in the U.K.⁽³⁷⁾

CONVENTIONAL DESIGN

ENERGY-EFFICIENT DESIGN XYLENES TOWER, FAWLEY (UK)



Concept of Divided Wall Columns is applied to provide energy and capital savings by combining a series of distillation towers into one, as demonstrated at the Fawley Refinery xylene tower (picture shown above).

Novel contactors: Drawing upon decades of leadership in materials, advanced modeling and process design, ExconMobil is progressing technologies that can greatly improve efficiency in natural gas processing. One example is RapAdsorb[™], a novel technology that uses less energy and has a much smaller physical footprint compared with conventional gas treating. RapAdsorb[™] has the potential to reduce the overall gas treating footprint by about 50 percent,⁽³⁸⁻⁴¹⁾ and may lead to up to a 25-percent reduction in GHG emissions.⁽⁴²⁾

Reimagining separations: New materials may provide a step-change reduction in energy use by replacing conventional separations processes, such as distillation for the refining and petrochemical industry. Distillation is highly energy intensive since it requires feedstocks to be boiled at high temperatures to separate them into their constituents. ExxonMobil and the Georgia Institute of Technology are progressing fundamental research on new materials that could be 50 percent more efficient than today's separation techniques.⁽⁴³⁻⁴⁴⁾ We are applying our scale-up expertise to develop this technology to more efficiently process unconventional crudes while lowering GHG emissions.

NATURAL GAS TREATING



A new natural gas treating technology, RapAdsorbTM, reduces the overall gas treating footprint by about 50 percent, as shown in blue.

NOVEL SEPARATION MATERIALS



Specially designed nanoengineered materials can separate crude oil into naphtha and kerosene rich permeate (green) without boiling.

Life cycle analysis (LCA)

LCA is the preferred scientific method to estimate the environmental impact of energy processes and products. It is important to include all emissions across the life cycle of each option when comparing different energy technologies. Every step that emits any type of GHGs must be included to properly estimate the GHG footprint. This includes GHG emissions associated with production of the resource, conversion and transportation steps and lastly consumption of the fuel by the end user (e.g., on a vehicle or in a power plant).

ExxonMobil has a long history of conducting LCAs on energy pathways. Many of these studies are carried out through collaborations with academic institutions and are made public through scientific journal publications. LCAs are important to comprehensively evaluate the GHG emissions impacts of alternate energy system options.

CASE STUDY: Power generation from Indian domestic coal vs. imported U.S. natural gas

Electricity demand in the developing world is increasing to meet the needs of growing populations. ExconMobil, along with the Indian Institute of Technology Bombay and the India Council on Energy, Environment and Water, published a full well-to-wire LCA comparing the GHG footprints of Indian coal and U.S. natural gas shipped to India for electricity generation.⁽⁴⁵⁾ As shown in the figure on the bottom right, overall full-life-cycle GHG emissions for imported natural gas are more than 40 percent lower than for local coal, in spite of the GHGs associated with liquefaction, long-distance transportation and regasification of the natural gas. This demonstrates the important role that a comprehensive, transparent LCA assessment can have in determining the best option to provide energy, while reducing emissions.



GHG emissions from power generation from Indian domestic coal vs. imported U.S. natural gas (kg CO2/MWh)



ENGAGING ON CLIMATE-RELATED POLICY

ExxonMobil believes that sound policy should reduce the risks of climate change at the lowest societal cost, while balancing increased demand for affordable energy and the need to address poverty, education, health and energy security.

Climate change is a global issue that requires collaboration among governments, private companies, consumers and other stakeholders to create meaningful solutions. We engage with stakeholders directly and through trade associations around the world to encourage sound policy solutions for addressing climate change risks.

Our scientists, engineers and other experts have long contributed to the development of sound policy at both the national and international levels through important collaborations as well as the development of key insights and analysis.

For example, we have participated in the IPCC since its inception in 1988, including co-authoring chapters of IPCC scientific reports. We collaborate with top universities and national labs, and have published more than 50 papers in peer-reviewed journals. Over the past year, we played a pivotal role generating policy-relevant reports on carbon capture, utilization and storage (CCUS) and infrastructure at the request of the U.S. Department of Energy.

We actively monitor policy at the domestic and global level to inform our business planning and to assist policymakers seeking expertise about energy markets and technology. For example, we have supported the Paris Agreement, and while we recognize there are gaps between the policies called for under current NDCs and the ultimate Paris goals, our experience can assist policymakers hoping to address these gaps.

For more than a decade, ExxonMobil has supported an economy-wide price on CO_2 emissions as an efficient policy mechanism to address GHG emissions. ExxonMobil is a founding member of the Climate Leadership Council (CLC). Formed in 2017, the CLC calls for regulatory simplification and the adoption of a carbon fee. According to the CLC, if implemented in 2021, the Council's bipartisan plan would cut the U.S. CO_2 emissions in half by 2035, as compared to 2005 levels.⁽⁴⁶⁾

ExxonMobil also provided financial support for "Americans for Carbon Dividends," a national education and advocacy campaign launched in 2018 to promote the policy pillars of the CLC.



UP CLOSE:

Oil and Gas Climate Initiative

ExxonMobil is part of the Oil and Gas Climate Initiative (OGCl), a voluntary initiative representing 13 of the world's largest oil and gas producers working to mitigate the risks of climate change.

This CEO-led organization focuses on developing practical solutions in areas including carbon capture and storage, methane emissions reductions, and energy and transportation efficiency. ExxonMobil supports OGCI's investments in technology and deployment of long-term solutions to reduce GHG emissions.




PROVIDING PRODUCTS TO HELP OUR CUSTOMERS REDUCE THEIR EMISSIONS

Over the next few decades, population and income growth, and an unprecedented expansion of the global middle class, are expected to create new demand for energy and hydrocarbon-based products, even under 2°C scenarios. ExxonMobil is responding to this growth in product demand by delivering solutions that enable our customers to reduce their emissions and improve energy efficiency.



Natural gas

Natural gas is a versatile, abundant and lower-emission fuel. The use of natural gas in power generation plays an important role in reducing global emissions. When considering life cycle emissions, natural gas emits up to 60 percent lower GHGs and produces significantly fewer air pollutants than coal for power generation. Natural gas also provides a reliable source of power to supplement renewable energy when wind or solar power is not available. LNG enables transportation of natural gas from supply centers to customers safely and cost-effectively. ExxonMobil is one of the largest natural gas producers in the world and a leader in LNG.



Lightweight materials and packaging

Demand for auto parts, housing materials, electronics and other products made from petrochemicals continue to grow. We produce weight-reducing materials for automobiles, resulting in an estimated 7 percent fuel economy improvement for every 10 percent reduction in vehicle weight. We also provide lightweight packaging materials for consumer goods resulting in less transportation-related energy use and GHG emissions. Advanced packaging also helps extend the shelf life of fresh food by days or even weeks, improving safety and reducing food waste and agricultural inputs.



Synergy

Advanced fuels and lubricants

ExxonMobil's high-performance synthetic lubricants deliver improved vehicle efficiency and help customers reduce their emissions. Our synthetic lubricants require less frequent replacement than conventional motor oils. Mobil 1[™] Advanced Fuel Economy synthetic motor oil can improve fuel economy compared to other motor oils. Premium fuels such as Synergy[™] gasoline and diesel also help consumers improve gas mileage. ExxonMobil is progressing several multi-billion-dollar refinery expansion projects to supply the growing demand for these advanced products.

MITIGATING EMISSIONS IN OUR OPERATIONS

ExxonMobil has a robust set of processes to improve energy efficiency and mitigate emissions. These processes include, where appropriate, setting tailored objectives at the business, site and equipment level, and then stewarding progress toward meeting those objectives. We believe this rigorous approach is effective to promote efficiencies and reduce GHG emissions in our operations.

Since 2000, ExxonMobil has invested nearly \$10 billion in projects to research, develop and deploy lower-emission energy solutions. ExxonMobil also continues to expand collaborative efforts with other companies and academic institutions. See pages 18-23 for more information on these collaborations.

We are committed to further increasing energy efficiency while reducing flaring, venting and fugitive emissions. We also leverage monitoring technology to minimize and reduce GHG emissions.

In 2018, the GHG emissions from the electricity used in ExxonMobil's operations represents more than 10 percent of our net equity GHG emissions, hence, using energy more efficiently is a powerful tool to reduce emissions. Cogeneration is a process that improves efficiency by simultaneously producing electricity while capturing useful heat or steam for industrial processes. We have interest in approximately 5,400 megawatts of cogeneration capacity in more than 100 installations around the world and are continuing to pursue additional economic cogeneration opportunities.

We have a working interest in more than one-fifth of the world's carbon capture capacity, capturing nearly 7 million tonnes of CO_2 in 2018. With the safe start-up of a gas injection project in Qatar and a CCS project in Gorgon in 2019, our annual carbon capture capacity increased to nearly 9 million tonnes⁽⁴⁷⁾ (see page 29). ExxonMobil continues to evaluate opportunities to further increase CCS capacity.

Investments on lower-emission energy solutions

GHG emissions avoided from carbon capture (Net equity, CO₂-equivalent emissions Million tonnes per year)

GHG emissions reduction from cogeneration⁽⁴⁸⁾ (Net equity, CO₂-equivalent emissions Million tonnes per year)







METRICS & TARGETS

ExxonMobil has established programs to drive improvements in energy efficiency and mitigate GHG emissions. These programs are supported by key performance metrics, which are utilized to identify and prioritize opportunities to drive progress.

Tracking our GHG emissions performance

ExxonMobil is committed to mitigating emissions in our operations. As we grow our business to meet increasing demand, we are working to minimize the resulting increase in emissions.

In 2018, we announced GHG emissions reduction measures that are expected to lead to considerable improvements in emissions performance when compared with 2016 levels. These include:⁽⁴⁹⁾

- 15 percent reduction in methane emissions by 2020,
- 25 percent reduction in flaring by 2020,
- 10 percent GHG emissions intensity reduction at Imperial operated oil sands by 2023.

In 2018, our methane emissions totaled 7 million CO_2 -equivalent tonnes. Flaring from our operations dropped by 23 percent from 2016. Imperial achieved a 2 percent reduction in GHG intensity at its operated oil sands facilities.

ExxonMobil's GHG emissions have remained relatively flat (see bottom right chart) from 2009 to 2018. The GHG emissions from the base facilities that were in operations in 2009 have decreased more than 20 percent (approximately 28 million tonnes), primarily due to portfolio optimization, energy efficiency improvements, and reductions in flaring, venting and fugitive emissions. Meanwhile, the GHG emissions from acquisitions, expansions, new developments and facilities (shown as growth) offset these decreases from the base facilities.

We are also continuing our efforts to identify opportunities to lower GHG emissions along our product value chains. As ExxonMobil grows its business to meet society's needs, the mix and relative size of our asset portfolio, may drive changes in our GHG emissions. We strive to achieve best-in-class GHG intensity for each asset group while identifying opportunities to reduce overall GHG emissions.





ExxonMobil GHG Emissions⁽⁵⁰⁾

(Net equity, CO2-equivalent emissions, million tonnes)

ExxonMobil is pursuing large-scale deployment of CCS needed for delivering sustainable, clean energy

Grow CCS capacity globally

Since 1970, ExxonMobil has cumulatively captured more CO₂ than any other company.⁽⁵¹⁾ While already a leader in CCS, we are working toward expanding capacity and are evaluating multiple opportunities that use advantaged technologies and leverage a supportive policy environment. In addition to deployments at our own facilities, we are working with Joint Ventures and other stakeholders including policymakers, and the OGCI to evaluate and deploy additional large-scale applications.

Joint ventures - QatarGas and Gorgon

In February 2019, QatarGas, the joint venture between ExxonMobil and Qatar Petroleum, started a gas capture and injection project. This project will initially capture and store approximately 2 million tonnes per year of CO_2 in addition to the 1 million tonnes of CO_2 currently captured annually at the base facility. In August 2019, one of the world's largest CCS projects began operating with the Gorgon LNG project start-up. This CCS facility is expected to reduce Gorgon's emissions by 40 percent over the life of the project. Once fully up and running, between 3 million and 4 million tonnes per year of CO_2 will be captured and stored. With the start-up of these projects, ExxonMobil's annual carbon capture capacity increased to nearly 9 million tonnes.⁽⁴⁷⁾

Port of Rotterdam

In December 2019, ExxonMobil signed an agreement with the Port of Rotterdam to prepare for the capture, transport and storage of CO_2 beneath the North Sea. ExxonMobil is assessing the feasibility of constructing a carbon capture facility at the company's Rotterdam refinery in the Netherlands.

Port of Antwerp

In December 2019, ExxonMobil entered into a collaboration agreement with the Port of Antwerp to explore the possible development of CCUS infrastructure.

Cumulative CO_2 capture volume since $1970^{(51)}$ (Million tonnes)



National Petroleum Council (NPC)

In 2019, the NPC completed a study at the request of the U.S. Department of Energy to define the potential pathways for integrating CCS at scale into the energy and industrial marketplace. As a member of NPC, ExxonMobil took a leadership role in developing a road map, including prioritized opportunities and associated detailed plans for additional CCS deployment of up to 500 million tonnes per annum in the U.S. over the next 25 years.

OGCI and the Clean Energy Ministerial (CEM)

In 2019, ExconMobil with OGCI members launched the CCUS KickStarter program to facilitate large-scale commercial deployment of CCUS via multiple low-carbon industrial hubs. These hubs will be designed to capture CO₂ from several industrial companies enabled by shared transport and storage infrastructure. In addition, the initiative will work with governments and other industries to provide supportive market conditions to encourage investments in CCS deployment. A strategic framework has been established with the CEM CCUS Initiative, a strategic cooperation designed to facilitate commercial scale investment in CCUS around the world.

UP CLOSE: Taking actions to reduce methane emissions

ExxonMobil is committed to reducing methane emissions in our own operations, as well as advancing technology and policy to make progress in a cost-effective manner.

Operations

ExxonMobil implemented a program across its U.S. unconventional production to reduce methane emissions from new and existing sources by:

- Regularly conducting leak detection and repair surveys
- Phasing out high-bleed pneumatic devices
- Monitoring liquid unloadings
- Improving facility designs
- Training operations management, superintendents, foremen, facility engineering personnel and those involved in leak inspections

Since initiating our voluntary program, we have conducted nearly 20,000 leak surveys on more than 4.6 million components at more than 8,700 production sites. We replaced approximately 90 percent of our high-bleed pneumatic devices (approximately 1,250 devices) across our U.S. unconventional production as of 2019. As a result of these actions, our observed leak rate and level of emissions substantially reduced. Since 2016, we have reduced our U.S. unconventional methane emissions by nearly 20 percent as of 2018, equivalent to about 36,000 tonnes.

Research and technology

Working with our industry peers, regulators, researchers and NGOs, ExxonMobil is undertaking extensive research to understand methane emission sources, and to help develop and test new detection and mitigation technologies. For example, ExxonMobil is assessing the results of a pilot field study in Freestone County, Texas, that tested advanced technologies to more efficiently detect leaks. The study, which evaluated drones, detection sensors mounted on vehicles and fixed sensors, will inform the next generation of mitigation efforts across ExxonMobil's operations, as well as industry generally, leading to further methane emission reductions.

Advocacy

We are also active in pursuing sound policies, and we support reasonable, cost-effective regulations. In this regard, ExxonMobil submitted a letter to the U.S. Environmental Protection Agency rulemaking docket indicating support for reasonable, cost-effective regulations to manage methane emissions from new and existing sources. We also engaged with states advancing their own regulatory programs, most recently serving on the technical board advising New Mexico's regulatory development. Additionally, we led the Policy and Regulatory work streams of the global Methane Guiding Principles (MGP) initiative. The MGP forum supported development of a methane information portal by the IEA and engaged with the European Commission's development of a methane emissions strategy for Europe, as well as the United Nations Environment Programme (UNEP)'s "Global Methane Alliance." Through this alliance, UNEP is asking governments to include methane reductions in their next round of NDCs to be submitted under the Paris Agreement.

UNCONVENTIONAL PRODUCTION PROGRESS

~20%

METHANE REDUCTION ACROSS U.S. UNCONVENTIONAL PRODUCTION AS OF 2018

~90%

HIGH-BLEED PNEUMATIC DEVICES PHASED OUT AS OF 2019

GHG emissions performance data

We assess our performance to support continual improvements throughout the organization. Since 2011, performance data include unconventional operations information. In 2014, we started reporting our data over a 10-year period to demonstrate trends over time as part of our commitment to transparency. The reporting guidelines and indicators of International Petroleum Industry Environmental Conservation Association, the International Oil and Gas Producers Association and the American Petroleum Institute Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (2015) informed what data we included in the performance table.

Managing the risks of climate change⁽⁵²⁾

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
⁽⁵³⁾ GHG emissions, absolute (net equity, CO ₂ -equivalent emissions), millions of tonnes	123	126	128	126	127	124	122	125	123	124
¹⁵⁴ Direct (excluding emissions from exported power and heat)	114	117	119	118	119	116	114	117	115	116
⁽⁵⁵⁾ Emissions associated with imported power	9	9	9	8	8	8	8	8	8	8
CO2 (excluding emissions from exported power and heat)	119	122	124	120	119	116	115	118	116	117
Methane (CO ₂ - equivalent)	3	3	3	5	7	7	6	7	7	7
Other gases (CO ₂ -equivalent)	1	1	1	1	1	1	1	<1	<1	<1
Emissions from exported power and heat	14	13	15	15	16	8	4	3	3	3
⁽⁵³⁾ GHG emissions, normalized (net equity, CO ₂ -equivalent emissions), tonnes per 100 tonnes of throughput or production										
Upstream	20.1	20.5	20.7	22.3	23.2	24.0	23.9	24.7	24.7	25.3
Downstream	21.0	20.8	20.0	19.6	19.7	19.2	18.9	19.4	18.6	18.6
Chemical	60.7	57.9	57.2	56.3	57.9	54.5	54.8	53.9	54.2	55.7
By-region GHG emissions (net equity, CO2-equivalent emissions), millions of tonnes										
Africa/Europe/Middle East	43	45	45	44	44	43	44	45	43	42
Americas	62	64	66	68	70	66	65	64	64	63
Asia Pacific	18	17	17	14	13	15	13	16	16	19
By-division GHG emissions (net equity, CO2-equivalent emissions), millions of tonnes										
Upstream	47	50	54	56	58	56	56	59	58	58
Downstream	56	55	54	51	49	47	45	45	43	42
Chemical	20	21	20	19	20	21	21	21	22	24
Carbon dioxide - captured for storage, millions of tonnes	4.6	4.8	5.0	4.8	5.9	6.9	6.9	6.3	6.6	7.0
Energy use (billion gigajoules)	1.5	1.5	1.5	1.5	1.4	1.4	1.5	1.5	1.4	1.5
Upstream (gigajoules per tonnes production)	1.9	2.0	2.0	2.0	2.1	2.3	2.4	2.4	2.5	2.6
Refining (gigajoules per tonnes throughput)	3.0	3.0	3.0	3.0	3.0	2.9	2.9	3.0	2.9	3.0
Chemical (gigajoules per tonnes product)	9.8	9.5	11.4	12.0	10.9	10.7	10.9	10.6	10.5	10.1
Hydrocarbon flaring (worldwide activities), million standard cubic feet per day	470	380	430	380	390	470	570	530	410	410
Hydrocarbon flaring (worldwide activities), millions of tonnes	4.4	3.6	4.0	3.5	3.7	4.5	5.3	5.0	3.8	4.0
⁶⁸ Cogeneration capacity in which we have interest, gigawatts	4.9	4.9	5.0	5.2	5.3	5.5	5.5	5.3	5.4	5.4



ExxonMobil utilizes a risk management framework based on decades of experience to identify, manage and address risks associated with our business.

ExxonMobil's approach to risk management

ExxonMobil's corporate risk framework provides a structured, comprehensive approach to identify, prioritize and manage risks across the Company. It is designed to drive consistency across risk type, and monitor key risks, including risks related to climate change. The framework includes five elements: (1) a way to organize and aggregate risks (illustrated at the right); (2) robust risk identification practices; (3) a prioritization method; (4) an inventory of systems and processes to manage risk; and (5) risk governance.

ExxonMobil's approach to risk governance includes clearly defined roles and responsibilities for managing each type of risk, utilizing a multilayered approach. This approach includes a definition of the responsibilities of risk owners, functional experts and independent verifiers. Each risk type is managed and supported by functional organizations that are responsible for specifying corporate requirements and processes. Each of these processes includes the critical elements of leadership, people, risk identification and management, and continuous improvement. Oversight responsibilities by the Management Committee and the Board and its committees, as described on pages 4-6, are a key part of risk governance.

Managing long-term risks associated with climate change is an integral part of managing strategic risks at ExxonMobil. A core element of our management of strategic risks is the annual *Outlook for Energy*. As described in the previous sections of this report, the *Outlook* reflects a long-term, data-driven approach to promote a deeper understanding of global trends and projections related to population and economic growth, energy demand and supply options, as well as assessments of key uncertainties and potential impacts of alternative assumptions. Uncertainties include changes in economic growth, the evolution of energy demand and supply, emerging and disruptive technologies, and policy goals and actions. The *Outlook* informs business strategies, assumptions and processes for evaluating investment opportunities. Managing risk associated with climate change is an integral part of that work, helping to ground our choices related to long-term strategies and individual investments.

ExxonMobil enterprise risk categories

Risk type	Examples of potential risks that could be impacted by climate change, energy transition and extreme weather
1 Strategic	Supply/demand, disruptive technology, geopolitical and government changes
2 Reputational	Industry reputation, corporate reputation
3 Financial	Price volatility, foreign exchange fluctuations, customers' credit risk, insurance
4 Operational	Geological risk, project risk, product quality and brand, cybersecurity, talent, supplier
5 Safety, Security, Health & Environment	Process safety, well control events, environmental incidents
Compliance & Litigation	Litigation risks, regulatory compliance

UP CLOSE:

Resiliency: Protection of our assets, the community and the environment

ExxonMobil has extensive experience operating in a wide range of challenging physical environments around the globe. Our history of design, construction and operations provides us with a solid foundation to address risks associated with different physical environments. The Company assesses the risks posed by weather and other natural elements, and designs its facilities and operations in consideration of these risks.

ExxonMobil's diverse portfolio requires us to work in remote and challenging environments, including flood-prone areas. Using a rigorous and comprehensive scientific assessment process and the highest quality data from measurements and advanced computer modeling, we consider the full range of potential environmental, socioeconomic and health risks associated with potential operations before pursuing a new development. In doing so, we gain a holistic understanding of our impacts, and utilize this information to implement measures to avoid environmental, socioeconomic and health risks, reduce them to acceptable levels, or remedy the impacts.

When considering physical environmental risks, including risks for our production, refining and petrochemical facilities, we evaluate the type and location of our current and planned facilities. As an example, offshore facilities could be impacted by changes in wave and wind intensity as well as by changes in ice floe patterns, while onshore facilities could be vulnerable to sea level rise, changes in storm surge, flooding, changes in wind and seismic activity, or geo-technical considerations. Environmental assessments are conducted in advance to ensure that protective measures and procedures are in place prior to building and start-up of the facilities.

We use industry standards such as ASCE 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, and historical experience with additional factors to cover a range of uncertainties. After construction of a facility, we monitor and manage ongoing facility integrity, through periodic checks on key aspects of the structures.

Our scientists and engineers are considered industry experts. Through their active participation and leadership in industry groups, they advise and gather insights from industry to inform and improve the industry standards which in turn are adopted to

enhance ExxonMobil's standards and procedures and industry practices such as the American Society of Civil Engineers' Climate-Resilient Infrastructure Adaptive Design and Risk Management Manual of Practice.

Once facilities are in operation, we maintain disaster preparedness, response and business continuity plans. Detailed, well-practiced and continuously improved emergency response plans tailored to each facility help ExxonMobil prepare for unplanned events, including extreme weather. Regular emergency drills are practiced in partnership with appropriate government agencies and community coalitions to help ensure readiness and minimize the impacts of such events. We establish strategic emergency support groups around the world to develop and practice emergency response strategies and assist field responders. Regardless of the size or complexity of any potential incident, each ExxonMobil facility and business unit has access to readily available trained responders, including our regional response teams, to provide rapid tactical support.

ExxonMobil remains steadfast in our commitment to excellence in safety, security, health and environmental performance, referred to collectively as operations integrity. We believe the best way to manage the integrity of our business is through a capable, committed workforce coupled with policies, practices and management systems designed to enable safe, secure and environmentally responsible operations.

ExxonMobil's comprehensive approach and established systems enable us to manage a wide variety of possible outcomes, including risks associated with climate change.



Design standards provide for resiliency and environmental protection



Proactive monitoring and surveillance to protect the environment



Supporting recovery efforts in our communities

How are ExxonMobil's operations and investments aligned with the Paris Agreement?

ExxonMobil supports the goals of the Paris Agreement,⁽⁴⁾ an agreement among national governments to reduce carbon emissions from their economies. The Company's *Outlook for Energy*, which forecasts future energy supply and demand, aligns in aggregate with the NDCs submitted by Paris Agreement signatories, which represent each country's plans to reduce its emissions.

ExxonMobil bases its business strategy and investments on its *Outlook*, which assumes progress in technologies, infrastructure and policies to meet the NDCs. These business strategies and investment plans are therefore aligned with the aggregate of the agreement's national targets.

The Company's strategy focuses on the dual challenge of meeting the growing demand for energy to support economic development around the world while minimizing environmental impacts and the risks of climate change. ExxonMobil believes it has an important role to play in helping reduce climate risks through its commitment to manage operational emissions, produce cleaner, more advanced products, conduct fundamental research into new technology solutions, and engage in climate policy discussions.

Over the past two decades, ExxonMobil has invested nearly \$10 billion in technology and programs to reduce emissions, resulting in highly efficient operations that have eliminated or avoided more than 400 million tonnes of CO_2 emissions.

As governments around the world implement policies to meet their respective emissionreduction goals, demand for more carbon-intensive energy products will be reduced. However, even under 1.5°C and 2°C scenarios, a growing and increasingly prosperous global population will increase energy demand and still require significant investment in new supplies of oil and natural gas.

The IEA's most aggressive forecast for the implementation of emission reduction policies, the SDS, estimates the world will still need 67 million barrels of oil per day in 2040.⁽⁵⁷⁾ However, without further investment, the impact of depletion would result in oil production of just 19 million barrels of oil per day in 2040.⁽⁵⁸⁾ The IEA estimates \$20 trillion of additional oil and natural gas investment is needed, just to keep pace with demand, and avoid a shortfall in supply.⁽²⁾ Based on ExxonMobil's current market position, this suggests an average

investment of \$30 billion to \$35 billion per year over this time frame, which is consistent with the Company's investment outlook.⁽⁵⁹⁾ Because ExxonMobil is a highly efficient operator, it is positioned to continue to play a prominent role in meeting these future needs.

Importantly, the Company continues to deploy its competencies in breakthrough technology development to pursue advances in the high-emission sectors where current technologies are insufficient to achieve deep reductions. These sectors – power generation, commercial transportation and industry – represent about 80 percent of current energy-related CO_2 emissions and are projected to increase with population growth and economic development. Breakthroughs in these areas are critical to reducing emissions and would make a meaningful contribution to achieving the goals of the Paris Agreement.

Does ExxonMobil have to reduce its production to align with the Paris Agreement?

The Paris Agreement does not contemplate or require individual companies to decrease production to align with the goal of maintaining global temperature rise to below 2°C. The structure of the agreement recognizes that energy-related emissions are driven by society's demand for energy – not its supply. Improved efficiency, effective government policies and informed consumer choices are more effective measures to address demand.

With respect to energy supply, production reductions by individual companies would have no impact on demand or consumption of energy, and would simply result in production shifting from one producer to another. And shifting of production would not necessarily reduce the amount of greenhouse gases produced and, in some cases, the opposite could be true. The transfer of production from well-run, highly efficient operators to less-efficient producers, for example, could actually increase emissions associated with the production of oil and natural gas, and finished products. Society benefits when the most efficient operators lead energy development efforts.

ExxonMobil has a long history of industry-leading operational performance. For example, the Company's refining operations have consistently ranked in the top quartile for energy efficiency in the key refining industry benchmark survey by Solomon Associates.⁽⁶⁰⁾ In ExxonMobil's chemical business, advanced efficiency technologies and techniques have reduced net equity greenhouse gas emissions intensity by nearly 4 percent since 2013.

In addition, this year the Company reported a nearly 20-percent reduction in methane emissions in its U.S. unconventional production through a series of industry-leading best practices such as upgrading of equipment and enhanced use of technology to improve inspections. ExxonMobil is on track to meet its goal to reduce company-wide methane emissions by 15 percent and flaring by 25 percent by year-end 2020 and Imperial-operated oil sands greenhouse gas emissions intensity by 10 percent by year-end 2023.⁽⁴⁹⁾ While the Company's voluntary efforts are important, they capture only a fraction of industry's overall methane emissions, which is why ExxonMobil works with policymakers to improve effectiveness of regulations so that all of industry participates to maximize the benefits to society.

Overall, the Company has invested nearly \$10 billion since 2000 on technology and programs to reduce emissions, including the development and deployment of carbon capture and storage where ExconMobil has more than 20 percent of the world's total capacity.⁽³⁴⁾ These investments helped eliminate or avoid more than 400 million tonnes of CO_2 emissions, which is equivalent to the annual energy-related CO_2 emissions of more than 46 million average U.S. homes.⁽⁶¹⁾

What is ExxonMobil doing to prepare for a lower-carbon future while meeting energy needs of a growing population?

ExxonMobil plays a critical role in providing the energy that supports economic growth and improves the quality of life for people around the world. Major forecasts project energy demand to increase as the global population rises to 9.2 billion by 2040 from 7.5 billion today, and because of growing prosperity and an expanding middle class.⁽³⁾

Even under 1.5°C and 2°C scenarios, meeting this increase in energy demand will require significant investment in new supplies of oil and natural gas, generally consistent with ExxonMobil's investment levels. At the same time, there is a need to pursue further emission-reduction efforts and technologies in support of the goals of the Paris Agreement.

The Company supports market-based approaches to reduce emissions, including further cost-effective regulation of methane and an economy-wide price on carbon. ExxonMobil believes market-based policies that place a uniform, predictable cost on carbon will drive emissions reductions at the lowest cost to society while supporting technology innovation and deployment.

Technology innovation is critical because the current solution set is insufficient to reduce emissions to targeted levels at an acceptable cost to society. According to the IEA, only seven of 45 important technologies and sectors are on track to help society reach the Paris Agreement goals.⁽¹⁵⁾ Meeting these goals will require large-scale deployment of new technologies in key areas – power generation, commercial transportation and industrial processes – where emissions are most significant and forecast to increase.

Near-term actions the Company is taking to prepare for a lower-carbon future, include:

- Expanding supplies of cleaner-burning natural gas
- Improving energy efficiency in operations
- Operating and investing in carbon capture and storage
- Reducing flaring and methane emissions from operations
- Developing products, such as premium lubricants, light-weight plastics, and special tire liners to help consumers improve efficiency and reduce emissions
- Supporting effective climate policy to address the risk of climate change at the lowest societal cost

Longer-term efforts include:

- Progressing advanced biofuels from algae and agricultural waste for commercial transportation and petrochemicals
- Researching breakthroughs to improve commerciality of carbon capture and storage technology for power generation and industrial applications
- Developing new and efficient technologies that reduce emissions in refining and chemical facilities

More information can be found in the Strategy section of this 2020 *Energy & Carbon Summary*.

Has ExxonMobil set long-term emissions targets consistent with 2°C scenarios?

In 2018, ExxonMobil announced a series of emissions-reduction targets relative to 2016 performance.⁽⁴⁹⁾

To manage methane, a higher-potency greenhouse gas, the Company has announced, and is on track, to reduce corporate-wide methane emissions by 15 percent by year-end 2020. To achieve this progress, key improvement programs were deployed, including in its upstream operations, where structured leak detection, repair activity and equipment upgrading are being implemented. As of 2018, methane emissions from ExxonMobil's U.S. unconventional production were down by nearly 20 percent.

The Company also established a target to reduce flaring by 25 percent by year-end 2020. Flaring is the process of burning natural gas as an alternative to releasing it directly into the atmosphere, often as a safety measure to relieve pressure and reduce risk of ignition. The Company is on track to meet its flaring-reduction target through equipment upgrades and infrastructure development.

In addition, ExxonMobil's Canadian affiliate, Imperial, announced a goal to achieve a 10percent decrease in greenhouse gas emissions intensity by year-end 2023. This will involve application of next-generation technology to improve performance at its heavy oil and oil sands facilities.

The Company also works with industry groups on emission-reducing initiatives. For example, as part of its membership in the OGCI, ExconMobil is working with OGCI members to reduce the members' collective average intensity of methane emissions from oil and natural gas production to a target of 0.25 percent by 2025 vs. $2017.^{(62)}$

These measures build upon established programs that deliver sustainable greenhouse gas reductions at operating sites. Setting targets with the aim of reducing production from a highly efficient operator such as ExxonMobil will do nothing to curb demand. Instead, it could result in shifting production to a less-efficient operator, having the effect of actually increasing overall emissions.

The Paris Agreement does not contemplate or require individual companies to decrease production in order to align with the goal of maintaining global temperature rise to below 2°C. The structure of the Paris Agreement recognizes that energy-related emissions are driven by society's demand for energy – not its supply. Improved efficiency, effective government policies and informed consumer choices are more effective measures to address demand, and therefore energy-related emissions.

ExxonMobil bases its business strategy and investments on its *Outlook*, which assumes progress in technologies, infrastructure and policies to meet the NDCs. Therefore, these business strategies and investment plans are aligned with the aggregate of the Paris Agreement NDCs.

ExxonMobil will continue to apply new technologies and approaches to successfully meet future energy and environmental challenges, and will consider additional targets as appropriate.

See page 27-31 in this 2020 *Energy & Carbon Summary* for further information on metrics and targets.

Why doesn't ExxonMobil report Scope 3 emissions?

The Company believes that it is important to report on Scope 1 emissions (direct GHG emissions from Company operations) and Scope 2 emissions (indirect GHG emissions from energy purchased by the Company) because these metrics provide an accurate reflection of the Company's efforts to efficiently manage energy use and reduce emissions.

ExxonMobil's Scope 1 emissions demonstrate the efficiency of its operations, portfolio of products, business sectors served, and resource type. Its Scope 2 emissions reflect its choice of energy sources, primarily purchases of electrical power to run its operations. By reporting both types of emissions, stakeholders can clearly evaluate the efficiency of ExxonMobil's operations compared to others within industry with a similar product portfolio, serving similar sectors, and developing similar resources.

ExxonMobil has a long history of highly efficient operational performance enabled by key investments at its manufacturing sites. For example, the Company has extensive combined heat and power cogeneration facilities in more than 100 installations with a gross capacity of 5,400 megawatts, which avoids 7 million CO₂-equivalent tonnes per year of GHG emissions.⁽⁴⁸⁾ In addition, the Company has reduced emissions through large-scale purchases of renewable electricity to power operational facilities. In fact, ExxonMobil ranked among the top 10 global corporate wind and solar purchasers in 2018.⁽⁶³⁾

Scope 3 emissions, on the other hand, result from the consumption or use of the Company's products, and are not within its direct control. Scope 3 emissions are a function of demand for energy products and are the result of choices consumers make regarding when and how to use energy, including ExxonMobil's products.

Furthermore, Scope 3 emissions do not provide any meaningful insight into the Company's emission-reduction performance and could be misleading in some respects. For example, increased natural gas sales by ExxonMobil that reduce the amount of coal burned for power generation, would result in an overall reduction of global emissions but would increase Scope 3 emissions reported by the Company.

Overall, ExxonMobil's aim is to help achieve the goal of lowering emissions at the lowest cost to society while continuing to provide the energy needed to enable modern life. The Company focuses on managing operational emissions, helping consumers reduce their emissions through the provision of more advanced products, engaging in policy discussions to help governments move toward a lower-carbon future, and importantly working on technologies that make meaningful contributions to the available solution set, which is currently insufficient to achieve the objectives of the Paris Agreement.

Why is ExxonMobil not investing in existing renewable energy sources like wind and solar?

Although wind and solar will play an important role in the transition to lower-carbon energy sources, new technology breakthroughs will be required to reduce emissions to levels outlined in 1.5°C and 2°C scenarios. ExxonMobil is undertaking research and development where the need is greatest. The Company is focused on areas where it can make a unique and significant contribution, and where it has deep scientific competencies. In this way, ExxonMobil can make the most meaningful and expedient contribution to society's efforts to manage the risks of climate change.

The Company's technology development program focuses on three distinct high-emitting sectors where there are currently limited viable solutions for broad deployment: commercial transportation, power generation and industrial processes. These sectors represent about 80 percent of current energy-related CO₂ emissions and are projected to increase with population growth and economic development.

In transportation, ExxonMobil is making progress in the development of advanced algae and cellulosic liquid biofuels. Because of their energy density, liquid fuel solutions are currently needed for commercial transportation where battery capacity is an issue for heavy loads and long distances.

In power generation and for industrial processes, the Company is working to make carbon capture and storage technology more economic, to potentially enable wider deployment. ExxonMobil currently has more than 20 percent of the world's total carbon capture capacity.

In the industrial sector, ExxonMobil is developing new processes for refining and chemical facilities to reduce energy use through advanced separations processes, catalysts and process configurations.

Breakthroughs in these areas are critical to reducing emissions and would make a meaningful contribution to achieving the goals of the Paris Agreement.

It should also be noted that ExxonMobil was one of the top purchasers in 2018 of renewable energy, including wind and solar, to support its operations.

The Energy & Carbon Summary is aligned with the core elements of the TCFD framework.

This year's *Energy & Carbon Summary* is aligned with the core elements of the framework developed by the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD), designed to encourage the informed conversation society needs on these important issues.

TCFD core elements and recommended disclosures	ExxonMobil disclosures				
Governance					
a. Describe the Board's oversight of climate-related risks and opportunities.	Page 3 - 6, 33				
b. Describe management's role in assessing and managing risks and opportunities.	Page 3 - 6, 33				
Strategy					
a. Describe the climate-related risks and opportunities the organization has identified over the short, medium and long term.	Page 7 - 26				
b. Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy and financial planning.	Page 7 - 26				
c. Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios,	Page 7 - 26				
including a 2°C or lower scenario.					
Metrics & targets					
a. Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and	Page 27 - 31				
risk management process.					
b. Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 GHG emissions, and the related risks.	Page 27 - 31				
c. Describe the targets used by the organization to manage climate-related risks and opportunities and performance	Page 27 - 28, 30				
against targets.					
Risk management					
a. Describe the organization's processes for identifying and assessing climate-related risks.	Page 32 - 33				
b. Describe the organization's processes for managing climate-related risks.	Page 32 - 34				
c. Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organization's	Page 32 - 34				
overall risk management.					

Disclosures

ExxonMobil is committed to providing our shareholders with disclosures that impart meaningful insights about our business, including how we manage climaterelated risks. This report, along with the rest of our comprehensive set of disclosures relating to climate-related matters, follow the framework established by IPIECA, including IPIECA's Climate Change Reporting Framework.⁽⁶⁴⁾ In addition, this year's report continues to be aligned with the core elements of the TCFD framework. IPIECA members represent a significant portion of the world's oil and natural gas production, including state oil companies, and is the industry's principal channel of communication with the United Nations. This broad, global membership enables a reporting framework that is tailored to the petroleum industry and better permits comparisons of member companies on a more consistent and standardized basis.

Web links to our other various climate-related disclosures are highlighted below:

- Sustainability Report (exconmobil.com/sustainabilityreport)
- Outlook for Energy (exxonmobil.com/energyoutlook)
- Technology (exxonmobil.com/technology)
- Enhanced Methane Emissions Reduction Program (exxonmobil.com/methanereduction)
- Climate-related materials (exxon mobil.com/climate)
- SEC Form 10-K (exxonmobil.com/secfilings)
- Executive Compensation Overview (corporate.exxonmobil.com/en/~/media/Global/Files/investor-relations/annual-meeting-materials/executive-compensation-overviews/2019-Executive-Compensation-Overview.pdf)

Existing policy frameworks (including the Paris NDCs), financial flows, and the availability of cost-effective technologies indicate that society is not currently on a 2°C pathway. Should society choose to more aggressively pursue a 2°C pathway, we will be positioned to contribute through our engagement on policy, development of needed technologies, improved operations and customer solutions.

(1) OECD – Organisation for Economic Co-operation and Development.

(2) IEA World Energy Outlook 2019, page 146.

(3) BROOKINGS INSTITUTION, There are many definitions of "middle class"-here's ours, Richard V. Reeves and Katherine Guyot Tuesday, September 4, 2018, January 2020, https:// www.brookings.edu/blog/up-front/2018/09/04/there-aremany-definitions-of-middle-class-heres-ours/

(4) Article 4 paragraph 2 of the Paris Agreement https:// unfccc.int/files/meetings/paris_nov_2015/application/pdf/ paris_agreement_english_.pdf

(5) UNEP (2018). The Emissions Gap Report 2018. United Nations Environment Programme, Nairobi, page XIV and XV, http://wedocs.unep.org/bitstream/ handle/20.500.11822/26895/EGR2018_FullReport_EN.pdf? sequence=1&isAllowed=y

(6) UNEP (2019). The Emissions Gap Report 2019, page XIII. https://www.unenvironment.org/resources/emissions-gapreport-2019

(7) IEA, Perspectives for the Energy Transition, page 57.

(8) "EMF was established at Stanford in 1976 to bring together leading experts and decision makers from government, industry, universities, and other research organizations to study important energy and environmental issues. For each study, the Forum organizes a working group to develop the study design, analyze and compare each model's results and discuss key conclusions." https:// emf.stanford.edu/about

EMF is supported by grants from the U.S. Department of Energy, the U.S. Environmental Protection Agency as well as industry affiliates including ExxonMobil.

https://emf.stanford.edu/industry-affiliates

(9) To understand some of the characteristics of future transition pathways, we analyzed energy and emissions data from a range of EMF27 stabilization, policy and technology targets, primarily focusing on 450 and 550 stabilization targets, as well as nopolicy cases that utilize a full suite of technologies. The suite of full technologies (FT) includes a range of options, including: energy efficiency, nuclear, carbon capture and storage (CCS), biofuels and non-bio renewables such as solar and wind. The EMF27 study considered other technology-limited scenarios, but a key finding was that the unavailability of carbon capture and storage and limited availability of bioenergy had a large impact on feasibility and cost. Given the potential advantages to society of utilizing all available technology options, we focused on capturing the results of different EMF27 models that ran 450-FT cases; we were able to download data for 13 such scenarios, and utilized that data as provided for analysis purposes (most of the scenarios had projections extending from 2010 to 2100). Data downloaded from: https://secure.iiasa.ac.at/web-apps/ene/AR5DB

(10) EMF27 cases include CO_2 emissions from energy and industrial processes.

(11) IEA World Energy Outlook 2019, page 46-47.

(12) The assessed 2°C scenarios produce a variety of views on the potential impacts on global energy demand in total and by specific types of energy, with a range of possible growth rates for each type of energy as illustrated in this report. Since it is impossible to know which elements, if any, of these models are correct, we used an average of all 13 scenarios to approximate growth rates for various energy types as a means to estimate trends to 2040 indicative of hypothetical 2°C pathways.

(13) The IPCC 1.5 Special Report would result in even stronger reductions of oil and natural gas demand by 2040 compared to the 2°C scenarios, yet would still require additional investments in oil and natural gas capacity.

(14) Based on the average of assessed 2°C scenarios' CO₂ emissions (~20 billion tonnes including energy and industrial processes), ExxonMobil GDP assumptions are consistent with 2019 *Outlook for Energy.*

(15) IEA, Progress on energy technologies fails to keep pace with long-term goals for clean energy transitions, 27 May 2019, https://www.iea.org/news/progress-on-energytechnologies-fails-to-keep-pace-with-long-term-goals-forclean-energy-transitions

(16) IEA, The Future of Trucks, 2017, EM analyses.

(17) Based on the average of the assessed 2°C scenarios referenced in this report, the combination of renewables, nuclear and fossil fuels using CCS is estimated in these scenarios to increase significantly as a percentage of total primary energy demand, rising from approximately 10% in 2010 to roughly 40% in 2040.

(18) Electricity delivered from fossil fuels without CCS as a percentage of total electricity delivered decreases from 66% to 20% on average from 2010 to 2040 under the assessed 2°C scenarios. Share of electricity from non-bioenergy renewables (e.g., wind, solar, hydro) increases from less than 20% to ~35%. Share of electricity generation utilizing CCS increases to about 20%. Share of electricity from nuclear increases from ~15% to ~20% (implies double the level of nuclear capacity from 2016 to 900 GW).

(19) Total electricity delivered as a percentage of total final energy demand increases from 18% to 28% on average across the 13 assessed 2°C scenarios referenced in this report. (20) Under the assessed 2°C scenarios, the average growth rate for oil demand is -0.36% from 2010 to 2040, which implies a decrease in absolute level of demand in 2040 by ~10% relative to 2010 levels, which is near 2000 levels. Oil demand has increased about 11% since 2010, hence it would require a demand decrease of ~20% to reach the same 2040 level relative to today's demand. Trends toward a level close to 2000 would imply oil used in road transportation trends toward 30 Moebd, and oil used for aviation and marine trends toward 9 Moebd.

(21) Based on average global demand growth rates under assessed 2°C scenarios.

(22) Based on average global demand growth rates under assessed 2°C scenarios.

(23) PwC: The Low Carbon Economy Index 2019: Emissions Relapse https://www.pwc.co.uk/services/sustainabilityclimate-change/insights/low-carbon-economy-index.html

(24) For the purposes of this report, proved reserves are yearend 2018 proved oil and gas reserves for consolidated subsidiaries and equity companies as reported in the Corporation's Annual Report on Form 10-K. Proved oil and gas reserves are determined in accordance with Securities and Exchange Commission (SEC) requirements. Proved reserves are those quantities of oil and gas which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be economically producible under existing economic and operating conditions and government regulations. Proved reserves are determined using the average of first-of-month oil and natural gas prices during the reporting year.

(25) For the purposes of this disclosure, resources are total remaining estimated quantities of discovered quantities of oil and gas that are expected to be ultimately recoverable. The resource base includes proved reserves and quantities of oil and gas that are not yet classified as proved reserves.

(26) To estimate global demand in 2040 for oil and natural gas, the average of the assessed 2°C scenarios' growth rates for oil and natural gas covering the period 2010-2040 have been applied to standard baseline estimates of oil and natural gas demand in 2010.

(27) IHS: Climate-Related Financial Risk and the Oil and Gas Sector, page 23.

(28) The assessed 2°C scenarios growth rates imply a range in 2040 global oil demand from about 53 to 103 Moebd and for 2040 global natural gas demand from about 265 to 625 BCFD.

(29) Hypothetical cumulative production determined by proportioning ExxonMobil's 2017 average daily production (Form 10-K, page 8) and 2017 average daily global oil and gas production to estimated 2040 average daily production (assuming ExxonMobil's current market share and 100% proved reserves replacement to maintain its proved reserves consistent with its production ratio at the end of 2017) and implied oil and gas demand from the 2°C scenarios average. Assumed linear decline of estimated average daily production through 2040.

(30) IEA: Perspectives for the Energy Transition, page 56. Estimate for IEA crude oil and natural gas and future prices for 2020, 2030 and 2040.

(31) As used here, "carrying value" is our property, plant and equipment (PPE) net of accumulated depreciation. ExxonMobil's carrying value of property, plant and equipment as of September 30, 2019, was approximately \$251 billion. The reference to "less than 5 percent of ExxonMobil's total carrying value of property, plant and equipment" is calculated by taking the PPE carrying value of ExxonMobil's resource base and subtracting from it the PPE carrying values of ExxonMobil's proved reserves, its unconventional liquids assets and its natural gas assets, and comparing this resulting value against ExxonMobil's total PPE carrying value as of September 30, 2019.

(32) Basis presented at the ExxonMobil 2018 Investor Day (\$60/ bbl Brent 2017 flat real, 2017 margins); excludes impact.

(33) Exxon only before 1999. The average is based upon a 10year interval. (34) Global CCS Institute, Global Status of CCS 2019, page 18.

(35) IEA, World Energy Outlook 2019, page 103.

(36) ExxonMobil estimates.

(37) B. Slade, B. Stober, D. Simpson, Dividing wall column revamp optimises mixed xylenes production, IChemE, Symposium Series No. 152, (2006).

(38) R.A. Johnson, H.W. Deckman, B.T. Kelley, R.H. Oelfke, S. Ramkumar, Apparatus and System for Swing Adsorption Processes Related Thereto. US Patent 10080991B2, 2018.

(39) P.D.J. McMahon, R.A. Johnson, S. Ramkumar, R.H. Oelfke, E.R. Thomas, A.K. Nagavarapu, W.W. Barnes, Apparatus and System for Swing Adsorption Processes Related Thereto. US Patent 10124286B2, 2018.

(40) W. Barnes, C.-C. Chen, T. Fowler, P. McMahon, A.K. Nagavarapu, D. Shatto, Novel adsorption-based gas treating technology platform for upstream gas separations, Offshore Technology Conference, (2018).

(41) F. Kapteijn, J.J. Heiszwolf, T.A. Nijhuis, J.A. Moulijn, Monoliths in multiphase catalytic processes–aspects and prospects, CatTech 3 (1) (1999) 23–40.

(42) C.S. Pereira, B.A. Patel, The role of process intensification in addressing the dual energy challenge, Chemical Engineering & Processing: Process Intensification 142 (2019) 107545.

(43) D.S. Sholl, R.P. Lively, Seven chemical separations to change the world, Nature 532 (2016) 435-437.

(44) ExxonMobil estimates.

(45) D.S. Mallapragada, I. Naik, K. Ganesan, R. Banerjee, I.J. Laurenzi, Environ. Sci. Technol., 53(1) (2019) 539-549.

(46) Resources for the Future: Analysis of alternative carbon tax price paths for Climate Leadership Council (CLC) carbon dividends plan, issue brief 18-07 by Marc Hafstead, 2019.

(47) Design capacity.

(48) ExxonMobil estimates.

(49) Governmental, legal or regulatory changes could directly or indirectly delay or otherwise impact GHG emission reduction measures.

(50) Our calculations are based on the guidance provided in API's Compendium of Greenhouse Gas Emission Estimation Methodologies for the Oil and Gas Industry and IPIECA's Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions. We report GHG emissions on a net equity basis for our business operations, demonstrating a share of emissions from any facility or operation in which ExxonMobil holds a financial interest, with the share reflecting the equity interest.

(51) Source: Global CCS Institute. Data updated as of April 2019 and based on cumulative anthropogenic carbon dioxide capture volume. Anthropogenic CO₂, for the purposes of this calculation, means CO₂ that without carbon capture and storage would have been emitted to the atmosphere, including, but not limited to: reservoir CO₂ from gas fields; CO₂ emitted during production and CO₂ emitted during combustion. It does not include natural CO₂ produced solely for enhanced oil recovery.

(52) ExxonMobil-operated emission estimates are based on a combination of measured and estimated emissions data using best available information. Our calculations are based on industry standards and best practices, including guidance from the American Petroleum Institute (API) and IPIECA. The uncertainty associated with the emission estimates depends on variation in the processes and operations, the availability of sufficient data, the quality of those data and methodology used for measurement and estimation. Changes to the estimates may be reported as updated data and/or emission methodologies become available. We work with industry, including API and IPIECA, to improve emission factors and methodologies. Emission estimates from non-ExxonMobil-operated facilities are included in the equity data. The data includes XTO Energy performance beginning in 2011.

(53) The net equity greenhouse gas emissions metric was introduced in 2011 as a replacement for the direct equity greenhouse gas metric. Information has been restated back to 2009 according to the new metric. The net equity greenhouse gas metric includes direct and imported greenhouse gas emissions and excludes emissions from exports (including Hong Kong Power through mid-2014). ExxonMobil reports greenhouse gas emissions on a net equity basis for all our business operations, reflecting our percent ownership in an asset.

(54) The addition of direct emissions and emissions associated with exported power and heat is equivalent to World Resources Institute (WRI) Scope 1.

(55) These emissions are equivalent to WRI Scope 2.

(56) Cumulative figure.

(57) IEA World Energy Outlook 2019, page 132.

(58) IEA, ExxonMobil analysis.

(59) ExxonMobil estimates.

(60) Solomon Associates. Solomon Associates fuels and lubes refining data available for even years only.

(61) Based on U.S. EPA Greenhouse Gas Equivalencies Calculator as of January 2020; https://www.epa.gov/energy/greenhousegas-equivalencies-calculator

(62) OGCI, Scaling up action aiming for net zero emissions, September 2019.

(63) BloombergNEF. The data were downloaded from BloombergNEF on Dec 13, 2018, and based on total wind and solar power purchase agreements signed in 2018.

(64) IPIECA climate change reporting framework: Supplementary guidance for the oil and gas industry on voluntary sustainability reporting. Published by IPIECA in 2017.



Exxon Mobil Corporation Corporate Headquarters 5959 Las Colinas Blvd. Irving, Texas 75039-2298 exxonmobil.com

Exhibit 23

Corporate Citizenship Report



- 3 Chairman's letter
- 4 About ExxonMobil
- 5 Global operations
- 6 Powering the world's progress
- 7 The Outlook for Energy
- 8 Sustainability
- 9 Engaging with stakeholders
- 10 External Citizenship Advisory Panel
- 12 ExxonMobil's key sustainability issues and challenges



Case Study:

ExxonMobil's Operations Integrity Management System



Safety, health and the workplace

- Safety
- Emergency preparedness and response
- Workplace security
- Health and wellness
- Workforce



Managing climate change risks

- Engaging on climate change policy
- Developing ruture technology
 Mitigating greenhouse
- gas emissions in our operations
- Developing solutions that reduce greenhouse gas emissions for customers



Case Study:

ExxonMobil's research and

81

development initiatives



Environmental performance

- Environmental management
- Biodiversity and ecosystem services
- Water management
- Spill performance
- Air emissions
- Environmental compliance
- Rehabilitation and decommissioning



Case Study:

Technological innovations in Arctic wildlife protection



Community and social impact

- Respecting human rightsManaging community
- engagement
 Strategic community investments



Case Study:

New country entry in Guyana for the Upstream business



Local development and supply chain management

- Local economic growth and development
- Supply chain management
- Shareholder relations

Corporate

governance

Ethics and integrity

Board of directors



Web

Throughout the report, additional content is available by clicking the icons shown on the left.

8	About this report
9	Materiality
0	Performance data
3	IPIECA/GRI content index
4	Assurance statement



In December 2015, students at the Federal Housing Estate Primary School in Lagos, Nigeria, learn about malaria prevention and proper bed net use through Grassroot Soccer's communitybased program. To learn more about this program, see page 69.

Chairman's letter

Energy makes life as we know it possible. Energy provides the fundamental underpinnings for quality of life. Energy powers the world's economies and allows us to improve our standards of living.

ExxonMobil's core mission is to power the world's progress by expanding energy supplies safely, securely and responsibly. We believe our industry will be instrumental to meeting a fundamental and universal human need. Our successes are a reminder that new technologies and proven techniques are the key to unlocking abundant sources of energy. We uphold the highest standards of safety and environmental protection in supplying the world's energy.

Our work enables billions to access the energy that supports their livelihoods. We understand the need to thoughtfully invest to expand the benefits of modern energy while protecting the environment and addressing the impacts of rising greenhouse gas emissions and climate change.

This Corporate Citizenship Report provides a view of how we work to help power the world's progress. It shares our priorities and our plans for the future. It provides data and examples that chart our progress and describe our approach. Some of the highlights related to our priorities include:

Safety, health and the workplace. The effort to develop energy resources takes our company to some of the most difficult and challenging places on earth. We make a commitment to do the right thing, the right way, every time each employee and contractor does his or her job. In 2015, we continued our journey toward our goal of *Nobody Gets Hurt*. We will never stop working to achieve and sustain this goal.

Managing climate change risks. Managing the risks of climate change is an important responsibility for our business and society at large. We believe that sound policy, free markets, innovation, technology and efficiency are essential in addressing the risks of climate change. We continue to advance research and development, leading to innovation in areas such as advanced biofuels, carbon capture and sequestration, and energy efficiency. Managing our own greenhouse gas emissions is a core element of our operations. We have and will continue to engage relevant stakeholders to further develop climate science and broaden its understanding by society at large. Environmental performance. Rigorous, science-based environmental management is a critical element of what we do. *Protect Tomorrow. Today.* sets the principles that guide our efforts to protect biodiversity, manage water use and air emissions, avoid spills, decommission sites and rehabilitate the environment.

Community and social impact. Maintaining respect for human rights, responsibly managing our impacts on communities and making valued social investments are integral to the success and sustainability of our business. In 2015, we contributed \$268 million to communities around the world, focusing on areas such as improving education, combating malaria and advancing economic opportunities for women. ExxonMobil's local content and supply chain management strategies are designed to deliver lasting and shared value to host countries, local communities and our business.

Governance. Upholding the highest ethical standards of business conduct is critical to maintaining our global license to operate. A commitment to ethics and integrity is the foundation of our corporate culture. We seek to maintain the highest anti-corruption compliance in all aspects of our operations.

The challenge of powering the world's progress is one that defies simple solutions. There are many stakeholders with strongly held views and differing opinions. We work to understand them and strive to strike an appropriate balance that maximizes the benefits to society. The approach we take will be grounded in facts and science, and will be guided by practical choices backed by human ingenuity. The good news is that practical options to meet people's needs for reliable, affordable energy continue to expand.

I'm pleased to share this *Corporate Citizenship Report* to show how we approach these challenges, the actions we're committed to taking and the performance of the capable men and women who make up ExxonMobil.

We continue to encourage feedback from all of our stakeholders at *exxonmobil.com/citizenship*.

RepW. Tilla

Rex W. Tillerson Chairman and CEO



About ExxonMobil

As a global provider of energy, ExxonMobil's core mission is to safely and responsibly deliver the energy needed to power the world's economic, social and technological progress. Every day, we work to do this with integrity, ingenuity and a commitment to good corporate citizenship. We recognize the significant responsibilities we have to our shareholders, neighbors, customers and communities as we find ways to bring affordable energy to a global market. We believe our employees, technical expertise, financial strength, global reach and disciplined approach provide ExxonMobil an advantage in addressing the challenges of meeting global energy demand.

As the world's largest publicly held oil and gas company, ExxonMobil has a diverse portfolio of high-quality assets, projects and resources across our Upstream, Downstream and Chemical businesses. We seek to maintain a balanced portfolio of opportunities to ensure profitable growth through a wide range of investment and geopolitical environments.

ExxonMobil's integrated businesses



Upstream

Our Upstream business encompasses high-quality exploration opportunities across all resource types and geographies, an industry-leading resource base, a portfolio of world-class projects and a diverse set of producing assets. We have an active exploration or production presence in 36 countries.

Downstream

Our balanced Downstream portfolio includes refining facilities in 14 countries. We are one of the largest integrated refiners and manufacturers of lube basestocks and a leading marketer of petroleum products and finished lubricants. Our high-quality products, combined with a strong global refining and distribution network, position us as a premier global supplier.

Chemical

ExxonMobil Chemical is one of the largest chemical companies in the world. Our unique portfolio of commodity and specialty businesses delivers superior returns across the business cycle. We manufacture high-quality chemical products in 16 countries. Our products serve as the building blocks for a wide variety of everyday consumer and industrial products.

million o net oil ar

million oil-equivalent barrels of net oil and gas production per day¹

million barrels of petroleum product sales per day²



million metric tons of prime product sales³

¹Gas converted to oil-equivalent at 6 million cubic feet = 1 thousand barrels.

²Petroleum product sales data reported net of purchases/sales contracts with the same counterparty.

³Prime product sales are total product sales excluding carbon black oil and sulfur. Prime product sales include ExxonMobil's share of equity company volumes and finished-product transfers to the Downstream.

Global operations

As the world's largest publicly held oil and gas company, ExxonMobil has a diverse and balanced portfolio of high-quality operations, projects and new opportunities across our Upstream, Downstream and Chemical businesses.

Upstream
 Ownstream
 Ohemical







Locations as of December 31, 2015. Map indicates major Upstream, Downstream and Chemical operating assets.

Alaska, United States



Powering the world's progress

At every link in the energy supply chain, ExxonMobil seeks to advance innovation and technology to deliver the energy the world needs — to support growth, opportunity and progress for all citizens. Powering the world's progress means expanding the benefits of modern energy while protecting the environment and addressing the impacts of greenhouse gas emissions and climate change. ExxonMobil's approach to powering the world's progress is founded on our core belief that a relentless pursuit of operational excellence, coupled with the power of science, technology and engineering in the hands of people with integrity, can solve even the most challenging problems.

ExxonMobil plays a key role in providing the energy needed for continued economic prosperity and human progress. The immense size of global energy needs can be difficult to conceptualize. Global energy demand in 2015 is estimated to be about 560 quadrillion British thermal units (BTUs), equivalent to about 12 billion gallons of gasoline daily, and this number is increasing. To put that number into perspective, the ExxonMobil-operated Hebron project in eastern Canada will produce approximately 700 million barrels of oil over the course of 30 years, enough to satisfy about three days of current global demand. For information on the global, economic, social and technological factors that determine the world's energy needs, see the discussion on our *Outlook for Energy* on the following page.

In addition to providing oil and gas resources, we strive to make significant contributions around the world through our capital and exploration expenditures and investments in research and development, as well as our community investments and local content development. In 2015, our capital and exploration expenditures, shareholder distributions, production, manufacturing and office expenses, and government taxes and duties totaled \$149 billion. For more in-depth analysis of our financial performance and investment decisions, see our 2015 Summary Annual Report and 2015 Financial and Operating Review.

ExxonMobil 2015 Summary Annual Report

ExxonMobil 2015 Financial and Operating Review

Global economic flows from ExxonMobil in 2015



ExxonMobil is a significant contributor to the global economy. In 2015, global economic flows from ExxonMobil totaled \$149 billion, with the highest contribution in government taxes and duties.

The Outlook for Energy

Energy matters to everyone, and we all play a role in shaping its future. Understanding the factors that drive the world's energy needs, and likely choices to meet those needs, is the mission of ExxonMobil's *Outlook for Energy*. By sharing the *Outlook* with the public, we hope to broaden that understanding among individuals, businesses and governments.

Every day, all over the world, energy makes modern life possible. We rely on it for food production, mobility, shelter, security, communication and modern health care. Energy also drives growth, opportunity and progress. The global population is projected to rise to 9 billion in 2040, while economic growth in China, India and other non-OECD⁴ countries will enable significantly more people to improve their living standards. We estimate that global energy demand will be 25 percent higher in 2040 than it was in 2014, led by a 45 percent increase in non-OECD countries.

Improved living standards will require meeting the world's energy needs while managing the environmental impacts of energy use, including climate change. Practical options to help meet the needs for reliable, affordable and cleaner energy continue to expand. We expect that as efficiencies improve and society shifts toward lower-carbon fuels, the amount of energy-related carbon dioxide (CO_2) emissions per dollar of global gross domestic product (GDP) will be cut in half by 2040.

We update our long-term energy outlook each year, taking into account the most up-to-date demographic, economic and technological information available. The following are some highlights from this year's *Outlook for Energy*:

- Energy is fundamental to standards of living As incomes rise, billions of people in developing nations will rise into the middle class; many will be able to afford amenities such as temperature-controlled homes, cars and appliances. In 2014, there were about 10 cars per 100 people in China. By 2040, this number is expected to rise to about 30 cars per 100 people.
- Developing nations will lead gains in GDP and living standards — We expect that China, India and many other developing nations will see strong growth in GDP and

Energy demand

Quadrillion BTUs



living standards to 2040. Per capita income in non-OECD nations is expected to rise by about 135 percent between 2014 and 2040; in OECD nations, it is expected to rise almost 60 percent.

- Economics and policies will impact the energy mix Increasingly, the mix of fuels that consumers use to meet their energy needs will be reshaped by economics, technology and government policies. In general, demand will shift toward cleaner fuels like natural gas, renewables and nuclear. The share of the world's electricity generated by coal will likely drop to about 30 percent in 2040, from more than 40 percent in 2014.
- Oil will remain the world's primary fuel We expect oil to continue to be the world's leading energy source, driven by demand for transportation fuels and by the chemical industry. One-third of the world's energy is expected to be provided by oil in 2040.

Global fuel demand in 2040 – projections

Quadrillion BTUs



- Natural gas grows more than any other energy source Demand for natural gas is growing rapidly, in part due to its abundance and ability to meet a wide variety of needs as the cleanest-burning major fuel. Around 40 percent of the growth in global energy demand from 2014 to 2040 is projected to be met by natural gas.
- Technology has the highest potential and the greatest uncertainty — Advances in technology have tremendous potential to help meet our energy and environmental goals, but the pace of change is difficult to predict. There is also significant emphasis on technological advances to improve energy efficiency. Global average fuel economy for lightduty vehicles is expected to improve by 80 percent from 2014 to 2040, reflecting advances in technology.

The Outlook for Energy: A View to 2040

⁴The Organization for Economic Cooperation and Development. Refer to the Organization for Economic Cooperation and Development website (*oecd.org*) for a listing of its members.

Sustainability

ExxonMobil is faced with the complex challenge of providing the energy needed to support economic growth and improved standards of living while balancing impacts on society and the environment. ExxonMobil views corporate citizenship as a key component of sustainable development. By designing our approach to corporate citizenship around six key areas, we contribute to society's broader sustainability objectives and manage the impact of our operations on local economies, societies, climate and the environment. These six areas of corporate citizenship — which include safety, health and the workplace; managing climate change risks; environmental performance; community and social impact; local development and supply chain management; and corporate governance – are discussed in detail throughout this report.

We are committed to aligning our long-term business objectives with these areas of corporate citizenship. As a global provider of energy, our primary objective is to responsibly meet the world's energy needs while increasing shareholder value. To help evaluate the success of our corporate citizenship initiatives and cultivate strong investor relations, we employ eight strategies that help quide and measure our commitment to good corporate citizenship and address society's diverse sustainability objectives. These strategies include:

- Integration
- Investment and cost discipline
 Risk management
- Operational excellence
- Portfolio management
- Project execution
- Technology leadership
- World-class workforce

Powering the world's progress depends on developing and retaining a world-class workforce. By pairing technical expertise and industry-leading research capabilities, ExxonMobil is able to identify and develop the high-quality oil and gas resources needed to help sustain economic development. We are also committed to developing innovative products and services that deliver superior performance for consumers and long-term value for shareholders.

We make strategic decisions on issues that directly affect the sustainability of our business. Our diligent investment and cost discipline approach allows us to execute deals with attractive valuations in a competitive industry environment. We work to deliver complex, integrated projects on time and on budget. Our goal is to maintain a diverse and balanced portfolio of high-quality resources, projects and assets across our businesses.

In every aspect of our business, we work to sustain safety, reliability and environmental stewardship of our operations through an unwavering commitment to operational excellence. We apply a systematic approach to identifying, evaluating and managing risks across our operations and relentlessly work to be the partner, neighbor, employer and supplier of choice around the world. For information on how our Operations Integrity Management System guides risk management throughout our operations, see page 15.





Engaging with stakeholders

As a global company, our business directly affects and is directly affected by many people, organizations and communities around the world. For a company of our size, building and maintaining relationships with a diverse group of stakeholders are both priorities and ongoing challenges. Energy issues are complex and our stakeholders represent multiple viewpoints. The discussions we undertake with our stakeholders help us understand a variety of perspectives. Regular stakeholder engagement helps us continue to improve our company and remain a responsible corporate citizen.

We interact with our stakeholders using a variety of mechanisms, including community meetings, Web and social media content, corporate publications, and one-on-one and group discussions, among others. We include examples of stakeholder engagement throughout this report. While ExxonMobil recognizes that our stakeholders may have a diverse set of interests, the following list demonstrates our different stakeholders and their typical areas of interest.

Employees

 Benefits; diversity; development opportunities; safety, health and wellness

Customers

 Product safety and sustainability; supply chain management; greenhouse gas emissions

Suppliers

• Expectations for suppliers; expanding local supply network; supplier diversity

Communities

 Community development; economic development; grievance management; human rights; operational impacts

Governments

• Taxes; local supplier development; job creation; impact assessments; ethics; education

Non-governmental organizations

• Biodiversity; water management; climate change; air quality; transparency

Shareholders

• Governance practices; board composition; policy engagement; sustainability

External Citizenship Advisory Panel

ExxonMobil has engaged an External Citizenship Advisory Panel (ECAP) since 2009 to provide an annual independent review of the company's corporate citizenship activities, including this report. ECAP members are experts in social and environmental topics and are leading academics, nongovernmental organization (NGO) representatives and former government employees. Each year, the ECAP reviews a draft of this report and provides feedback, which we evaluate and incorporate into the report as appropriate.

ECAP statement on 2015 Corporate Citizenship Report

To the readers of this report,

We are pleased to share our independent opinion on ExxonMobil's 2015 *Corporate Citizenship Report*. Over the course of our engagement period in 2015–2016, we participated in teleconference, email and in-person discussions with ExxonMobil's corporate citizenship team and subject matter experts. While the Panel's mandate includes engaging with the company on policy and strategy issues, this statement focuses on its transparency efforts through reporting.

We had an opportunity to review and provide feedback on a draft of the report, some of which was adopted. We hope that ExxonMobil will consider the remainder of our feedback to inform its future corporate citizenship reporting.

This letter is not an official endorsement of the report, the corporation or its policies, but rather our individual and collective views on the quality and progress made in ExxonMobil's citizenship practices and reporting. In recognition of substantial time spent during the engagement period, ExxonMobil provided a donation on behalf of the panelists to nonprofit organizations of our choice and reimbursed ECAP-related travel expenses.

2015 commentary

We appreciate the wide scope of reporting and the number of issues included in this report. In particular, we recognize the company's ongoing work to provide additional performance data to back up statements made in the report. The countryspecific case studies are effective in providing readers with relevant examples that demonstrate how ExxonMobil's policies and approaches are employed. While we believe that the report's scope is extensive with many interesting and appropriate stories, there are several areas where we have recommendations for the company's future reporting efforts.

Climate change

In his introductory statement, Chairman Tillerson mentions that "managing the risks of climate change is an important responsibility for our business and society at large." However, as a whole, the report needs greater clarity regarding the breadth and effectiveness of the company's steps to address those risks.

With regard to the topics of climate-related research, the development of innovative technologies, and improving energy efficiency in its own operations, ExxonMobil describes considerable progress. However, the largest contribution to greenhouse gas emissions comes not from ExxonMobil's internal operations, but from the use of its products. If society is to take significant actions to reduce the risks of climate change, which ExxonMobil states as an important responsibility, it must adopt appropriate public policies that reduce greenhouse gas emissions from fossil fuels. Future reports would benefit from more specificity about the company's support for a carbon tax, as well as its engagement on other policy issues in the United States and internationally.

Additionally, we would encourage the company to discuss more fully its continued focus primarily on oil and gas, relative to plans for moving toward lower-carbon sources of energy. Many of the world's leading companies — including some in the oil and gas sector — are publicly announcing science-based goals to transition their businesses toward a low-carbon economy. As investors and stakeholders increasingly call for disclosure of corporate strategic goals, we believe ExxonMobil would benefit from becoming a leader in this regard.

The generation of methane emissions is another issue where we believe the company could describe its efforts more broadly. The Up Close example on page 37 provides insight into XTO Energy's efforts to reduce methane emissions at its hydraulic fracturing sites throughout the United States. We would welcome a broader description of ExxonMobil's efforts to reduce these emissions. First, what are the company's efforts to reduce methane emissions in its other operations worldwide? Second, we would welcome learning of the company's stance on various public policy options to reduce these emissions, including whether there are any U.S. federal or state regulations that it supports or is actively advocating.

Human rights and social reporting

While we understand that social reporting lags behind environmental, safety and economic reporting across all sectors, we believe ExxonMobil could discuss its approach to respecting human rights across its operations and in its supply chain in greater depth and with more specificity. For example, we would like to see ExxonMobil describe its approach to upholding the *Voluntary Principles on Security* and Human Rights in the report. We commend the company for assuming a leadership position on the steering committee of the *Voluntary Principles* in 2015. As we recommended last year, we would like the report to reflect greater rigor in presenting its approach and the outcomes of its efforts to respect security and human rights, especially using metrics to evaluate its performance vis-à-vis other companies.

We appreciate the reporting on outcomes of ExxonMobil's community investment initiatives, particularly the malaria examples described on pages 69–70, and the company's support for women's economic empowerment. In future reports, we would like the company to provide insight on how the grievance mechanisms at its various projects are used in practice.

Role of suppliers, contractors and other partners

We commend the ongoing work that the company is undertaking to better understand and influence the environmental, social and human rights performance of the companies with which it does business. We recognize there are thousands of such companies as well as other partners that are working with ExxonMobil, but feel that the company could further describe how it is working proactively with these entities to improve their sustainability performance, both individually and collectively.

Comparison and benchmarks

ExxonMobil provides useful industry benchmarking data for its annual safety performance data. However, outside of this topic,

ExxonMobil does not give the readers of this report adequate context to determine the company's performance relative to others in the industry. We would recommend that ExxonMobil consider including industry benchmark information around its other material issues. In addition, we would recommend ExxonMobil further enhance its descriptions on performance and progress made compared with prior years.

Conclusion

We are grateful for the opportunity to provide our collective feedback on ExxonMobil's transparency and disclosure efforts directly in this report. We are encouraged to see that the company's reporting continues to evolve and improve each year, and we look forward to sustained engagement to identify and discuss other opportunities for continual improvement.

Sincerely,

Mark Cohen Sarah Labowitz Frank Loy Jane Nelson Salil Tripathi

April 11, 2016



Mark Cohen Professor of Management and Law Vanderbilt University Owen Graduate School of Management



Frank Loy Former Under Secretary of State for Global Affairs U.S. Department of State



Salil Tripathi Senior adviser, global issues Institute for Human Rights and Business



Sarah Labowitz Co-director of Center for Business and Human Rights New York University Stern School of Business



Jane Nelson Director of Corporate Responsibility Initiative Harvard University Kennedy School of Government

ExxonMobil's key sustainability issues and challenges

Our stakeholders are increasingly interested in how we are incorporating sustainability and addressing challenges in our everyday operations. Suzanne McCarron, ExxonMobil vice president of public and government affairs, answers some of these questions from stakeholders in the discussion below.

With low oil prices and concerns about stranded assets, does ExxonMobil have any plans to diversify its energy mix?

We believe prices over the long term will continue to be driven by market supply and demand, with the demand side largely being a function of global economic growth. On the supply side, prices may be significantly impacted by political events, the actions of OPEC and other large government resource owners, and other factors. To manage the risks associated with price, ExxonMobil evaluates annual plans and all investments across a wide range of price scenarios. Our assessment is that operations will exhibit strong performance over the long term. This is the outcome of disciplined investment, cost management, asset enhancement programs and application of advanced technologies.

Our analysis confirms our long-standing view that all energy sources are necessary to meet rising global energy demand and to support improving living standards worldwide. All of ExxonMobil's current hydrocarbon reserves will be needed, along with substantial future industry investments, to address global energy needs. ExxonMobil's *Outlook for Energy* and all credible forecasts, including that of the International Energy Agency, predict that carbon-based fuels will continue to meet about three-quarters of global energy needs through 2040.

We also have a team within the company — the ExxonMobil Emerging Technologies team — that studies every aspect of the energy business, from oil and natural gas to alternatives. It looks into areas outside our company's current business focus. If a technology could have a material effect on the future of energy, the Emerging Technologies team works to understand and evaluate it. We work hard to keep our research aperture wide.



Suzanne McCarron has worldwide responsibility for the company's public policy, government relations, communications, media relations and corporate citizenship activities. Suzanne authors our *Perspectives* blog, laying out some of the energy challenges we face and encouraging active discourse about their solutions.

What are ExxonMobil's views of the climate agreement reached at the COP 21 climate conference in Paris?

The recently concluded talks reflected the complexities of enacting thoughtful policies that address climate risks in a meaningful way while also ensuring accessible and affordable energy supplies for societies throughout the world.

As policymakers develop mechanisms to meet the goals set in Paris, ExxonMobil encourages them to focus on reducing the greatest amount of emissions at the lowest cost to society. At the same time, we urge them to recognize important shared humanitarian needs, including providing reliable and affordable energy to improve living standards.

As a global issue, climate change requires global solutions. Both developed and developing countries must now work together in crafting policies aimed at mitigating greenhouse gas emissions, while recognizing differing national priorities.

What is ExxonMobil doing to address the risks of climate change?

We believe the risks of climate change are real and warrant thoughtful action. Climate change is a global issue that requires the collaboration of governments, companies, consumers and other stakeholders to create global solutions. ExxonMobil continues to support and contribute to efforts to reduce greenhouse gas emissions.

For more than three decades, we have continuously funded and participated in research to improve understanding of climate science, often in conjunction with government bodies and leading research universities. This has resulted in hundreds of publicly available documents on climate-related topics, including more than 50 peer-reviewed publications. We promote discussion on issues of direct relevance to the company and contribute to a wide range of academic and policy organizations that research and promote dialogue on significant domestic and foreign policy issues.

We value scientists and research, and we collaborate with the world's smartest minds in partnership with more than 80 universities around the world. With more than 2,200 Ph.D. scientists and engineers and more than 5,000 employees at our research and technology divisions around the world, we work day in and day out to explore the new energy solutions of the future. We spend about \$1 billion annually on energy research, a total that includes commitments to biofuels, carbon capture and sequestration, bio-products, non-hydrocarbon energy supply, power generation, transportation, energy efficiency and climate science. Since 2000, we have spent nearly \$7 billion on technology to reduce greenhouse gas emissions, including on energy efficiency, cogeneration, flare reduction, carbon capture and sequestration, and research on lower-emission energy solutions. This includes investments of more than \$3.8 billion since 2000 to address energy efficiency and flare mitigation at our Upstream facilities around the world. Additionally, since 2001, more than \$2 billion has been invested in our Upstream and Downstream cogeneration facilities to more efficiently produce electricity and reduce greenhouse gas emissions at our manufacturing sites.

We are proud of the progress we've made, and we recognize the importance of continuing our research and development to help further expand the understanding of climate science. Our efforts have enabled us to take meaningful action to mitigate the risks of climate change, and we will continue to build on this foundation as we work with governments and stakeholders to further address the issue.

Increasingly, a number of oil and gas companies are terminating their exploration activities in the Arctic. Does ExxonMobil still believe Arctic development is financially and environmentally viable?

The Arctic represents the world's largest remaining region of undiscovered conventional oil and gas resources. While developing these resources presents a variety of challenges, ExxonMobil has a strong portfolio of assets and opportunities in a range of Arctic environments. The company has operated in the region for nearly a century. We began by gaining a scientific understanding of the environment. Design and operational plans in Arctic locales, similar to everywhere we operate, are founded on our commitment to operating in an environmentally responsible and sustainable way. For example, our extended-reach drilling technologies have allowed for field development from land by drilling horizontally under the sea. This approach reduces the number of offshore structures required to recover oil and gas resources by drilling multiple, long-reach wells from the same location, which helps to reduce both underwater noise and our environmental footprint. We also use special earthquake- and frost-resistant pipelines in some northern areas.

ExxonMobil developed the industry's only dedicated, in-house Arctic research program more than 40 years ago. Continued Arctic technology development has allowed us to design, build and operate gravity-based platforms capable of withstanding 6-million-ton icebergs in the North Atlantic and operating year-round in ice-covered waters offshore Sakhalin Island in Russia.

Additionally, we piloted and enhanced technologies in 2015 to monitor local wildlife and improve our environmental performance on Alaska's North Slope. State-of-the-art technologies, including satellite-based remote sensing technology, ground surveillance radar and unmanned aerial systems, help us to monitor local wildlife near our operations and reduce our environmental impact. For more information about our technological innovations in Arctic wildlife protection, see the case study on page 56.

How does ExxonMobil manage the risks associated with operating in water-stressed areas?

We have a systematic process for assessing and managing the risks of our operations wherever we operate, and this includes, for example, how we manage water. This process includes a reassessment over the life of the project to identify changes in operations or environmental conditions. Our operations use alternative water sources, where appropriate, and seek opportunities to reduce, reuse and recycle water. We consider multiple factors in determining the right approach for a given process or site, including costs, varied operational efficiencies, increased energy use or the consequences of producing more concentrated waste streams. Together, these factors help us determine site-specific approaches, which vary from site to site due to local conditions and availability. What impact has the company experienced since expanding its equal employment protections to include sexual orientation and gender identity in early 2015?

ExxonMobil's global policies have always prohibited all forms of discrimination in any company workplace, anywhere in the world. In the United States, ExxonMobil's equal employment opportunity and harassment in the workplace policies were updated last year to explicitly include sexual orientation and gender identity, which is consistent with ExxonMobil's longstanding practice of listing enumerated protected classes as defined by federal law.

ExxonMobil supports a work environment that values diversity and inclusion, and has numerous inclusive programs and policies that help make ExxonMobil a great place to work. These include support for employee networks that foster a work environment committed to diversity and inclusion, such as People for Respect, Inclusion and Diversity of Employees (PRIDE), which supports lesbian, gay, bisexual and transgender employees.

Following the incident at the Torrance refinery, what measures has the company taken to address the potential for similar safety incidents at its other refineries?

We deeply regret the incident. Thankfully, no one was seriously hurt. ExxonMobil takes all incidents seriously and is committed to learning from them and taking steps to prevent a recurrence. In addition to cooperating with all agencies investigating the incident, we have conducted our own, separate internal investigation led by a team of subject matter experts from across the corporation. The team spent several months on site interviewing witnesses, reviewing documents, inspecting equipment and preparing a comprehensive report that identified the direct cause of the incident, and made recommendations to prevent a recurrence. We are implementing the recommended changes in operating procedures, monitoring equipment and training at ExxonMobil refineries, and will share what we've learned with the refining industry.

There have been a number of pipeline releases over the past several years; what is ExxonMobil doing to ensure the integrity of its pipelines?

Pipeline transport is recognized as the safest means for moving oil and petroleum products. The immense system in the United States is a critical part of the country's energy infrastructure, moving vital products from locations where they're produced to the markets where they're consumed to fuel cars, heat our homes and power our economy.

That said, we are committed to improving pipeline safety and carefully maintaining and monitoring our infrastructure. We have implemented enhanced surveying techniques and state-of-the-art inspection technologies and analyses of our pipelines. These surveys and inspection findings are helping us identify areas where we can strengthen our pipeline integrity.

What is ExxonMobil doing to improve community relations in areas where it is conducting hydraulic fracturing operations?

We believe an open dialogue is vital to our long-term success. Unconventional development is still relatively new in many areas where we operate, and we meet with local leaders and community members to find out what is important to the community and to listen to their questions and concerns. Naturally, people living near our operations are concerned that our work could disrupt their way of life. We strive to address their concerns, and we take actions to limit potential impacts, such as altering our traffic routes to avoid disrupting school bus traffic. We also provide site tours to community members so they can observe and ask questions about drilling, hydraulic fracturing and processing.

No two communities are the same, and we have undertaken several approaches across the United States to establish a two-way dialogue with our stakeholders. These approaches include weekly community notices, community advisory panels, land conservation projects and town hall meetings. Our goal is more than just getting our work done — we want to be a good neighbor and productive member of the community, both before we begin work and throughout the life cycle of our projects. Do you find your approach to risk management to be effective in helping employees identify and address relevant safety, security, health and environmental risks and issues?

ExxonMobil remains steadfast in its commitment to excellence in safety, security, health and environmental performance and operations integrity. Many of our operations and products represent potential risks to people and to the environment. Recognizing and managing these risks is inherent in our business, and we believe the best way to meet our commitment is through a capable, committed workforce, and practices designed to enable safe, secure and environmentally responsible operations. We accomplish this through clearly defined policies and practices and with rigorously applied management systems designed to deliver results. The Operations Integrity Management System, or OIMS, is a cornerstone of our commitment to managing risks and achieving excellence in performance. More than just a set of guidelines, OIMS is part of ExxonMobil's corporate culture and the way we run our business.

ExxonMobil Perspectives blog

Case Study

ExxonMobil's Operations Integrity Management System

Clive Smith, who worked at our Fawley refinery in the United Kingdom for more than 25 years, ensures the integrity of our equipment. ExxonMobil's OIMS framework establishes common expectations for addressing the safety, security, health and environment risks inherent in our business.

ExxonMobil remains steadfast in our commitment to excellence in safety, security, health and environmental (SSH&E) performance, referred to collectively as operations integrity. Operations integrity extends to all aspects of our business that can impact SSH&E performance. We believe the best way to manage the integrity of our business is through a capable, committed workforce coupled with policies, practices and management systems designed to enable safe, secure and environmentally responsible operations.

The Operations Integrity Management System

The Operations Integrity Management System (OIMS) is the cornerstone of our commitment to managing SSH&E risk and achieving operational excellence.
Since the inception of OIMS in the early 1990s, we have significantly reduced our lost-time incident rates, demonstrated a remarkable decline in marine spills and contributed to continuing emission reductions.

OIMS establishes a common framework for addressing SSH&E risk across all aspects of our operations, including our supply chain. At the global corporate level, the OIMS framework is built around 11 elements, as illustrated below, each covering a key aspect of risk across the breadth of ExxonMobil's operations. Each element is comprised of a number of expectations, 65 in all, that provide greater detail.

OIMS element 1 — management leadership, commitment and accountability — outlines the expectations of managers as they lead their organization through OIMS. OIMS element 11, operations integrity assessment and improvement, describes the requirements associated with how each operating unit evaluates the extent to which it is meeting the expectations of OIMS. These two elements are often referred to as the "bookends" of OIMS, with element 1 being the "driver" and element 11 providing the feedback mechanism to ensure continuous improvement. Elements 2 through 10 address the operational, day-to-day aspects of OIMS, such as risk management, facilities design and construction, and personnel and training.

All operating organizations are required to conform to the expectations described in OIMS. In order for the 11 elements and 65 expectations to be consistent and relevant across ExxonMobil's diverse operational portfolio, our Upstream, Downstream and Chemical businesses have established detailed OIMS guidelines. These guidelines describe how each business unit addresses the 65 corporate expectations relevant to that business unit's operations. Additionally, management is responsible for ensuring that management systems satisfying the framework are in place at each operating unit.

OIMS includes a systematic, disciplined approach to measure progress and track accountability across business lines, facilities and projects. To drive continuous improvement, we evaluate opportunities to improve the OIMS framework by periodically reviewing and upgrading it.

External standards and OIMS

OIMS addresses the management of SSH&E risks at our operations worldwide. OIMS conforms to recognized safety, security, health and environmental standards, such as the International Organization for Standardization (ISO), the Occupational Health and Safety Assessment Series for occupational health and safety management systems (OHSAS) and the American Chemistry Council (ACC) Responsible Care® requirements.

In 2013, Lloyd's Register Quality Assurance Inc. (LRQA) reviewed our ongoing performance and attested that OIMS is consistent with the intent and meets the requirements of the environmental management system ISO 14001:2004 and the occupational health and safety management system

The OIMS framework

OHSAS 18001:2007. This attestation is valid for three years, and our next attestation is scheduled to take place in 2016.

Responsible Care® is the chemical industry's comprehensive health, safety, security and environmental performance improvement initiative. Lloyd's Register Quality Assurance Inc. also certifies OIMS conformance to Responsible Care Management System® Technical Specification RC101.04 per ACC's requirements. Systems within OIMS are linked to the relevant Responsible Care Management System® expectations. This approach allows ExxonMobil to run its business through one SSH&E management system, OIMS, and align with local and global standards.



The Operations Integrity Management System framework is built around 11 elements, each covering a key aspect of risk across ExxonMobil's global operations.

ExxonMobil's culture of risk management

Application of OIMS is required across all of ExxonMobil's operations, with particular emphasis on design, construction and operations. Regardless of job function, all ExxonMobil employees and third-party contractors have the responsibility and expectation to identify, assess and mitigate the risks associated with their activities and ExxonMobil operations.

"OIMS is the way we do business. It ensures that we manage SSH&E risks in a consistent and reliable manner to achieve operational excellence. OIMS is embedded in our culture and has resulted in behaviors that reflect our core values."



Paul Schuberth Upstream safety, security, health and environment manager

OIMS enables ExxonMobil — a large organization that operates across diverse cultures and geographies — to speak the same language when it comes to safety and risk management. The OIMS framework is embedded in ExxonMobil's company culture. In 2013, as part of our commitment to continual improvement, we introduced a new training experience called the OIMS Leadership Academy. The training is aimed at enhancing the OIMS leadership skills of supervisors and managers, who then lead and run the business with more effective utilization of OIMS, thus improving SSH&E performance and minimizing incidents. In total, we have trained more than 1,000 supervisors in 36 courses.

OIMS and corporate citizenship

Our approach to corporate citizenship is intended to contribute to society's broader sustainability objectives. We believe OIMS plays a key role in ExxonMobil's corporate citizenship efforts by communicating expectations to employees, measuring progress and helping ensure results adhere to our SSH&E commitments. For example, OIMS element 6 requires the leadership teams running our facilities to anticipate and meet all applicable laws, regulations, permits and other governmental requirements and ensure the resulting operating requirements are documented and communicated to those affected. We periodically verify compliance of our operations with these obligations.

We recognize that the impact of our operations extends beyond our work sites, and therefore element 10 of OIMS addresses community awareness and emergency preparedness. Effective management of stakeholder relationships is important to enhance the trust and confidence of the communities where we operate. Emergency planning and preparedness are essential to ensure that, in the event of an incident, all necessary actions are taken for the protection of the public, our personnel, the environment and our assets.

For example, continued application of OIMS principles in our drilling operations helps us achieve our vision of *Nobody Gets Hurt*. In 2005, our drilling operations developed the hurt-free approach to personnel safety. The hurt-free approach was developed as an alternative to traditional treatment-based programs to align with the vision of *Nobody Gets Hurt*. It provides a framework that enables a culture of caring while also allowing for insightful trends analysis through consistent assessment of actual incident severity and potential consequence. In response to its success in our drilling operations, we rolled out the approach to the Upstream business in 2012 and are now implementing it company-wide.

We hold internal and external workshops and collaborative meetings to promote the hurt-free approach across the corporation and across our industry. We have been able to demonstrate that drilling operations can be performed all over the world in a safe and environmentally sound manner, whether in an Arctic environment or other high-risk environments with appropriate application of risk management principles and programs. We will not sacrifice the safety of our employees or our contractors in order to deliver on our commitments to business partners and shareholders.



Kristen Kuhn standing aboard the *Maersk Viking* drill ship in the Julia field, Gulf of Mexico.

Safety, health and the workplace

Jessica Berkey, a worker at our Joliet Refinery in Illinois, United States. The Joliet Refinery employs more than 600 people and is a leader in energy efficiency among U.S. refineries. No matter where in the world we work, we are relentless in our pursuit of Nobody Gets Hurt.



At ExxonMobil, our efforts to protect the safety and health of our employees, contractors and communities are fundamental to our long-term business success. As such, we are committed to providing the energy needed to power the world's progress safely and responsibly. We seek to promote a culture of safety and health by attracting, developing and retaining individuals who share our core values and our commitment to integrity and operational excellence.

Safety

At ExxonMobil, safety is more than just a priority — it is a core value and an integral part of our culture that applies to every aspect of our operations. Wherever we are in the world, we are committed to doing the right thing, the right way, every time so that every employee and contractor comes home from work safe and healthy each day. We will never stop working toward our goal of *Nobody Gets Hurt*.

"We all have a responsibility to manage risk as part of our roles, be that technical, operational or financial. Identifying, assessing and managing the risks is key to our operations integrity. I am proud to see the leadership and commitment toward safety everywhere I go, embedded in our corporate culture around the world. We are truly relentless as we work toward our goal of Nobody Gets Hurt."



Lynne Lachenmyer

Safety, security, health and environment vice president

ExxonMobil's Operations Integrity Management System (OIMS) drives the sustainability of our disciplined approach to safety. OIMS is embedded in our everyday work and serves as the foundation for managing our risks. For more information about OIMS, see page 15. As a result of our disciplined approach, we continue to reduce incidents and work toward our goal of *Nobody Gets Hurt*. However, when an accident or near miss does occur, we investigate the incident and all potential outcomes and evaluate barriers to preventing future occurrences. As part of our commitment to continuous improvement, we look at leading indicators that allow for a closer analysis of incidents with potentially severe consequences in order to enhance our risk prevention and mitigation. We then share incidents through our global networks to ensure lessons learned are implemented across our worldwide operations.

Personnel safety

Regardless of job function, all ExxonMobil employees and third-party contractors have the responsibility and expectation to identify, assess and mitigate the risks associated with our operations. Over the past 10 years, we have reduced our workforce lost-time incident rate by more than 30 percent. We will continue to work toward our goal of *Nobody Gets Hurt*.

We deeply regret that two of our contractors were fatally injured in two separate incidents related to ExxonMobil operations in 2015. The incidents were related to work at one

Lost-time incident rate¹



In 2015, our workforce lost-time incident rate per 200,000 work hours was 0.034, slightly higher than the previous year. Over the past decade, we have reduced this rate by more than 30 percent. When compared with the American Petroleum Institute U.S. petroleum industry workforce benchmark, ExxonMobil continues to be below the industry average.

¹Workforce includes employees and contractors. Incidents include both injuries and illnesses. Depending on the reporting year, around 5 to 10 percent of the incidents are illness-related. of our fueling stations and installation of electrical hardware at one of our major projects. We thoroughly investigated these incidents to determine contributing factors, then identified steps to prevent similar incidents and enhanced our work practices and facilities accordingly. We have processes in place to look at all incidents, even those that did not result in injuries, to understand the potential consequences. By applying this process, we seek to learn from any incident. We will relentlessly pursue this goal until we achieve our stated vision of *Nobody Gets Hurt*.

As part of our operations-wide dedication to safety, we strive for effective collaboration between all workers, including third-party suppliers and contractors. Every day, our contractors take part in safety training and safety meetings alongside our employees. A key element in our strategy for contractors is the enhancement of leadership

Total recordable incident rate²

Incidents per 200,000 work hours



In 2015, ExxonMobil's total recordable workforce incident rate per 200,000 work hours was 0.24, a slight decrease from 2014. Over the past decade, we have reduced this rate by more than 30 percent. When compared with the American Petroleum Institute U.S. petroleum industry workforce benchmark, ExxonMobil continues to be below the industry average.

²Workforce includes employees and contractors. Incidents include both injuries and illnesses. Depending on the reporting year, around 5 to 10 percent of the incidents are illness-related.

practices and safety management systems. Since 2000, we have conducted ongoing safety leadership forums with the contractors working on our major projects, with the focus on establishing a partnership between ExxonMobil and our contractors that leads to an injury-free workplace.

For example, within our portfolio of Arctic projects, the Sakhalin-1 project held its 12th annual contractor safety forum on Sakhalin Island for about 200 people. Local authorities, contractors and Exxon Neftegas Limited managers emphasized the importance of making a difference with our core safety, security, health and environmental (SSH&E) values including *Nobody Gets Hurt* and *Protect Tomorrow. Today.* The forum covered topics including eliminating high consequence incidents, health awareness, environmental protection and community contributions. For more information about *Protect Tomorrow. Today.*, see page 46.

Our affiliate, Esso Angola, achieved its best safety performance during significantly expanded activity in production, drilling and project execution, including the completion of Phase 2 of the Kizomba Satellites project. This notable safety performance was a result of the continuous hard work of affiliate personnel as well as strong engagement in safety programs, such as "boots on the ground," a program designed to increase supervisor and employee engagement at the workplace. By increasing this interaction, supervisors can better mentor newly hired staff around our desired safety culture, one in which our employees care for each other.

Up Close: Safety milestones and awards

We are proud of our culture of safety, and we strive to be a global safety leader. One of the most significant measures for ExxonMobil as a company is our safety performance. In 2015, ExxonMobil and our affiliates around the world achieved the following safety milestones and awards:

- The Odoptu Stage 2 project on the northeastern coast of Sakhalin Island, Russia, safely completed 3.8 million hours of work at the Odoptu site in 2015, and a total of 7.7 million hours since project site work began in late 2012, without a recordable or lost-time injury. The strong safety performance is the result of engaged leadership and a team-wide commitment to embracing the core values in safety, security, health and environment.
- In June 2015, ExxonMobil's Rotterdam refinery in the Netherlands received a VOMI Safety eXperience Award.
 VOMI is a trade organization in the Netherlands for companies in the process industry. The VOMI Safety eXperience Award is a new initiative aimed to increase the level of safety awareness perceived by people working "on the shop floor." Through this award, VOMI gives a voice to an especially important group of people for whom this level of safety is critical.

- ExxonMobil's venture office in Rio De Janeiro, Brazil, passed a safety milestone in 2015, achieving more than 1 million hours of safe work. This achievement represents an accumulation of 18 years of team effort and safety focus.
- In 2015, the Malaysian Society for Occupational Safety and Health honored our Kuala Lumpur business support center (KLBSC) with the 2014 Occupational Safety and Health Gold Class I Award, the highest award given in the sector. The award recognizes our exceptional safety and health management and performance in various areas.

"We could not have achieved this honor without strong support from the other functions in Malaysia such as facilities and SSH&E, as well as the management team. The prestigious award highlights the strong commitment toward safety by KLBSC employees and is a testament to ExxonMobil's commitment to strong safety programs."



Chin Chien Hoong Site lead, KLBSC



"Achieving success has a lot to do with effective collaboration and a team approach with all involved, including our contractors, co-ventures and the government of Angola."



Edson Dos Santos Kizomba C operations superintendent



Workers commemorate safety performance at our Odoptu site on Sakhalin Island in 2015.

In 2015, we continued to look for ways to prevent highpotential incidents in our operations. For example, we are exploring technologies that detect a worker's presence in the blind spots of heavy construction equipment to avoid accidents. We have taken our experience and shared it in construction industry forums to advance these technologies by encouraging use beyond the oil and gas industry.

Process safety

Our commitment to process safety — the equipment, procedures and training that prevent the uncontrolled release of hydrocarbons and hazardous substances — is a core value that shapes risk management across our operations. We seek to ensure our facilities are well-designed and safely operated to prevent potential safety incidents. To that end, we use a comprehensive and disciplined approach to identify, eliminate or manage process safety risks associated with our operations, which employs layers of preventive and mitigative barriers, including equipment, processes and people, as illustrated in the graphic on the right.

Process safety incident triangle



As part of the American Petroleum Institute Recommended Practice 754 and the International Association of Oil & Gas Producers No. 456 industry standards, the process safety incident triangle is used to represent events from Tier 1 through Tier 4.

Eliminate serious incidents

At ExxonMobil, we look to ensure effective barriers are intact.

Know the major hazards Major asset-specific hazards are known.

Understand the barriers

Barriers are defined and individual responsibilities are assigned to protect from and mitigate risks.

Maintain barrier health

Barrier effectiveness is assessed and regularly discussed.



"When managing process safety, we focus on both facility risks and human performance risks. It takes relentless leadership throughout the organization with mechanisms to ensure accountability at all levels and verification that these risks are managed effectively 24 hours a day, 7 days a week, 365 days a year."



Bob Bailes Downstream and Chemical safety, security, health and

We subscribe to the American Petroleum Institute (API) Recommended Practice 754 and the International Association of Oil & Gas Producers No. 456, which are industry standards. These standards define process safety indicators and use a process safety incident triangle to represent events from Tier 1 through Tier 4, as seen on the left. Tiers 1 and 2 include incidents resulting in a loss of primary containment (LOPC). According to the API, LOPC is defined as an unplanned or uncontrolled release of any material from primary containment, including nontoxic and nonflammable materials. Tiers 3 and 4 represent near-misses and leading performance measures such as on-time maintenance performance. In 2015, we had 74 Tier 1 process safety events, which is slightly higher than 2014. Tier 1 process safety events are tracked and analyzed in our overall efforts to prevent significant events. In 2015, events occurred in various phases of our operations and include equipment malfunction and person or equipment interface. Event analysis is used to enhance our prevention efforts and organizational learning.

Our focus on process safety remains high, with a continued emphasis on ensuring that preventive and mitigative barriers are in place. We recognize that a significant process safety event at any site affects everyone in the industry by eroding stakeholder trust. When such incidents do occur, we are committed to learning from them and taking steps to prevent a recurrence. We deeply regret the incident that occurred on February 18, 2015, at the Torrance refinery and are thankful there were no serious injuries or community health impacts. We are working with regulators to thoroughly investigate the incident, and we are applying the lessons learned by enhancing operating procedures, monitoring equipment and training at ExxonMobil refineries. We will share our findings with the refining industry to help prevent future occurrences.

Collaborating with our peers and industry associations on process safety is paramount to sharing lessons learned within our company and across our industry. ExxonMobil serves as a contributing member to a variety of groups and initiatives focused on improving safety in the industry. For example, we actively engage in the Advancing Process Safety initiative, a collaborative effort between the American Fuel and Petrochemical Manufacturers and the API, representing nearly all of the U.S. refining capacity. This initiative is focused on improving process safety performance across the industry by sharing experiences and knowledge about process safety events, hazard identification metrics and industry-proven practices.

Product safety and responsibility

We recognize the importance of managing and communicating product safety information to those who handle and use ExxonMobil products, including employees and contractors within our operations as well as with our customers, consumers, governments and regulators. To promote product stewardship, we carefully assess the safety, health and environmental aspects of our products, as well as compliance with product safety legislation for all intended markets.

ExxonMobil's approach to product safety is defined by the product safety policy, found within ExxonMobil's *Standards* of *Business Conduct*. Each ExxonMobil business unit has developed management systems that address the key elements in our product safety policy. These management systems are reviewed on a routine basis to ensure compliance with the policy. Additionally, components of the management systems are in line with product safety guidelines developed by IPIECA, the global oil and gas industry association for environmental and social issues, and the International Council of Chemical Associations.

A key component of these systems is the communication of the potential hazards and risks from the use of our products. Our rigorous *Product Stewardship Information Management System* applies common global processes and computer systems to capture and communicate information on the safe handling, transport, use and disposal of our products, as well as emergency contact information. This system enables ExxonMobil businesses to comply with changing regional and national hazard communication regulations with the adoption of the Globally Harmonized System of Classification and Labelling Chemicals developed by the United Nations. In the past year, more than 27,000 safety data sheets for ExxonMobil products and manufacturing streams have been authored and distributed as part of the implementation of this guidance by several national and regional regulatory authorities, including:

- Argentina
 New Caledonia
- Brazil
 Singapore
- Israel
- Korea
 United States

Turkey

Malaysia

In 2015, the Association of International Chemical Manufacturers (AICM) awarded ExxonMobil China the Chairman's Award in Responsible Care for exemplary achievement in safety, health and environmental performance. This is the second time that our operations in China have been recognized by AICM for its safe chemical product management and handling.

Over the past several years, the industry has seen a significant increase in the utilization of rail transport for crude oil, primarily due to new unconventional production sources. In the North American market, ExxonMobil manages one of the largest shipper rail fleets in our industry to move our crude oil, plastics, chemicals, lubricants and fuels products to customers. We believe safe transport by rail is a shared responsibility, covering rail maintenance, train operations, rail car integrity and emergency response. We have comprehensive risk management plans in place to help ensure rail transportation of all products is conducted in a safe manner. These plans address rail car design as well as loading and unloading procedures. Additionally, we regularly engage with our industry peers and emergency responders to promote the safe transport of oil products and develop improved training programs for public responders across North America.

Emergency preparedness and response

The ability to respond to emergencies promptly is critical, and we conduct extensive training and drills to prepare for such situations. At ExxonMobil, we believe effective emergency preparedness requires competent response teams. To that end, we establish strategic emergency support groups (ESGs) around the world to develop and practice emergency response strategies and assist field responders. We routinely train ESG members, a wide variety of ExxonMobil employees, on a range of possible scenarios, including simulated spills, fires, explosions, natural disasters and security incidents. In 2015, 550 employees participated in 35 ESG training sessions.

ExxonMobil takes a disciplined and structured "command and control" approach to emergency preparedness that is based on clear communication. Regardless of the size of an event, each ExxonMobil facility and business unit has access to a wide array of trained responders, including our regional response teams (RRTs), which provide rapid tactical support when needed. Our three RRTs — North America; Europe, Africa and Middle East; and Asia Pacific — address tactical issues associated with the field response. The RRTs comprise approximately 500 ExxonMobil personnel trained in one consistent management system with common roles and responsibilities. In total, the RRTs completed four training exercises in 2015, with approximately 400 ExxonMobil participants.

In May 2015, the North America RRT held a two-day exercise in Seattle, Washington, for ExxonMobil affiliate SeaRiver Maritime. As part of the exercise, participants responded to a simulated release of 80,000 barrels of oil from a marine vessel. One key objective of the exercise included educating participants on the value and use of a net environmental benefit analysis



Workers deploy a containment boom as part of an emergency response training exercise in Australia.

Up Close: Expanding emergency preparedness and response capabilities

ExxonMobil is committed to improving our emergency preparedness by enhancing our response programs, processes and training offerings. In 2015, the emergency preparedness and response center of excellence supported ExxonMobil Upstream affiliates in implementing a global incident command system (ICS). By implementing this system globally, ExxonMobil can utilize common response processes that allow personnel from different affiliates to easily assist one another if needed. The ExxonMobil RRTs also use ICS, which allows them to seamlessly integrate into affiliate teams. Our use of ICS is aligned with the National Incident Management System and allows us to respond in a seamless fashion with federal, state, local and tribal responders in the United States and abroad.

In addition to ICS, we are rolling out a common operating picture (COP). COP is a computing platform based on geographic information system (GIS) technology that provides a single source of data and information to improve situational awareness and accelerates decision-making for emergency response or project planning activities. The GIS data and information can be from ExxonMobil sources as well as publicly available information to depict "big picture" images of places and situations. Both ICS and COP have been successfully implemented in the United States, with an emphasis on the Gulf of Mexico, as well as piloted internationally during Upstream exercises in Australia, Indonesia and Russia. We have also rolled out ICS to our operations in Angola, Canada, Equatorial Guinea, Malaysia and Norway.

to mitigate impacts from a crude oil release. Additionally, in October 2015, ExxonMobil executed an oil spill response deployment exercise at our Baytown complex in Texas. The exercise was intended to meet regulatory requirements as well as demonstrate our North America RRT's response readiness abilities. In total, more than 120 personnel were involved in the training event, including volunteers from our refining and supply, midstream, chemical and production operations.

"The quality of the exercise and high degree of professionalism by all involved is a clear demonstration of ExxonMobil's commitment to emergency preparedness and response. I was also very encouraged to see such a strong partnership with the regulatory agencies that participated."



Lisa VanderLaan Safety, security, health and environment support manager

We continually look for innovative ways to provide emergency preparedness and response training in a safe and controlled environment. For example, we are exploring the use of immersive 3-D simulator technology for conducting emergency response training for plant operators. This technology uses ultra-realistic virtual reality operating conditions to create lifelike training scenarios. We are currently testing a full-scale simulator of an actual gas processing facility in Qatar to provide realistic training on more than 300 interactive control devices in six gas processing units.

Workplace security

Ensuring the security of our people, physical assets and intellectual property is systematically embedded in our daily operations. We employ consistent worldwide practices to address security challenges in the diverse locations where we do business. Our new facilities go through a security analysis that takes into account potential risks, the application of countermeasures, relationships with communities and compliance with applicable laws.

ExxonMobil regularly assesses potential threats to our operations. Our security personnel commonly participate in security-related drills, training and industry forums to



In 2015, regional response team members in Australia pilot the incident command system and common operating picture.

enhance our established risk management methodologies, threat-assessment capabilities and technical security applications. In higher-risk locations, we monitor local conditions and maintain detailed security preparedness plans, such as evacuation and intruder response plans. Security-related response plan review and training was a key area of interest for ExxonMobil in 2015. Employees traveling to and residing in severe- and high-threat countries received specialized training designed to provide information about potential threats and appropriate responses in challenging security environments. Security-related plans were also reviewed and refreshed to better ensure response to events were effective and efficient.

As the threat of cybersecurity continues to evolve, we must protect our business against the growing risk of cyberattacks, which can potentially affect our data, facilities and operations. In 2015, 100 percent of our employees and contractors completed Web-based cybersecurity training on how to identify and respond to potential cybersecurity risks, in addition to an ongoing awareness program to reinforce safe computing behaviors. On average, our cybersecurity screening programs block more than 64 million emails, 139 million Internet access attempts and 133,000 other potentially malicious actions each month.

Health and wellness

ExxonMobil cares about the health and well-being of our workforce and their families. Our health policy communicates the corporate expectations for identifying and evaluating health risks related to our operations that can potentially affect our employees, contractors or the public. We seek to address the diverse health considerations prevalent in the different locations in which we work by creating effective and efficient solutions that protect our workforce and operations from major health threats. We also provide voluntary health programs to our employees that are designed to promote enhanced well-being and productivity.

To ensure our occupational health risks are credibly assessed, prioritized and documented, we utilize an exposure assessment strategy to identify and evaluate health risks related to our operations, as identified by OIMS. Health hazard exposure assessments for field work activities are conducted by our industrial hygiene professionals using a comprehensive global approach that not only identifies and evaluates health hazards, but also provides for risk-based prioritization.

To protect our workers and their families while preventing potential operation disruptions, ExxonMobil developed prevention, control and monitoring programs that address the threat of infectious diseases such as malaria, tuberculosis, HIV/AIDS, Ebola and other outbreaks. For example, our *Malaria Control Program* is designed to prevent and quickly manage malaria cases among employees and contractors working in or traveling to malaria-prone areas. Since 2007, no malaria-related deaths among ExxonMobil workers have been reported. In addition, no operational disruptions due to an infectious disease outbreak have been reported in company workplaces since 2010. For information about our efforts to eliminate malaria in the communities where we operate, see page 66.

Leveraging our ongoing efforts to combat infectious diseases enabled us to swiftly mobilize to help communities address the Ebola virus outbreak in West Africa, which took a toll on the region and resulted in more than 11,000 deaths from 2014 to 2015. During that time, ExxonMobil worked to ensure the safety of our employees and contractors in the region, none of whom were directly impacted by the virus. In total, ExxonMobil contributed more than \$670,000 to Ebola-related community health investments.

ExxonMobil's *Culture of Health* is our U.S.-based health and wellness program, which is designed to support the health of our employees and reduce health care costs. We provide collaborative health education, nutrition and fitness programs that are formatted to meet the needs of a variety of work environments such as offices and manufacturing sites. Additionally, we offer employees health coaching and disease management.

Supporting a culture of health outside the United States is also a priority. Our *Culture of Health* pilot programs in Argentina, Malaysia, Nigeria and the United Kingdom moved into sustainment phase at the end of 2015. In each country, we develop programs within the context of different health care systems, health needs and available resources. We offer benefits plans that comply with or exceed applicable country laws or regulations.

In recent years, ExxonMobil has taken a leadership role in minimizing and mitigating worker fatigue, which has the potential to impact the health and safety of our workforce. Studies show that, in addition to being safer, individuals who are rested and alert are less likely to experience personal health issues including cardiovascular, immune and psychosocial conditions. Because of this, we have implemented relevant programs at a variety of our sites, including refineries, chemical plants and pipeline operations in the United States, as well as some of our Upstream facilities in Canada. Additionally, we have started integrating personal fatigue management into our *Culture of Health* programs.

Workforce

We consider our approximately 73,500 employees to be our greatest asset. For this reason, ExxonMobil seeks to foster a diverse workforce of highly talented individuals who are dedicated to integrity, high-quality work and good corporate citizenship. Our career-oriented approach to developing an exceptional workforce includes recruiting outstanding talent and supporting long-term professional development.

Employment practices and policies

As a global organization, the diversity and inclusion of thought, skill, knowledge and culture across our company facilitates innovation and is a key competitive advantage. Through a range of programs, activities and investments, we strive to create and maintain a diverse workforce representative of the numerous geographies where we do business. Our *Global Diversity Framework* is the foundation for this approach, with three interrelated objectives:

- Attract, develop and retain a premier workforce from the broadest possible pool to meet our business needs worldwide.
- Actively foster a productive work environment that allows every employee to contribute fully to the achievement of superior business results — an environment where individual and cultural differences are respected and valued, and where all employees are encouraged to achieve their ultimate potential.
- Identify and develop leadership capabilities for performing effectively in a variety of international and cultural environments.

Global Diversity Booklet

"I have worked in several geographies and financial positions with individuals from many different backgrounds and cultures. I am constantly reminded that we have a large number of capable individuals with differing skills and approaches throughout this company. It is important that they are all engaged in furthering our business objectives. We accomplish this by providing an environment where everyone can contribute and can continually grow and develop both personally and professionally."



Carol Peters Associate general tax counsel

Up Close: ExxonMobil's Houston campus

In 2015, ExxonMobil completed construction of a new state-of-the-art campus in Houston, Texas, which hosts around 10,000 employees in our Upstream, Downstream and Chemical companies and associated service groups. We believe the campus will foster improved health and wellness among employees and enhance our ability to attract, develop and retain the top talent in the industry. The campus design is based on extensive research into best practices in workplace health, wellness and collaboration.

For example, the campus is designed with an open floor plan that optimizes the use of natural light and encourages collaborative opportunities for its co-located businesses and services. Specifically, the campus features highly networked, shared, multipurpose work spaces that create a collaborative work environment. In addition to increased collaboration, research indicates that the open floorplan concept can lead to improved productivity, engagement and innovation over the long term.

"The combination of our new central SSH&E organization and co-location at the new campus has brought our environment, regulatory and socioeconomic professionals together like never before. It has enabled collaboration within our organization and across our business lines both on a large and small scale, facilitating learnings and sharing of best practices. Individuals who may have interacted once or twice every couple years previously now see each other on a daily basis and seek input from individuals from diverse backgrounds."



Christine Byrne Environment manager

The campus also features an extensive network of paths and walkways linking it with natural and cultivated landscapes. Surveys at the campus identified 343 ecologically valuable



ExxonMobil employees collaborating at the Houston campus.

trees, of which 213 were preserved in place. Professional arborists moved the remaining trees to other locations within the campus and are providing observation and care to ensure their continued health. We also installed a system to collect rainwater from the property. More than 80 percent of the water used on site is reclaimed and reused for cooling and irrigation needs. Overall, the campus uses 90 percent less potable water than the national average for commercial buildings.

To support a healthy lifestyle among employees, the Houston campus includes a 100,000 square-foot wellness center complete with a three-story glass atrium, cardio and strength training facilities, a basketball court and personal training services. By the end of 2015, more than 30 percent of the campus residents had enrolled in the campus wellness center. ExxonMobil cares about the well-being of our employees as well as their families. The on-campus Explorers Club is designed to provide ExxonMobil employees with quality child care services for children ages six weeks to pre-kindergarten.

Additionally, campus residents enjoy a wide array of on-site healthy dining venues to support a sustainable diet. Dining selections include a variety of nutritional options and choices for special diets, all of which align with ExxonMobil's *Culture of Health* program. Menu boards at the respective stations outline the most current *Culture of Health* menu options, which are periodically offered at employee events. Our Standards of Business Conduct govern all aspects of our employment, including recruitment, hiring, work assignments, promotions, transfers and terminations, as well as wage and salary administration. The Standards support our commitment to provide equal employment opportunities, prohibit harassment and discrimination in the workplace and align with applicable laws and regulations in the countries where we operate.

We provide training on the *Standards* for new employees and offer regular refresher courses to current employees. Additionally, we use a series of Web-based trainings and tools to help our employees understand effective communication and cultural sensitivities across a diverse workforce. We strictly prohibit any form of discrimination by or toward employees, contractors, suppliers or customers in any ExxonMobil working environment.

Standards of Business Conduct

2015 workforce by geographic region³

Thousands of employees



In 2015, our total workforce was approximately 73,500, slightly lower than the total workforce in 2014. The largest concentration of ExxonMobil employees is in the United States with 30,400, followed by Europe and Asia Pacific with 15,300 and 13,300, respectively. Our global reach directly contributes to the diversity of our workforce and the success of our business.

³Data exclude company-operated retail store employees.

Our global policies promote diversity and inclusion and prohibit any form of discrimination, including those based on sexual orientation and gender identity. At ExxonMobil, harassment, even in its most subtle forms, directly conflicts with company policy and is not tolerated. Every employee is subject to disciplinary action, including termination, for any act of harassment. We employ a comprehensive training and stewardship program to ensure employees worldwide understand, implement and follow our anti-harassment policy. Additionally, our annual reporting and compliance procedures include a letter to senior managers emphasizing their responsibility to maintain work environments free from harassment and discrimination.

Diversity and inclusion

We support local employee networks to foster an environment committed to diversity and inclusion. The voluntary, employee-led groups offer networking, development programs and community service, and proactively mentor and assimilate new employees. Some of these networks include:

- Asian Connection for Excellence (ACE)
- Black Employee Success Team (BEST)
- Global Organization for the Advancement of Latinos (GOAL)
- People for Respect, Inclusion and Diversity of Employees (PRIDE)
- Veteran Advocacy and Support Team (VAST)
- Women's Interest Network (WIN)

We engage a wide range of education programs and recruiting activities that are intended to reach out to a diverse pool of highly qualified employment candidates. ExxonMobil's internships and financial aid initiatives play a key role in our diversity recruiting, through practical work experience, scholarships and university grants. We also support professional organizations such as the National Society of Black Engineers, Society of Women Engineers, Society of Hispanic Professional Engineers and the National Action Council for Minorities in Engineering, among others. ExxonMobil believes these strategic investments in education will help build a source of diverse, talented individuals. For more information on our education initiatives, see page 66. "My WIN leadership team's role is to promote individual and collective growth to support women to achieve their ultimate potential. We serve as a catalyst to improve business acumen, promote fellowship to enhance contributions to the business and cultivate hundreds of successful mentoring relationships that help women achieve their career goals. I am proud of our WIN accomplishments, which are reflected in the growth and advancement of women in technical and leadership roles."

Sujata Bhatia



Project manager, gas and power marketing Women's Interest Network chair

We remain committed to improving the gender balance within our company. ExxonMobil promotes leadership opportunities for women throughout all aspects of the employment relationship, including recruitment, hiring, training, promotions, transfers and wage and salary

2015 percentage of women and minorities by position in the United States

Based on U.S. Equal Employment Opportunity Commission reporting



In the United States, women accounted for approximately 26 percent of our U.S. workforce in 2015, with more than 16 percent in leadership positions. Similarly, in 2015 minorities accounted for 25 percent of total U.S. employees and our minority representation in leadership was 17 percent.

Up Close: Employee resource groups

We believe the training, skills and experiences of veterans are a valuable component to a diverse, productive organization. In 2014, we created our newest employee resource group, the Veteran Advocacy and Support Team (VAST), which provides mentoring, coaching and networking opportunities designed to enhance the personal and professional development of our veterans and those who continue to serve. VAST also welcomes non-veteran employees to participate in the program. In total, VAST supports more than 690 employees.

In addition to helping onboard ExxonMobil employees who are former or current military service personnel, VAST also focuses on facilitating recruitment, assimilation, retention and advancement of veterans. In November 2015, VAST hosted a Veterans Day event at our Houston campus. The event brought together veterans and veteran supporters

administration. In 2015, 41 percent of our worldwide management and professional new hires were women. This is significantly higher than the percentage of women in our broader employee population at 28 percent. In the United States, 33 percent of our 2015 engineering hires were female, higher than the U.S. percentage of female engineering students.

Approximately 17 percent of our executive employees worldwide are women, an increase of 50 percent over the past decade. This increase, in part, is a result of continued focus on early identification of female management development candidates. Notably, 29 percent of our early career stage executive employees worldwide are women. For more information on how we advance opportunities for women worldwide, see page 66.

To increase the representation of minorities in our U.S. operations, our hiring programs include outreach initiatives to identify diverse candidates. For example, through our technical scholarship program, we award scholarships to ExxonMobil minority interns to assist them in completing their college degrees. In 2015, we provided 44 technical scholarships, an increase of 80 percent over the past 10 years. from across ExxonMobil's operations. In total, more than 200 people attended the event, during which U.S. Air Force Major General Giovanni Tuck discussed the similarities and interdependencies between defense logistics and the energy industry, as well as the skills and experiences veterans provide to the business community.

"As veterans and ExxonMobil employees, my wife Ruth and I co-founded VAST to be a resource for veterans seeking to leverage their proven leadership skills and diverse life experiences. We seek to provide mentorship and professional development, which is beneficial both for employees and the company."

Jeff Vargo

Construction supervisor, ExxonMobil Development Company VAST co-founder

"As a technical scholarship recipient, I was able to grow academically and professionally in the chemical industry. The scholarship program helped me build a quick network of peers and mentors. ExxonMobil has provided the opportunity to apply the concepts and skills I learned at Howard University, and I am excited to continue learning and developing in my role as a process contact engineer since joining the company in 2015."



Jamille Jamison Contact engineer

In 2015, 35 percent of management and professional new hires in the United States were minorities. Further, 37 percent of our engineering hires were minorities, significantly higher than the percentage of U.S. minorities in our broader population. Of our U.S. executives, approximately 14 percent are minorities, an increase of 70 percent over the past decade facilitated by a consistent focus on minority management development. Notably, 14 percent of early career U.S. executive employees in 2015 were minorities.



U.S. Air Force Major General Giovanni Tuck presents to VAST members during a Veterans Day event hosted at the Houston campus.

2015 percentage of female management and professional new hires by geographic region



In 2015, 41 percent of our worldwide management and professional new hires were women, significantly higher than the percentage of women in our broader employee population.

Retention and engagement

Our global, diverse workforce represents a competitive advantage for ExxonMobil. We retain and develop our employees by providing an environment where personal and professional growth is encouraged and career objectives are developed and achieved.

We communicate openly with our employees through frequent one-on-one and team discussions as well as larger organizational meetings. All employees undergo an annual performance assessment and development process, during which they have the opportunity to engage in a structured, documented discussion with their supervisors about work accomplishments, learning objectives, development opportunities and career interests. This process, coupled with company training, mentorship programs and networking opportunities, provide the basis for ongoing employee growth and continual performance improvement.

ExxonMobil offers robust corporate and technical training programs designed to engage employees in professional development. In 2015, our major business units spent \$124 million on training employees. Of that, we directed 84 percent toward professional and technical training. In 2015, more than 5,000 employees at various levels of the company participated in ExxonMobil's leadership development training programs, of which 32 percent were women and 48 percent were employees from outside the United States.

ExxonMobil also offers a variety of workplace flexibility programs to maintain engagement and maximize productivity by addressing individual employee needs. These workplace flexibility programs differ based on the legal requirements, infrastructure and culture of locations where we do business. Examples of workplace flexibility programs include adaptable workplace arrangements, modified workweek, part-time regular employment and adjustable work hours.

Employee benefits

Our benefits programs are an integral part of a total remuneration package designed to support our long-term business objectives, as well as attract, retain and reward the most qualified employees. Our goal is to be responsive to the needs of employees throughout their careers and into retirement.

Ensuring access to affordable health care helps employees effectively manage health care issues and reduces related financial concerns. Our funding levels of qualified pension plans comply with applicable laws and regulations. Defined benefit pension obligations are fully supported by the financial strength of ExxonMobil or the respective sponsoring affiliate. The company provides retirement benefits that support our long-term career orientation and business models.

Training expenditures and number of employees trained



In 2015, ExxonMobil spent \$124 million on training employees. In total, 85,000 non-unique participants at various levels of the company participated in ExxonMobil training programs in 2015, a 31 percent increase since 2011.

Up Close: Sustainability training for Chemical employees

We view all of our employees as ambassadors for ExxonMobil. Our employees can help communicate our internal efforts and explain our positions on important topics to the outside world. By including the topic of sustainability in our company training offerings, we can help ensure employees understand our approach to sustainability and can effectively communicate our sustainability objectives to people outside the company.

Since 2011, we have offered face-to-face training on sustainability to commercially facing ExxonMobil Chemical Company (EMCC) employees. In 2015, we expanded our sustainability training to all EMCC employees as part of a new computer-based training platform to help broaden exposure to the topic beyond just the commercial organization.

This computer-based training includes introductory-level information such as the definition of sustainability, how EMCC incorporates sustainability into its operations, emerging sustainability challenges and how individuals can contribute to sustainability at home and at work. Since the computer-based training was launched in August 2015, 857 Chemical employees and 75 other employees have taken the course.



For information on ExxonMobil's approach to sustainable development, see page 8.

Managing climate change risks

Harold Johnson, lab technician at our Products Technology Center in Paulsboro, New Jersey, examines a motor oil sample. Since 2000, ExxonMobil has spent approximately \$7 billion to develop lower-emission energy solutions.



Society continues to face the dual challenge of meeting energy demand to support the economic growth needed for improved living standards, while simultaneously addressing the risks posed by rising greenhouse gas emissions and climate change. While future temperature changes and the associated impacts are difficult to accurately predict, we believe the risks of climate change are real and warrant thoughtful action.

ExxonMobil supports advancement of the scientific understanding of climate change and is committed to providing affordable energy to support human progress while advancing effective solutions to address the risks of climate change. Our climate change risk management strategy includes four components: engaging on climate change policy, developing future technology, mitigating greenhouse gas emissions in our operations and developing solutions that reduce greenhouse gas emissions for our customers.

Engaging on climate change policy

Climate change is a global issue that requires the collaboration of governments, companies, consumers and other stakeholders to create global solutions. We believe countries need to work together to craft policies aimed at mitigating greenhouse gas emissions that recognize the priorities and needs of both developed and developing countries. We engage stakeholders directly and with trade associations around the world to encourage sound policy solutions for addressing these risks.

Attributes of sound climate policy

ExxonMobil believes the long-term objective of effective policy is to reduce the risks posed by climate change at minimum societal cost, in balance with other societal priorities such as poverty eradication, education, health, security and affordable energy.

We fundamentally believe that free markets, innovation and technology are essential to addressing the risks of climate change. Success in developing and deploying impactful technologies will highly depend on governments creating a policy landscape that enables innovation and competition. Policies need to be clear and guard against duplicative, overlapping and conflicting regulations, which send mixed signals to the market and impose unnecessary costs on consumers. We believe that effective policies are those that:

- Promote global participation;
- Let market prices drive the selection of solutions;
- Ensure a uniform and predictable cost of greenhouse gas emissions across the economy;
- Minimize complexity and administrative costs;
- Maximize transparency; and
- Provide flexibility for future adjustments to react to developments in climate science and the economic impacts of climate policies.

Policies based on these principles minimize overall costs to society and allow markets to help determine the most effective and commercially viable solutions.

Given the wide range of societal priorities and limited global resources, all policies, including climate change policy, must be as economically efficient as possible. ExxonMobil believes that market-based systems that impose a uniform, economy-wide cost on greenhouse gas emissions are more economically efficient policy options than mandates or standards. This is because market-based policies more effectively drive consumer behavior and technology innovation, while mandates and standards eliminate consumer choice and can perpetuate ineffective technologies.

Since 2009, ExxonMobil has held the view that a properly designed, revenue-neutral carbon tax is a more effective market-based option than a cap-and-trade approach. A carbon tax is more transparent, can be implemented in existing tax infrastructure, avoids the complexity of creating and regulating carbon markets where none exist and reduces greenhouse gas emissions price volatility, thus delivering a clearer, more consistent long-term market price signal.

Only through a sound global policy framework will the power of markets and innovation enable society to find cost-effective solutions to address the risks of climate change, while at the same time continuing to address the many other challenges the world faces.

Engaging stakeholders

Managing the risks of climate change will require increased innovation and collaboration. Therefore, ExxonMobil engages a variety of stakeholders — including policymakers, investors, consumers, non-governmental organizations (NGOs), academics and the public — on climate change issues of direct relevance to the company.

Up Close: Attributes of sound marketbased policy

While market-based systems may have different designs and regional applications, we believe effective systems are those that promote global participation and are characterized as follows:

- Apply to all greenhouse gas emissions across the economy;
- Provide a uniform price for all greenhouse gas emissions;
- Apply the costs of greenhouse gas emissions to the parties most able and likely to alter behavior in response to a price signal;
- Prevent shifting of greenhouse gas emissions to unregulated jurisdictions;
- Provide for linkages with other market-based systems outside the regulated jurisdiction;
- Return revenue generated from the system back to the economy in an equitable fashion that encourages economic growth and limits regressive income effects; and
- Provide for accurate and cost-effective greenhouse gas emissions measurement, verification and reporting.

Up Close: Outcomes from COP 21

In December 2015, parties to the United Nations (UN) Framework Convention on Climate Change convened in Paris for the 21st Conference of the Parties (COP 21). COP 21 resulted in a global agreement which, for the first time, commits all parties to undertake action on climate change and report on related progress. Key commitments of the agreement include:

- "Each party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve."
- "Each party shall communicate nationally determined contributions every five years."
- "Each party shall regularly provide ... a national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases" and "information necessary to track progress made in implementing and achieving its nationally determined contribution."



Participants at the 21st Conference of the Parties in Paris, December 2015.

ExxonMobil believes that these commitments are a positive step in achieving global participation to address climate change risks.

For many years, ExxonMobil's *Outlook for Energy* has taken into account the potential for climate policies to become increasingly stringent over time and impose rising costs on energy-related carbon dioxide emissions. Preliminary analyses of the aggregation of intended nationally determined contributions, which were submitted by governments as part of the COP 21 process, indicate a greenhouse gas emissions trajectory similar to that anticipated in our *Outlook*.

ExxonMobil continues to support and contribute to efforts to reduce greenhouse gas emissions. We believe the risks of climate change are real and warrant thoughtful action. Meeting the climate change challenge will require action from all parts of society, including governments, civil society and the private sector. We believe it is possible to address climate change risks while also meeting growing global energy demand and supporting economic development.

ExxonMobil actively advocates for responsible policies that would be effective in addressing the risks of climate change. When we encounter proposals, we offer informed data and policy analysis and engage in thoughtful debate. We have had hundreds of meetings with policymakers in the United States, the European Union and Canada to share our views on carbon pricing policy. We will continue to meet with policymakers and other stakeholders to discuss effective approaches to reduce greenhouse gas emissions. For additional information on ExxonMobil's approach to political advocacy and contributions, see page 86.

Our chairman and members of the management committee have primary responsibility for — and are actively engaged in — managing climate change risks. The board of directors receives annual in-depth briefings that cover updates on public policy, scientific and technical research, and company positions and actions related to climate change. To drive improvement, our merit-driven employee development and compensation systems integrate performance in environmental areas, including emissions and energy efficiency.

In order to ensure that our corporate communications accurately reflect our internal policy positions, we employ a corporate-wide global climate change and greenhouse gas issue management team. As issues arise at the local, state, national and regional levels, our global team of experts evaluate and develop a company position on the issue. ExxonMobil employees also hold key leadership positions, including board of director positions, with many trade associations that engage on climate change issues, including the American Petroleum Institute (API), the International Association of Oil and Gas Producers (IOGP) and IPIECA, the global oil and gas industry association for environmental and social issues. We believe an effective policy response to climate change requires a thorough understanding of the climate system. Our scientists have been involved in climate change research and related policy analysis for more than 30 years. This has resulted in hundreds of publicly available documents on climate-related topics, including more than 50 peer-reviewed publications.

While our long-standing and continuous involvement with climate science research, often conducted in collaboration with governmental bodies and leading universities, has advanced the company's understanding of the climate system, ExxonMobil is committed to continued engagement with the climate science community in an effort to further develop the science. ExxonMobil contributes to a wide range of academic and other organizations that research and promote dialogue on addressing climate change risks.

Peer-reviewed articles on climate research



We engage with IPIECA on a number of issues, including climate change risks. Rick Mire, environment, regulatory and socioeconomic manager, has represented ExxonMobil at IPIECA for more than a decade and has served as chair since 2012.

Experts from our organization have participated in the UN Intergovernmental Panel on Climate Change (IPCC) since its inception. Most recently, our scientists contributed to the IPCC Fifth Assessment Report in lead author, review editor and reviewer roles. For additional information on the IPCC's Fifth Assessment Report, see the adjacent Up Close. Our scientists also participated in the work of the U.S. National Academy of Sciences, including its work to review the third U.S. National Climate Assessment Report and provide advice to the U.S. Global Change Research Program.

Engaging industry

ExxonMobil recognizes the growing interest in climate change risks and understands that stakeholders seek a better understanding of the positions of the oil and gas industry, as well as how individual companies approach the management of climate change risks within their own businesses.

IPIECA was established in 1974 at the request of the United Nations Environmental Program. As an active IPIECA member, ExxonMobil engaged with member companies in advance of the December 2015 COP 21 meeting in Paris in order to help develop a common industry position on global efforts to address and mitigate climate change risks. That work culminated in The Paris Puzzle — a publication on the challenges and responses needed to address the risks of climate change.

IPIECA Paris Puzzle

Recognizing the desire of stakeholders for more accessible and clear information, in 2015 we also took a key role collaborating with IPIECA and its member companies to create a voluntary reporting framework for oil and gas companies to publish their climate change risk management approach in a simple, straightforward and transparent manner. The resulting framework, which IPIECA will pilot during 2016, covers a wide range of climate-related issues and provides a consistent reporting methodology for the oil and gas industry. This framework should enable interested stakeholders to understand an individual company's views on the issues central to addressing climate change risks.

IPIECA Climate Change Reporting Framework

Up Close: ExxonMobil and the IPCC

For more than 25 years, the IPCC has provided periodic assessments of climate change, including information on the causes and impacts as well as potential response strategies. Experts from ExxonMobil have participated in the IPCC since its inception. In October 2014, the IPCC completed its Fifth Assessment Report, which offers an update of materials related to climate science, including the socioeconomic aspects of climate change and its implications for sustainable development. Our scientists contributed to the IPCC Fifth Assessment Report in lead author, review editor and reviewer roles.

The Fifth Assessment reports high confidence in the scientific certainty of many aspects of climate change, including that atmospheric greenhouse gas concentrations are rising in response to emissions, the earth's temperature has warmed over the last century and that the risks associated with climate change will increase with the magnitude of atmospheric greenhouse gas concentration and temperature increases. The assessment notes that the ability to forecast the magnitude and pattern of future climate change remains less certain and confidence declines when moving from a global to local scale.

While the current scientific understanding of climate change leaves some unanswered questions, it is clear that the risks are real and warrant thoughtful action. ExxonMobil employs a risk management strategy and continually strives to improve our understanding of the impacts of climate change. As part of our *Outlook for Energy* analysis, we project an energyrelated carbon dioxide (CO_2) emissions profile through 2040. This can be compared with the energy-related CO_2 emissions profiles from various scenarios outlined by the IPCC. When we do this, our *Outlook* emissions profile approximates the IPCC's intermediate Representative Concentration Pathways 4.5 emissions profile in shape, but is slightly under it in magnitude.

IPCC's Fifth Assessment Report

Developing future technology

As society transitions to lower greenhouse gas emission energy solutions, technological advancements that change the way we produce and use energy will be instrumental in providing the global economy with the energy it needs while reducing greenhouse gas emissions. Recognizing the limitations associated with most existing low greenhouse gas emissions energy technologies, particularly in delivering the necessary economy and scale, we are conducting fundamental research to develop low greenhouse gas emission energy solutions that have the potential to be economically feasible without subsidies, standards or mandates. ExxonMobil is pioneering scientific research to discover innovative approaches to enhance existing and develop next-generation energy sources.

ExxonMobil's Emerging Technologies program brings together executives, scientists and engineers from across ExxonMobil's businesses to identify and evaluate technology research opportunities with a long-term strategic focus. The Emerging Technologies team seeks to understand a wide range of technology options and how they may impact the global energy system in the near term and as far as 50 years into the future. Our evaluation extends well beyond our base business and near-term focus. If a technology could have a material effect on the future of energy, we insist on knowing about it and understanding the related science. Understanding the fundamental science serves as a basis for our broader research efforts and may lead to further technology development aimed at practical application, such as our work on biofuels. Additionally, this awareness informs our internal analysis of the global energy landscape as reflected and encapsulated in our annual Outlook for Energy.

The Outlook for Energy: A View to 2040

At the center of our research is ExxonMobil's Corporate Strategic Research laboratory, a fundamental research institution with approximately 150 Ph.D. scientists and engineers focused on addressing the company's long-range science needs. The laboratory's scientists are internationally recognized experts in their field. Our research portfolio, as illustrated in the graphic above, includes a broad array

ExxonMobil's approach to developing future technology



of programs, including biofuels, carbon capture and sequestration, alternative energy and climate science.

"ExxonMobil is a leader in its commitment to fundamental science and has a constancy of purpose when looking at emerging energy technologies. As part of our commitment, we continue to widen our research aperture through collaborations with academics and other third parties to better enable us to identify potential breakthroughs in lower-emission technologies."



Vijay Swarup

Vice president, research and development

In addition to in-house research, the Corporate Strategic Research laboratory conducts strategic research with leading universities around the world. For example, in 2014, ExxonMobil signed an agreement to join the Massachusetts Institute of Technology Energy Initiative, a collaboration aimed at working to advance and explore the future of energy. ExxonMobil was also a founding member of the Global Climate and Energy Project at Stanford University, which seeks to develop fundamental, game-changing scientific breakthroughs that could lead to lower greenhouse gas emissions and a less carbon-intensive global energy system. Other university collaborations cover a wide range of scientific topics, from understanding the impacts of black carbon and aerosols at the University of California, Riverside to the fundamentals of biomass pyrolysis used to make biofuels at lowa State University.

Advanced biofuels

ExxonMobil funds a broad portfolio of biofuels research programs including ongoing efforts to develop algae-based biofuels, as well as programs for converting non-food based feedstocks, such as whole cellulosic biomass, algae-based feedstocks and cellulose-derived sugars, into advanced biofuels. We believe that additional fundamental technology improvements and scientific breakthroughs are still necessary in both biomass optimization and the processing of biomass into fuels. Specifically, scientific breakthroughs are needed to ensure that advanced biofuels can be scaled up economically and produced with the desired environmental benefit of lower life cycle greenhouse gas emissions.

Up Close: Advanced biofuels partnership with Michigan State University

ExxonMobil is a leader in funding and conducting research on advanced biofuels. In 2015, ExxonMobil and Michigan State University (MSU) launched a partnership to advance biofuel research by developing the basic science required to progress algae-based fuels and bio-products.

Research has shown that algae photosynthesis can be highly efficient under optimal conditions in the laboratory but that this efficiency drops under realistic growth conditions. The partnership seeks to understand why some strains of algae are more efficient than others by using advanced technologies to study the photosynthetic processes of many cultures under different conditions.

The objective is to eventually process algae bio-oils in ExxonMobil refineries to supplement crude oil as the raw material to manufacture gasoline, diesel, aviation fuels and marine fuels. We are also researching potential applications for chemicals and lubricants.

Algae biofuel research and development is a long-term endeavor that could take decades to commercialize at scale. In this partnership, we are working to build on our significant progress since beginning this work in 2009.

"Nature has provided us with a great potential for improvement, and there are many strains of algae that have adapted to work in different environments. We want to determine how they do this and which genes are responsible. Then, we can potentially combine traits to make strains that are more efficient under harsh conditions."

David Kramer

Photosynthesis and bioenergetics professor, MSU-Department of Energy Plant and Research Laboratory

Our advanced biofuels research includes joint research collaborations with Synthetic Genomics Inc., Renewable Energy Group, the Colorado School of Mines, Michigan State University, Iowa State University, Northwestern University and the University of Wisconsin. For additional information on biofuel initiatives in 2015, see the adjacent Up Close.

Energy investment in advanced biofuels

Carbon capture and sequestration

Carbon capture and sequestration (CCS) is the process by which CO_2 gas that would otherwise be released into the atmosphere is captured, compressed and injected into underground geologic formations for permanent storage. With a working interest in approximately one-third of the world's total CCS capacity, ExxonMobil is a leader in one of the most important next-generation low-carbon technologies. In 2015, we captured 6.9 million metric tons of CO_2 for sequestration.

ExxonMobil believes the greatest opportunity for future largescale deployment of CCS will be in the natural gas-fired power generation sector. While CCS technology can be applied to coal-fired power generation, the cost to capture CO_2 is about twice that of natural gas power generation. In addition, because coal-fired power generation creates about twice as much CO_2 per unit of electricity generated, the geological storage space required to sequester the CO_2 produced from coal-fired generation is about twice that associated with gas-fired generation.

ExxonMobil is conducting proprietary, fundamental research to develop breakthrough carbon capture technologies that have the potential to be economically feasible without government subsidies, standards or mandates.

Environmental life cycle assessments

Every product has the potential to impact the environment. These impacts can be associated with use of the product itself, the manufacturing process or the acquisition of raw materials used to make the product. As a result, a holistic estimate of a product's environmental impact should reflect its entire life cycle.



Our LaBarge gas plant in Wyoming contributes to the total carbon dioxide ExxonMobil captures for sequestration each year.

To help direct our research efforts, we use in-house experts and tools to conduct environmental life cycle assessments of emerging products and activities. In doing so, we are able to assess which technologies have the potential to deliver the game-changing results that will be needed to transition the energy system to lower-emissions solutions.

ExxonMobil researchers also collaborate with researchers at national laboratories and universities around the globe to advance the science of life cycle assessments. In recent years, we have developed new approaches for quantifying environmental impacts associated with energy systems, and published our findings in prestigious peer-reviewed journals. Peer-review and collaboration with external scientists enhance dialogue with the academic research community and bring external expertise and perspective to ExxonMobil life cycle assessments, supporting sound science both within the company and in the greater scientific community.

Mitigating greenhouse gas emissions in our operations

As we seek to increase production of oil and natural gas to meet growing global energy demand, we are committed to continuing to take actions to mitigate greenhouse gas emissions within our operations.

ExxonMobil has a robust set of processes designed to improve efficiency, reduce emissions and contribute to effective long-term solutions to manage climate change risks. These processes include, where appropriate, setting tailored objectives at the business, site and equipment levels, and then

Greenhouse gas emissions (net)¹

Net equity, CO_2 -equivalent emissions Millions of metric tons



In 2015, ExxonMobil's net equity greenhouse gas emissions were 122 million CO_2 -equivalent metric tons. Relative to our 2014 performance, our 2015 emissions decreased by approximately 1 million CO_2 -equivalent metric tons.

¹Our calculations are based on the guidance provided in API's Compendium of Greenhouse Gas Emission Estimation Methodologies for the Oil and Gas Industry and IPIECA's Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions. stewarding progress toward meeting those objectives. Based on decades of experience, ExxonMobil believes this rigorous bottom-up approach is a more effective and meaningful way to drive efficiency improvement and greenhouse gas emissions reduction than simply setting high-level corporate targets. We also believe that continuing to use this approach will yield further improvements in all sectors of our business.

In the near term, we are working to increase energy efficiency while reducing flaring, venting and fugitive emissions in our operations. In the medium term, we are deploying proven technologies such as cogeneration and carbon capture and sequestration where technically and economically feasible. Longer term, we are conducting and supporting research to

Greenhouse gas emissions (normalized)

Net equity, CO₂-equivalent emissions Metric tons per 100 metric tons of throughput or production



Through our commitment to energy efficiency, application of structured processes and continued use of a bottom-up approach, we continue to yield industry-leading results. For example, normalized greenhouse gas emissions from our Downstream business totaled 18.9 metric tons per 100 metric tons of throughput or production in 2015. This represents an improvement of 13 percent compared with our 2006 performance.

develop breakthrough, game-changing technologies. Since 2000, ExxonMobil has spent approximately \$7 billion to develop lower-emission energy solutions.

In 2015, ExxonMobil's net equity greenhouse gas emissions were 122 million CO_2 -equivalent metric tons. Relative to our 2014 performance, our 2015 emissions decreased by approximately 1 million CO_2 -equivalent metric tons. This decrease was primarily driven by energy efficiency improvement and asset divestment.

2015 CDP (Carbon Disclosure Project) response

Greenhouse gas emissions avoided from ExxonMobil actions²

Net equity, CO₂-equivalent emissions Millions of metric tons



In 2015, greenhouse gas emissions avoided from ExxonMobil actions were 20.5 million metric tons, cumulative since 2006. This represents an additional reduction of 0.8 million metric tons compared with our 2014 performance.

²Cumulative since 2006

Emissions reduction



>\$3.8 Billion

invested since 2000 at our Upstream facilities around the world on emission reduction efforts, including energy efficiency and flare mitigation



>\$400 Million

invested over the past 15 years at our refining facilities around the world to reduce greenhouse gas emissions



>\$2 Billion

in support of Upstream and Downstream cogeneration facilities since 2001 to more efficiently produce electricity and reduce greenhouse gas emissions

>\$200 Million

in capital expenditures at global Chemical facilities since 2004 to reduce greenhouse gas emissions

Energy efficiency

In 2015, energy used in our operations totaled 1.7 billion gigajoules. Energy consumed in our operations generates more than 80 percent of our direct greenhouse gas emissions and is one of our largest operating costs. As such, we have focused on energy efficiency for several decades. Since 2000, we have used our Global Energy Management System in the Downstream and Chemical businesses, and our Production Operations Energy Management System in our Upstream businesses to identify and act on energy savings opportunities.

Through our commitment to energy efficiency, application of structured processes and continued use of a bottom-up approach, we continue to yield industry-leading results. For example, in the 2010, 2012 and 2014 Refining Industry Surveys,³ ExxonMobil's global refining operations achieved first quartile energy efficiency performance.

Flaring

In 2015, flaring volume from our combined Upstream, Downstream and Chemical operations totaled 5.3 million metric tons. This represents an increase of 0.8 million metric tons compared with our 2014 performance.

The increase in flaring in 2015 was primarily due to operations in Angola, where a third-party-operated liquefied natural gas (LNG) plant was not operating. These increases were partially offset by flaring reductions resulting from the completion of commissioning work at our Papua New Guinea LNG plant and operational improvements at the Usan production field in Nigeria.

ExxonMobil is a charter member of the *Global Gas Flaring Reduction Partnership*. In addition, we put in place our own parameters, the *Upstream Flaring and Venting Reduction Environmental Standard for Projects*, in 2005. Accordingly, our goal is to responsibly avoid routine flaring in new Upstream projects and reduce "legacy" flaring in our existing operations.

Hydrocarbon flaring

Millions of metric tons



In 2015, flaring volume from our combined Upstream, Downstream and Chemical operations totaled 5.3 million metric tons. This represents an increase of 0.8 million metric tons compared with our 2014 performance.

For example, our joint venture operations in Qatar have recently begun using a jetty boil-off gas (JBOG) recovery facility to recover the natural gas that was previously flared during LNG vessel loading at the marine berths located at the Ras Laffan Port. Approximately 1 percent of the LNG loaded onto the ships evaporates due to the difference in temperature between the LNG and the ship tank. The JBOG recovery facility collects the boil-off gas and returns it to the LNG plants to be used as fuel or converted back into LNG. During one year of operation, the JBOG facility has recovered more than 500,000 metric tons of gas and reduced LNG vessel loadingrelated flaring by around 90 percent.

³The Solomon Survey provides a global benchmarking assessment of the refining industry and is conducted every two years.



Paula Byrum inspects equipment at our XTO Energy operations site near Herbert Springs, Arkansas.

Up Close: Mitigating methane emissions at XTO Energy

XTO Energy manages methane emissions as a matter of safety and environmental responsibility. Responsible methane containment practices are applied during drilling, completion and production operations to minimize methane emissions. We manage emissions through a mix of voluntary and regulatory actions, such as implementing leak detection and repair programs, reducing oil and gas completion emissions and targeting replacement of high-bleed pneumatics with lower-emitting devices.

After drilling and completion of a new well, our workers prepare the production equipment for decades of operation. A key part of these preparations is to ensure that the natural gas product is contained by the production equipment. We utilize optical gas imaging cameras to locate equipment leaks that would otherwise be invisible, which allows us to detect leaks and make repairs. This attention to detail is important to promote safety and environmental performance. There is a growing interest within the scientific and policy communities on human-related methane emissions. In the United States, we are working with federal and state governments and within industry to ensure that regulations aimed at reducing emissions of methane and volatile organic compounds sufficiently support long-term operations, achieve emission reduction objectives and provide flexibility for technology.

We continue to seek greater understanding of the magnitude and characteristics of oil and gas industry-related methane emissions. XTO Energy participated in studies conducted by the University of Texas and Environmental Defense Fund which quantified the methane leakage rate in the United States from Upstream gas production activities at 0.4 percent of the total gas produced. The results of this study helped validate Environmental Protection Agency estimates. We are active in ongoing methane research including participating in a methane measurement reconciliation study with the Department of Energy's National Renewable Energy Laboratory to close the knowledge gap between methane measured at ground sources and methane measured from the air. We are also working with Stanford University on its new Natural Gas Initiative, which will focus on methane measurement and monitoring technologies.

Venting and fugitive emissions

Our venting and fugitive emissions in 2015 totaled 6 million CO₂-equivalent metric tons, which is essentially flat relative to our 2014 performance. While venting and fugitive emissions, most of which are methane, represent approximately 5 percent of our direct greenhouse gas emissions, we recognize the importance of reducing these emissions. We continue to look for cost-effective ways to reduce methane and other hydrocarbon emissions in our operations, such as replacing high-bleed pneumatic devices with lower-emission technology and conducting green well completions in targeted Upstream operations. For more information on how XTO Energy manages methane emissions, see the adjacent Up Close.

Cogeneration

Cogeneration technology captures heat generated from the production of electricity for use in production, refining and chemical processing operations. Due to its inherent energy efficiency, the use of cogeneration leads to reduced greenhouse gas emissions. Our cogeneration facilities alone enable the avoidance of approximately 6 million metric tons per year of greenhouse gas emissions.

We have interests in approximately 5,500 megawatts of cogeneration capacity in more than 100 installations at more than 30 locations around the world. This capacity is equivalent to the annual energy needed to power 2.5 million U.S. homes. Over the past decade, we have added more than 1,000 megawatts of cogeneration capacity and continue to develop additional investment opportunities.

For example, ExxonMobil began the construction of a new 84-megawatt cogeneration facility at our Singapore refinery's Jurong site. When this facility is completed in 2017, ExxonMobil will have more than 440 megawatts of cogeneration capacity in Singapore, enabling our integrated refining and petrochemical complex to meet all its power needs.



Up Close: Managing the business risks of climate change

By 2040, the world's population is projected to reach 9 billion — up from about 7.2 billion today — and global GDP will have more than doubled. As a result, we see global energy demand rising by about 25 percent from 2014 to 2040. In order to meet this demand, we believe all economic energy sources, including our existing hydrocarbon reserves, will be needed. We also believe that the transition of the global energy system to lower-emissions sources will take many decades due to its enormous scale, capital intensity and complexity. As such, we believe that none of our proven hydrocarbon reserves are, or will become, stranded.

Energy and carbon — managing the risks

ExxonMobil's long-range annual forecast, *The Outlook for Energy*, examines energy supply and demand trends for approximately 100 countries, 15 demand sectors and 20 different energy types. The *Outlook* forms the foundation for the company's business strategies and helps guide our investment decisions. In response to projected increases in global fuel and electricity demand, our 2016 *Outlook* estimates that global energy-related CO₂ emissions will peak around 2030 and then begin to decline. A host of trends contribute to this downturn — including slowing population growth, maturing economies and a shift to cleaner fuels like natural gas and renewables — some voluntary and some the result of policy.

ExxonMobil addresses the potential for future climate change policy, including the potential for restrictions on emissions, by estimating a proxy cost of carbon. This cost, which in some geographies may approach \$80 per ton by 2040, has been included in our *Outlook* for several years. This approach seeks to reflect potential policies governments may employ related to the exploration, development, production, transportation or use of carbon-based fuels. We believe our view on the

Energy-related CO₂ emissions

Billion metric tons



⁴The Organization for Economic Cooperation and Development. Refer to the Organization for Economic Cooperation and Development website (*oecd.org*) for a listing of its members.

potential for future policy action is realistic and by no means represents a "business-as-usual" case. We require all of our business lines to include, where appropriate, an estimate of greenhouse gas-related emissions costs in their economics when seeking funding for capital investments.

We evaluate potential investments and projects using a wide range of economic conditions and commodity prices. We apply prudent and substantial margins in our planning assumptions to help ensure competitive returns over a wide range of market conditions. We also financially stress test our investment opportunities, which provides an added margin against uncertainties, such as those related to technology development, costs, geopolitics, availability of required materials, services and labor. Stress testing further enables us to consider a wide range of market environments in our planning and investment process.

Developing solutions that reduce greenhouse gas emissions for customers

Over the next few decades, population and income growth — and an unprecedented expansion of the global middle class — are expected to create new demands for energy. Meeting these demands will not just require more energy, but will also require energy to be used more efficiently across all sectors.

While ExxonMobil strives to improve efficiency throughout our own operations, we are also delivering solutions that enable our customers to reduce their own emissions and improve their own energy efficiency as well as increase reliability, performance and longevity of the associated products. These solutions can be characterized as:

- Expanding the supply of cleaner-burning natural gas to reduce emissions in power generation;
- Developing premium, high-efficiency fuels and lubricants; and
- Creating innovative chemical materials that can be applied in a range of consumer products.

Cleaner-burning natural gas

One of the greatest opportunities for society to reduce greenhouse gas emissions is through the use of natural gas in power generation. Natural gas is a flexible, abundant and lowemissions fuel that is available across the globe. On a life cycle basis, from extraction through electricity consumption, using natural gas emits up to 60 percent fewer greenhouse gas emissions than coal. It is also the ideal partner for intermittent renewable energy sources, such as solar or wind, as it can provide reliable power when these renewable sources are not available. As the world moves toward a lower greenhouse gas emissions-intensive energy mix over the coming decades, natural gas will be one of the most important fuels to enable reductions in greenhouse gas emissions.



In 2015, the Center for Liquefied Natural Gas released a technical study that compares the differences between life cycle greenhouse gas emissions from power generation fueled by U.S.-exported LNG versus that of coal in Germany, Japan, South Korea, China and India. The study analyzed emissions during each stage of the LNG life cycle process — from wellhead to power generation — and found that life cycle greenhouse gas emissions from coal were about twice as high as emissions from U.S.-produced LNG in these markets, which demonstrates the long-term potential benefits of LNG use in these markets.

LNG and coal life cycle assessment of greenhouse gas emissions

Since our merger with XTO Energy in 2010, ExxonMobil has become one of the largest natural gas producers in the world. Coupled with our leadership in the development and production of LNG, ExxonMobil is well-positioned to meet growing demand for this cleaner-burning energy source.

Advances in technology have made it economically viable to ship natural gas all over the world, making it a truly

global resource. By converting natural gas into LNG, it can be delivered via tanker from distant production areas to intended markets. Given its flexibility, environmental benefits and large resource base, LNG is a natural choice to help meet the world's growing energy needs. ExxonMobil's experience spans across the entire LNG value chain, including Upstream development, pipelines, liquefaction plants, shipping and regasification terminals. Our ability to successfully link these complex elements distinguishes us from our competitors and enables us to provide a reliable gas supply to buyers and end users.

Premium fuels and lubricants

ExxonMobil produces fuels and lubricants that deliver higher vehicle efficiency and lower emissions. In addition, we continue working on research and development of new fuels and lubricants. Our extensive family of highperformance lubricants includes synthetic lubricants that have sustainable customer benefits, such as longer drain intervals than conventional mineral oils, meaning they can be replaced with less frequency, therefore reducing the volume of used oil for disposal or recycle. In addition, extending lubrication service intervals increases efficiency and lowers maintenance costs while reducing potential risks from worker and machine interactions. There are also specific application advantages for these products, including in wind turbine applications where machinery is several hundreds of feet in the air and exposed to weather. Mobil lubricants are used in more than 40,000 wind turbines worldwide.

Innovative chemical materials

Materials developed by ExxonMobil provide manufacturers with quantifiable benefits in a multitude of consumer applications. These materials include resilient, lightweight plastics



Hanna Jokinen, an ExxonMobil lab chemist, studies the characteristics of a lubricant sample. that are used by automotive manufacturers to reduce vehicle weight and deliver greater efficiency for drivers. We have also developed advanced tire technologies that help maintain optimal tire pressure, improve rolling resistance and aid fuel efficiency, as around 25 percent of vehicle tires in the United States are underinflated. By addressing this issue, drivers could collectively save up to 1 billion gallons of gasoline per year.

Additionally, our next-generation plastic packaging reduces total product weight and allows more products per shipment, fewer trucks on the road, less gasoline and energy used, fewer greenhouse gas emissions and ultimately less material to be reused, recovered or recycled. ExxonMobil plastic products also contribute to safety within the food industry. Plastic packaging is lightweight, durable and flexible, which makes it ideal for preserving food. According to the Food and Agriculture Organization of the United Nations, one-third of the food produced in the world goes to waste each year. Plastic packaging can help reduce spoilage, increase access to food and improve food safety for consumers around the world.

Solutions in the automotive industry

Halobutyl and EPDM rubbers are used to make automotive products, such as tire innerliners, window and door seals, fan belts and radiator hoses.





ExxonMobil's Arkutun-Dagi topside offshore Sakhalin Island, Russia.

Up Close: Engineering resiliency into our operations

ExxonMobil operates facilities in a wide range of challenging physical environments across the globe, and has done so for many decades. Our extensive design, construction and operating experience provides us great familiarity with the risks associated with different physical environments. The company is aware of the risks posed by extreme weather events and recognizes the risks that climate change could potentially introduce for facilities exposed to changes in extreme weather events over the life of an investment.

When considering weather-related risks, we evaluate the type and location of our current and planned facilities. As an example, offshore facilities could be impacted by changes in wave and wind intensity as well as by ice flow patterns, while onshore facilities could be vulnerable to sea level rise and changes in storm surge. In the Arctic, long-term changes in ice and permafrost could impact the design of structural foundations.

Our facilities are designed, constructed and operated to withstand a variety of extreme climatic and other conditions, with safety factors built in to cover a number of engineering uncertainties, including those associated with wave, wind and current intensity, marine ice flow patterns, permafrost stability, storm surge magnitude, temperature extremes, extreme rainfall events and earthquakes. Our consideration of changing weather conditions and inclusion of safety factors in design cover the engineering uncertainties that climate change and other events may potentially introduce. After construction of a facility, we monitor and manage ongoing facility integrity, for example through periodic checks on key aspects of the structures. In addition, we regularly participate with major engineering societies and industry groups to assess and update engineering standards to manage the risks of extreme weather.

Once facilities are in operation, the risks of extreme weather are also addressed by disaster preparedness and response and business continuity planning. Detailed, well-practiced and continuously improved emergency response plans tailored to each facility help ExxonMobil prepare for extreme weather events. Regular emergency drills are practiced in partnership with appropriate government agencies to help ensure readiness and minimize the impacts of such events.

While most scientists agree climate change could pose risks related to extreme weather, sea level rise, temperature extremes and precipitation changes, the limited scientific understanding of the likelihood, magnitude, frequency and geographic distribution of these events poses a challenge in facility planning. ExxonMobil's comprehensive approach and established systems enable us to manage a wide variety of possible outcomes over the coming decades.

Case Study

ExxonMobil's research and development initiatives

Upstream researchers in our hydrocarbon systems analytical geochemistry laboratory perform gas chromatography and mass spectrometry measurements on hydrocarbon samples. We seek to develop breakthrough technologies that can benefit our business and have a positive impact on society. We believe human ingenuity and innovation are critical to supplying the fuels and products that consumers need in a manner that is safe for our employees, communities and the environment. To support this, ExxonMobil is founded on a culture of science and technology. We employ more than 2,200 Ph.D. scientists and 5,000 employees at our research and technology divisions around the world. Each year, we invest around \$1 billion on corporate research and development efforts. Our goal is to develop breakthrough technologies that can benefit our business and have a positive impact on society and the environment.

We are also collaborating with leading universities to research and discover next-generation energy solutions. We are proud



to say that as a result of these and other such research and development initiatives, ExxonMobil was named one of the "Top Global 100 Innovators" by Thomson Reuters in 2015 for our leadership performance in overall patent volume, patentgrant success rates, global reach and invention influence.

Our scientists and engineers are presently working to develop technologies designed to produce energy in an increasingly safe, economical and environmentally responsible manner. Two examples are full wavefield inversion and advanced drilling technologies, both of which are enabled by high-performance computing. A supercomputer is a high-performance computer that executes at or near the current maximum operational rate for computers. Supercomputers play an important role in the field of computational science and are used in various fields, including quantum mechanics, climate research and oil and gas exploration. ExxonMobil uses high-performance computing to find and develop the most challenging resource opportunities in the world.

With advanced algorithms and high-performance computing, we are able to process extremely large volumes of data from multiple sources to identify key trends and relationships to determine which decisions will yield the most positive outcome. By leveraging our computational sciences expertise to combine software, engineering and geoscience skills, we are able to deliver the advanced technical capabilities needed to execute technical computations on an unprecedented scale to analyze models, perform simulations and assess opportunities.

Full wavefield inversion

Full wavefield inversion (FWI), a key component of ExxonMobil's EMprise seismic capability, uses supercomputing technology to provide geoscientists unparalleled insights into the physical characteristics of rocks and geologic structures in the subsurface. In the past, the oil and gas industry could only utilize a portion of the sound wave data in 3-D seismic processing technology because processing techniques could not handle the complexity and quantity of data.

FWI enables us to better leverage data from a seismic survey to produce high-definition images of the subsurface that could make development and production more efficient and less costly. In doing so, we can help make oil and gas resources easier to identify and target in exploration, development and production programs, which ultimately helps us reduce our impact on the environment. Specifically, FWI enables us to evaluate data with more certainty — and in a time frame that is practical for business applications — whether or not the rock that is surveyed has potential to contain hydrocarbons.

 (\triangleright) Full wavefield inversion technology animation



Advanced drilling

Advances in technologies used for well drilling and completion have enabled the energy industry to reach new sources of oil and natural gas to meet rising demand around the world. Recent innovations in advanced drilling technology, such as ExxonMobil's proprietary Vybs software, are helping bring about new efficiencies and environmental benefits.

Vybs is the latest breakthrough technology used to overcome factors that limit drilling efficiency. In an effort to improve efficiency, Vybs uses sophisticated algorithms to understand and harness the vibrations at the end of a drill string. Vybs uses kinetic energy from the drill string, thus reducing the amount of energy needed from the rig to penetrate the subsurface. Improving drilling efficiency means wells can be drilled faster, which reduces costs and the amount of time spent with a drill rig on location. In addition to helping reduce the costs associated with drilling, this technology also helps reduce the environmental impact of energy production and safeguard our employees and contractors by allowing more oil and gas to be produced with fewer wells and by reducing our well pad size.

Partnerships with leading universities

ExxonMobil is partnering with approximately 80 universities around the world to explore next-generation energy technologies. We recently began collaborations with Princeton University and Massachusetts Institute of Technology (MIT) as part of our commitment to finding meaningful and scalable solutions to meet global energy demand.

In October 2014, ExxonMobil became a founding member of the MIT Energy Initiative, a unique collaboration that aims to advance and explore the future of energy by focusing on new energy sources and more efficient uses of conventional energy resources. Since launching the collaboration with MIT, the joint research program has made inroads into several areas, including bio-inspired catalysts for the petrochemical industry and computational modeling to better understand the properties of iron and iron-based alloys used in pipelines. The program has also enabled ExxonMobil to expand research efforts to emerging areas like photovoltaic and nuclear power, as well as enhance our understanding of energy options and the interactions between them.

In 2015, ExxonMobil entered a five-year partnership with E-ffiliates, a program administered by Princeton University, to pursue transformational innovations in the fields of energy and environment. E-ffiliates has already started working with research groups across the university, including selected graduate students and post-doctoral researchers. The partnership will help accelerate research by creating an umbrella framework that makes it easy for any business unit of Exxon Mobil Corporation to undertake research projects with any department or lab at Princeton.

"Meeting the world's energy needs in a sustainable way is a formidable challenge. Developing economically viable solutions requires the collaborative efforts of industry, government and academia. We are delighted that ExxonMobil is joining E-ffiliates, broadening the vibrant collaboration between Princeton and leading industry partners in the energy and environmental sectors."

Pablo Debenedetti

Dean of research, Princeton University

Environmental performance

XTO Energy drilling operations in Belmont County, Ohio. ExxonMobil employs structured management processes across an asset's life cycle to ensure we effectively identify and understand the actual and potential impacts of our activities.



ExxonMobil is committed to operating in an environmentally responsible manner while providing the energy needed to power the world's progress. ExxonMobil's Corporate Environment Policy and Protect Tomorrow. Today. expectations serve as the foundation of our efforts, which are guided by a scientific understanding of the environmental impact of our operations as well as the social and economic needs of the communities in which we operate.

Environmental management

Protect Tomorrow. Today. is a set of corporate-wide environmental performance expectations. These expectations build upon the existing Corporate Environment Policy, which is incorporated in ExxonMobil's Standards of Business Conduct, and based on the following principles:

- Delivery of superior environmental performance, leading to a competitive advantage;
- Driving environmental incidents with real impact to zero, through a process of continuous improvement; and
- Achieving industry leadership in focus areas valuable to the business.

Standards of Business Conduct

For more than 10 years, *Protect Tomorrow. Today.* has guided us toward our goal of superior environmental performance. Our employees demonstrate their dedication to this goal every day by helping the organization achieve environmental leadership, caring about the communities where we work and sharing our lessons learned with industry and our stakeholders for the benefit of all.

As we manage our operations, we must understand the impact of our business on the environment, adhere to a consistent risk management approach and maintain a relentless focus on operational excellence. Our *Operations Integrity Management System* (OIMS) drives our approach to environmental management. OIMS defines a set of expectations that align our environmental objectives with our business activities and provides a framework to identify and manage environmental risks. For additional information on how OIMS guides ExxonMobil's approach to environmental management, see page 15.

ExxonMobil's projects and operations are set in a diverse range of environments that present a variety of environmental, social and health risks and opportunities. We employ structured management processes across an asset's life cycle to ensure we effectively identify and understand the actual and potential impacts of our activities.

Our Environmental Aspects Assessment (EAA) process allows us to systematically identify, assess, manage and monitor environmental and social risks throughout the life cycle of our assets. Environmental Business Planning is undertaken to plan, oversee and steward environmental performance. New developments are typically subject to an Environmental, Socioeconomic and Health Impact Assessment (ESHIA) process. Environmental, Socioeconomic and Health Management Plans (ESHMP) are then prepared to "operationalize" ESHIAs by defining the set of measures that will be employed during development and operations to avoid environmental and social risks, reduce them to acceptable levels or remedy the impact. We integrate stakeholder feedback, scientific understanding and other due diligence into these processes to ensure we operate in a safe, respectful and environmentally protective manner. ExxonMobil has undertaken or participated in ESHIAs or EAAs for a wide variety of projects and activities around the world, including projects ranging from single-well exploration drilling programs to new technology evaluation pilots and large development mega-projects.

Biodiversity and ecosystem services

As part of the expectations of *Protect Tomorrow. Today.*, ExxonMobil strives to be a leader in safeguarding the ability of the environment to provide ecosystem services — the direct and indirect benefits people obtain from the environment, such as food, water, shelter, clean air and cultural identity. Our approach to managing biodiversity and ecosystem services recognizes factors such as the rarity of individual species, their roles in different ecosystems and habitats, their vulnerabilities and their cultural significance. For our major projects, biodiversity and ecosystem services are taken into account during our environmental risk management processes.

💭 Environmental Aspects Guide



Up Close: Protecting the biodiversity of Bioko Island

Bioko Island, located 20 miles off the Gulf of Guinea coast in West Africa, is one of the most biologically diverse places on earth, with critical habitat for seven species of endangered monkeys and four species of nesting sea turtles. For nearly 20 years, the ExxonMobil Foundation has supported the Bioko Island Biodiversity Protection Program (BBPP) in Equatorial Guinea, in association with Drexel University and the National University of Equatorial Guinea, to conserve the island's biodiversity through educational and research programs as well as conservation activities.

Since 2008, the ExxonMobil Foundation has provided core funding for the Moka Wildlife Center, the country's first and only biological field station. Here, BBPP hosts educational programs designed to illustrate the value of biodiversity and to foster an environmental ethic in local children. To build upon this initiative, we sponsored the construction of an interpretative nature trail in 2015.

Protecting biodiversity

We plan our activities based on a scientific understanding of the biodiversity in our areas of operation. As part of our commitment to operating in an environmentally responsible manner, we conduct research and support initiatives to help improve biodiversity management. In 2015, we contributed approximately \$4 million to organizations focused on biodiversity protection and land conservation.

For many years, we have sponsored research efforts to study the effects of sound on marine mammals to avoid potentially adverse impacts of our operations. In 2015, Exxon Neftegas Limited, an ExxonMobil subsidiary in Russia, conducted a seismic program covering all three Sakhalin-1 offshore license areas. Throughout the design and implementation of the program, being protective of the western gray whale — a species classified as critically endangered by the International Union for Conservation of Nature (IUCN) — was very important. Our detailed monitoring and mitigation strategy The trail runs adjacent to the BBPP Moka Wildlife Center and allows visitors to observe the local fauna and flora up close. The trail is also marked with signs that display various facts about the biodiversity in the area. In addition to providing information on the various plants and animals, the signs explain their use or importance to the local community. Local children in Moka and other nearby villages can visit the center, walk the trail and learn more about the importance of preserving the biodiversity of Bioko Island.

"The ExxonMobil-BBPP relationship is an internationally recognized model of successful corporate, government and international education cooperative activities. This two-decade relationship built a solid foundation for saving the biodiversity of Bioko Island, for providing sustainable livelihoods for Equatoguineans who depend on the nation's rich natural resources for survival and for improving the international profile of Equatorial Guinea."



Dr. Mary Katherine Gonder Director, Bioko Biodiversity Protection Program

 (\triangleright) Protecting the biodiversity in Equatorial Guinea

was based on 17 years of research on these animals and their habitat and the best practices developed and enhanced during previous seismic operations, as well as knowledge of the timing and behaviors of whales in the area.

We also support research aimed at improving our management of biodiversity. For example, ExxonMobil's Upstream Research Company is investigating the application of environmental genomics in biodiversity assessment and monitoring. Advances in DNA technologies have enabled the rapid characterization of the biodiversity of environmental samples. This has the potential to improve our ability to manage environmental risks by significantly reducing the time required for environmental surveys and analyses compared with conventional methods.

Working in protected areas

ExxonMobil manages elevated biodiversity or species risks by examining the environmental context of the areas where we operate and ensuring adequate protective measures are



Local children reading a book series developed by BBPP learn about the importance of biodiversity in their lives and for their nation.

developed and implemented. We periodically screen the locations of our major operating facilities against databases of the IUCN and World Protected Areas. In 2015, an estimated 25 percent of our major operating facilities were within 5 kilometers of designated environmentally sensitive areas. These data inform our emergency response contingency plans and environmental impact surveys by helping prioritize areas needing special protection.

We continue to collaborate with the Wildlife Habitat Council (WHC) to develop educational and outreach programs through the Corporate Lands for Learning (CLL) program. Currently, we have five CLL programs certified at or near our facilities, including the Billings (Montana) refinery, the Baton Rouge (Louisiana) complex, our Clinton (New Jersey) research facility, the Fife (United Kingdom) ethylene plant and Lentol Garden in Greenpoint, Brooklyn, New York. These programs help us promote environmental awareness, biodiversity and science initiatives in our workforce and local communities. In 2010, the Cold Lake operations of our Canadian affiliate, Imperial Oil, became the first oil and gas operator in Canada to be certified by the WHC. This site was re-certified in 2015, demonstrating our continued commitment to conservation excellence.

By the end of 2015, we actively managed approximately 7,100 acres of land for the benefit of wildlife, which includes assessing habitats, developing plans to enhance or sustain wildlife, implementing the plans and monitoring the status at 16 of our sites through 18 certified programs. Over the past year, there has been a reduction in the number of wildlife habitat programs and acreage certified through WHC. This change reflects the consolidation of sites to our Houston campus and the sale or disposition of previously owned sites. It is our hope that the new owners will continue management of the properties for wildlife habitat valuable to those communities. During the site consolidation process, our employees turned their efforts toward certification of the Houston campus property, achieved in 2014, and continue to seek opportunities at other locations for enhancing wildlife habitat and providing environmental education to local communities.



Rocky Mountain College wildlife biology students and members of the Billings Senior High School STEM Society engage in habitat research at ExxonMobil's Billings refinery's wildlife habitat area in Montana.

One of the recent highlights related to our long-term association with WHC is at our Billings refinery. The 110-acre WHC-certified wildlife habitat at our Billings refinery has served as a learning lab since 2002 for Rocky Mountain College and, starting in 2015, Billings Senior High School. The refinery's conservation efforts have earned international recognition by the WHC and the habitat program has received WHC certification for a decade. In 2015, the site achieved WHC CLL certification, allowing the refinery to more fully use the habitat area for education purposes, especially field research. The students from Rocky Mountain College and Billings Senior High School are making good use of the opportunity and have recently collaborated to install nets for a fishery and turtle survey in an effort to enhance their environmental curricula.

Water management

Water and energy are interrelated. Water is essential for providing energy and energy is needed to deliver clean water to people. This connection, or nexus, between energy and water highlights the importance of these resources for society and the environment. As such, we work to prevent adverse impacts to water resources from our withdrawals and discharges and prudently manage the water we do use.

ExxonMobil develops and implements water management strategies, most notably at the local level, that take into consideration quality and availability, as well as potential trade-offs, such as varied operational efficiencies, increased energy use or the consequences of producing more concentrated waste streams. For more information about how ExxonMobil manages water, visit our website.

ExxonMobil's approach to water use

Water use

In 2015, the net freshwater consumption at our operations was 300 million cubic meters, representing more than a 5 percent decline since 2007, in part due to the development and implementation of local water management strategies. ExxonMobil's total freshwater consumption includes use by refineries and chemical plants, oil and gas production, and onshore shale resources development in the United States.

Global freshwater consumption¹

Millions of cubic meters



ExxonMobil's global freshwater consumption in 2015 was 300 million cubic meters. This represents a 30 million cubic meter increase when compared to our 2014 global freshwater consumption. Since 2012, we have actively maintained our freshwater consumption below our 2011 performance.

¹We report freshwater intensity alongside consumption data in our performance data (pages 90-92). Freshwater intensity is the ratio of net freshwater consumption to the amount of throughput or production. Normalized in this way, we can better understand how efficiently we are using freshwater in our operations. Data collection began in 2007. Includes XTO Energy data beginning in 2011.

We recognize that some of our operations use significant amounts of water, and we understand the necessity to engage with stakeholders regarding their concerns about the use and protection of local water resources. For example, the amount of water needed to hydraulically fracture a typical shale gas well ranges from 3 million to 4 million gallons. However, it is important to put this quantity into perspective. For example, the World Resources Institute found that the average golf course in the United States uses 4 million gallons of water in less than one summer month. In fact, hydraulic fracturing operations account for less than 5 percent of our total water consumption. For more information on our water consumption, see the performance graph above. As illustrated on the right, the amount of the freshwater needed to produce an identical unit of energy from natural gas is less than for a variety of other energy sources, including hydroelectric power and ethanol. According to a recent study by the U.S. Department of Energy's National Energy Technology Laboratory, shale gas production uses about 10 times less water than is used for coal production, and 1,000 times less water than is used for fuel ethanol or biodiesel production. Even so, we continue to look for opportunities to reduce our water use.

ExxonMobil seeks to continuously improve the development and implementation of water management strategies. Part of this effort involves improving our understanding of not only the quantity of our water consumption, but also when and where this consumption occurs. In 2015, ExxonMobil collaborated with ETH Zurich, one of the leading international universities for technology and the natural sciences, to co-author a peer-reviewed paper on improving the capability to assess water stress indices. The purpose of the paper was to explain the impacts of freshwater consumption in life cycle assessments (LCA) of comparative energy sources. In particular, the paper highlights the importance of regional and seasonal variations when considering water stress as part of an LCA.

American Chemical Society water stress index paper

Based on our analysis using the latest version of the oil and gas industry global water tool, almost 40 percent of our major operating sites are located in areas identified with the potential for water stress or scarcity. Where appropriate, we conduct a detailed local analysis of specific water use-related risks and develop site-specific management strategies such as the deployment of water conservation technologies, the use of alternative freshwater sources, recycling of municipal and industrial wastewater and harvesting of rainwater.

For example, conventional methods of dust suppression can require large amounts of freshwater to maintain safe working conditions. By applying a biodegradable dust-control product to the roads at our oil sands operations in Kearl, Canada, we were able to significantly reduce the amount of water required to manage road dust. In 2015 alone, the Kearl oil sands operations saved an estimated 36 million gallons of water.

How much water is needed to produce one quart of oil-equivalent energy?²

Freshwater intensity is the total amount of freshwater needed to produce an identical unit of energy for a variety of energy sources and transportation fuels.



Natural gas

One oil-equivalent guart of natural gas requires anywhere from a tablespoon to a cup of water. Unconventional or "fracked" natural gas is at the higher end of the range.



Extracted coal

One oil-equivalent quart of extracted coal requires less than two quarts of water.



Ethanol

One oil-equivalent quart of ethanol requires from six quarts to as much as 1,176 guarts of water (depending on irrigation). This is typical of most biofuels.



Petroleum

One guart of petroleum requires from one to two-and-a-half quarts of water. (Extraction itself requires less than a cup most of the water goes toward cooling in the refinery.)



Electric power from coal

One oil-equivalent quart of electric power from coal requires anywhere from 11 to 18 quarts of water for cooling. (Gas-fired turbines also require cooling water, but are a bit more efficient and require less water than coal-fired plants.)



Hydroelectric power

One oil-equivalent guart of hydroelectric power requires from 15 quarts to as much as 5,040 quarts of water because of evaporation and subsurface seepage from reservoirs.



²Adapted from the freshwater intensity page at exxonmobil.com.



Heating up an 80-gallon water heater to shower temperature

Wastewater management

ExxonMobil responsibly manages process wastewater and produced water from our operations, and we proactively look for opportunities to address any potential water quality issues. For our Upstream projects, our *Water Management Standard* outlines minimum expected environmental performance and mitigation measures. This *Standard* establishes the planning and design basis for reducing impacts to surface waters, groundwaters, estuarine and marine waters as well as to the associated habitats and users, from a use or consumption viewpoint as well as with regard to discharge quality.

Produced water, a byproduct of upstream oil and gas operations, is typically managed onshore by injection into deep underground reservoirs. For offshore production facilities, produced water is managed by re-injection into an associated reservoir or treatment and discharge into the marine environment in accordance with applicable regulatory requirements. From 2014 to 2015, ExxonMobil conducted a series of sampling and modeling initiatives in Australia to evaluate how produced water discharges might interact with the local marine environment. The results showed the amount by which the concentration of discharge constituents vary day-to-day and the way discharges mix in the sea with the surrounding currents. These factors are critical to understanding the overall environmental impacts of the discharges. The study will continue in 2016.

Seismicity

The topic of induced seismicity has gained more attention over the past few years. In some instances, due to unique geologic conditions, oil and gas operations may trigger seismic activity. Such operations may include reservoir depletion, wastewater disposal injection and in rare situations, hydraulic fracturing. We recognize the issue of oil and gas operations inducing seismicity is a matter of public concern. No matter the cause — natural or human induced — local communities have concerns about seismic activity in their area. We support risk management and mitigation approaches that consider various mitigation methods for the relative risks in a given context, including the assessment of factors such as fluid volumes, formation character, tectonic setting, operating experience and local construction standards. For example, at XTO Energy, we follow a disciplined injection well siting protocol, which uses available data, including federal, state or internal seismic information, to conduct a risk assessment prior to siting a disposal well. Some government agencies mitigate seismicity risk during development with operational "traffic light" systems.

We believe it is important to gain a better understanding of all types and sources of seismic activity. By supporting research at universities, cooperating with governmental agencies and conducting our own research, we are contributing to developing a better understanding of seismicity. We believe having a science-based risk management approach is an essential foundation for evaluating events and avoiding adverse effects of seismicity. In addition, ExxonMobil has been strengthening our risk management systems related to this challenge and proactively sharing our findings with local communities, academia and regulators.

In 2015, ExxonMobil provided technical leadership to States First — a multi-state initiative aimed at facilitating innovative regulatory solutions for oil and natural gas producing states — for its induced seismicity working group's primer on potential injection-induced seismicity associated with oil and gas development. Specifically, the primer provides guidance on evaluating risks associated with induced seismicity from wastewater disposal wells and helps regulatory agencies develop strategies for managing and mitigating risks. Research findings for the primer indicate that risk management, risk mitigation and response strategies are most effective when specific local geologic conditions and operational situations are considered. Accordingly, the primer does not recommend specific policies, emphasizing that a one-size fits all regulatory scheme would not be flexible enough to account for area-specific risks and concerns.

"State agencies are on the forefront of oil and gas regulation and are diligently working to address the safety and environmental issues surrounding modern energy development. Knowing how to best mitigate and manage the risk of induced seismic events requires multidisciplinary scientific understanding that often reaches beyond the domain expertise of any individual state agency or regulatory body. ExxonMobil's technical leadership alongside the contributions of academia, environmental stakeholders and regulators provides a valuable contribution in helping *States First* develop a guide for regulators that is grounded in the best available science."



Mike Paque Executive director, Groundwater Protection Council

Potential injection-induced seismicity associated with oil and gas development: A primer on technical and regulatory considerations informing risk management and mitigation

Spill performance

We implement preventive measures to avoid spills and continually seek to improve our risk management, operations integrity and containment capabilities. As a result of these efforts, we had fewer spills in 2015 compared with 2014. Over the past five years, we have reduced the number of spills greater than 1 barrel by more than 30 percent.

If a spill does occur, we ensure a rapid, comprehensive response. The total volume of hydrocarbons spilled to soil and water was 10,800 barrels in 2015, and more than 55 percent was recovered at the spill sites. The majority of these spills did not affect third parties or the communities that surround our assets. In 2012, we started measuring significant spills to the environment (SSEs) across the corporation. SSEs are a subset of our overall spills, which we define as spills that have impacted or have the potential to impact surface water, groundwater, sensitive environments or communities.

We had 11 SSEs in 2015, which represented approximately three percent of the total number of spills. Our largest SSE occurred when 10 U.S.-Midcontinent production facility tank releases occurred during a flooding event related to a tropical



Claire Madden, ExxonMobil manager of lubricants sales process and operations, celebrates at the christening ceremony for the *Eagle Bay* in Philadelphia, Pennsylvania.

Significant spills to the environment

Number of spills of any fluid type that warrant greater focus



In 2012, ExxonMobil began measuring significant spills to the environment (SSEs), the number of spills of any fluid type that warrant greater focus. In 2015, we had 11 SSEs, more than a 40 percent decrease from 2014.

storm. Other SSEs that occurred were related to valve and flow line failures during normal operations. The findings from our SSEs have prompted further preventive work on facility integrity and reliability upgrades, as well as addressing human factor causal elements. We are increasing focus on learning from these spills to prevent their recurrence.

ExxonMobil recognizes the potential risk for spills from marine vessels and we take a diligent approach to safe and environmentally responsible marine transportation. The worldwide marine business of ExxonMobil's affiliates, which involves about 500 vessels in daily service, logged more than 21,500 voyages and 47,000 port calls in 2015, safely transporting approximately 1.5 billion barrels of crude oil and refined products. This year, ExxonMobil's marine affiliate, SeaRiver Maritime Inc., placed the *Eagle Bay*, the second of its two new U.S. crude oil tankers, into service transporting crude oil from Alaska's North Slope. This vessel incorporates the latest safety technologies and greatly reduces air emissions, which earned it the **2015 Green Ship Award** from the **Port of Long Beach**. For additional information on our efforts to reduce air emissions in our operations, see page 53.

In addition to marine transportation, ExxonMobil Pipeline Company transports approximately 2.6 million barrels of petroleum and chemical feedstocks and products through approximately 5,000 miles of active pipelines operated in the United States every day. We are committed to pipeline safety and carefully maintain and monitor our infrastructure to identify and prevent corrosion, third-party damage or illegal intrusions

Spills (not from marine vessels)³

Number of oil, chemical and drilling fluid spills greater than 1 barrel



In 2015, we had 319 oil, chemical and drilling fluid spills greater than 1 barrel (not from marine vessels), the majority of which were spills to soil. This number has decreased significantly over the past five years due to our relentless approach to operations integrity.

³Includes XTO Energy data beginning in 2011.

onto our rights of way. We patrol our pipeline routes and monitor pipeline operations using state-of-the-art systems, alarms and other monitoring technologies. For more information on how we are managing products transported by rail, see page 22.

Offshore oil spill response

As part of ExxonMobil's commitment to maintaining operational excellence everywhere we work, we have developed specialized offshore spill response capabilities and tactics. We have the industry's only dedicated, in-house oil spill response research program, which includes a focus on cold water and remote locations, such as the Arctic.

ExxonMobil has participated in and provided technical leadership to several joint industry projects to enhance industry offshore spill response capability. These initiatives include the


A worker descends an equipment access walkway onboard a Marine Well Containment Company vessel in the Gulf of Mexico.

American Petroleum Institute (API) joint industry task force, the International Association of Oil and Gas Producers (IOGP) Arctic oil spill response technology joint industry program, an IOGP and IPIECA joint industry project and the API oil sands technical subcommittee. These initiatives allow us to share best practices and learn from our peers. For more information about this topic, visit the following websites:

API joint industry task force

📈 Arctic oil spill response technology



Additionally, for the past five years, ExxonMobil has been an active member of the Marine Well Containment Company (MWCC), an independent not-for-profit company that provides well containment equipment and technology in the deepwater U.S. Gulf of Mexico. In 2015, we re-entered a pre-existing exploratory well for development in the Gulf of Mexico's Julia oil field after receiving a cap-and-flow permit from the Bureau of Safety and Environmental Enforcement. This permit was awarded based on the enhanced response capability of MWCC capture vessels. MWCC added two modular capture vessels to its inventory in 2015. These vessels, which ExxonMobil took the lead in constructing, are maintained and operated on behalf of the MWCC's 10 member companies.

Marine Well Containment Company

We continually identify and develop advanced technologies to manage risks and improve offshore oil spill response. For example, we commercialized the use of biodegradable surfactants that can be sprayed onto the water surface around the perimeter of an oil slick, causing the oil to retract and thicken so that it can be burned in a controlled fashion without using a fire-resistant boom.

Air emissions

We seek opportunities to reduce the air emissions associated with our operations and the products we deliver to increase shareholder value and meet regulatory requirements. As a result of these efforts, ExxonMobil's combined emissions of volatile organic compounds (VOCs), sulfur dioxide (SO₂) and nitrogen oxides (NOx) have decreased more than 45 percent over the past 10 years across all of our businesses.

One example of how we have reduced emissions from our Upstream operations involves Balder, one of ExxonMobil's permanent, floating production vessels stationed offshore Norway. From 2013 to 2015, the vessel's four main power engines were converted to low-NOx systems. The conversion has reduced annual NOx emissions by approximately 21 percent, equal to 290 metric tons of NOx per year. Another example involves our Antwerp refinery in Belgium. In 2015, the refinery began construction of a new tail gas cleanup (TGCU) system to reduce on-site SO₂ emissions by more than 2,300 metric tons per year. The TGCU is expected to be fully operational in 2017.



Balder, one of ExxonMobil's permanent, floating production vessels, stationed in Norway.

Air emissions

Millions of metric tons



In 2015, the combined SO₂, NOx and VOC emissions from our operations totaled 0.39 million metric tons, representing a slight decrease from 2014.

In January 2015, the International Maritime Organization reduced the cap on the sulfur content in marine vessel fuels from 1.0 to 0.1 percent by mass for all ships operating in emission control areas (ECA). This action has reshaped the shipping landscape, particularly in Europe and North America, spurring new demand for fuels that help marine operators comply with the cap. In response, we introduced *ExxonMobil Premium Heavy Distillate Marine 50*, an ECA-compliant premium fuel that combines the low sulfur content of lighter marine oils with the lower volatility typically associated with heavy fuel oils.

"By working collaboratively across the Downstream, ExxonMobil developed a wide and exciting array of solutions to lead the marine industry into this new era."



Nancy Carlson Vice president, aviation and marine

Environmental compliance

ExxonMobil complies with applicable host-country environmental laws and regulations and applies responsible standards where laws and regulations do not exist. Wherever reasonable, we strive to go beyond compliance to demonstrate leadership in environmental management. One example of this is at our Baton Rouge refinery in Louisiana.

ExxonMobil's Baton Rouge refinery is the third-largest refinery in the United States, occupying 2,100 acres along the Mississippi River. In 2014, we upgraded the biological oxidation (BIOX) wastewater treatment system at the refinery. Our investment included an additional \$10 million to increase denitrification capacity. The new BIOX system became fully operational in January 2015 and has successfully cut effluent nitrate levels by 50 percent. The system has also helped reduce the refinery's overall reportable releases to the environment, including air emissions, water discharges and offsite waste transfers, by 30 percent.

"This project is good for the environment and the Mississippi River. We're reducing nitrates and also making a small reduction in air emissions. This project will support our facility for decades and ensure our leadership in environmental stewardship."



Irving (Junior) Sanders

Refinery senior water advisor, Baton Rouge

Our worldwide environmental expenditures in 2015 totaled approximately \$5.6 billion. This included an estimated \$1.8 billion in capital expenditures and approximately \$3.8 billion in operating expenses. In 2015, 53 penalties, fines and settlements were paid, accounting for less than one-tenth of one percent of total environmental expenditures, or about \$5.5 million.

Rehabilitation and decommissioning

Effectively decommissioning onshore and offshore assets is essential to reducing our overall environmental impact. When operations reach the end of their useful life, we work to ensure the safe and responsible decommissioning of our assets. To do so, we develop decommissioning plans that utilize proven and cost-effective methods and consider potential risks, costs and benefits.

Since its creation in 2008, ExxonMobil Environmental Services (EMES) — our global functional organization that provides guidance and support on the remediation and stewardship of surplus sites — has managed more than \$5.7 billion of remediation work and returned more than 1,800 properties to beneficial end uses. In 2015 alone, EMES monitored 5,700 active sites in more than 30 countries. In 2015, we collaborated with the Land Trust Alliance, a national land conservation organization, to create *Establishing Conservation Easements on Corporate Lands: A Guide for Corporations and Land Trusts.* This document will serve as a reference tool for many corporations, including those in the oil and gas industry, when managing land with inherent conservation value warranting permanent protection.

Establishing Conservation Easements on Corporate Lands: A Guide for Corporations and Land Trusts

Whenever possible, we look for opportunities to repurpose former ExxonMobil sites and surplus properties for beneficial use. For example, Harris County, Texas, is home to an inland waterfowl rookery, which serves as a sheltered breeding spot for herons, egrets, spoonbills and other species of coastal water birds. To help protect the rookery, we donated more than five acres of surplus land located adjacent to the rookery for



Tricolored heron at the Armand Bayou waterfowl rookery in Harris County, Texas.

stewardship by the Armand Bayou Nature Center. The former drill site now serves as a protective buffer to ensure that the rookery and its inhabitants are safe from future development.

Rehabilitation

We continually seek to enhance our reclamation processes by integrating site remediation plans into life cycle planning for an asset. Before Imperial Oil, an ExxonMobil affiliate in Canada, began construction of the Kearl development, a pre-disturbance assessment was conducted. This assessment helped to document reference conditions for the site's soils and vegetation, which will be used to plan and execute end-of-life site reclamation work. In particular, topsoil was salvaged during the construction phase so that it could be used during reclamation.

Our focus on site rehabilitation leads us toward innovative ways to ensure the land we use is available for environmental and societal benefits in the future. For example, as areas of the Kearl oil sands mine in Canada are no longer needed, we prioritize them for progressive reclamation. Progressive reclamation not only prevents erosion in the short term, but also allows the land to be returned to the local boreal forest ecosystem more quickly. Reclamation planners at Kearl, working closely with local First Nations, aim to achieve a maintenance-free, self-sustaining landscape in the long term, the planning for which takes into account traditional knowledge of the area's wildlife, habitat and biodiversity. As of 2015, cumulative permanent reclamation on the Kearl lease was approximately 242 acres that include terrestrial, wetland and aquatic ecosystems.

ExxonMobil is committed to the responsible, sustainable and consistent stewardship of rehabilitated former operational sites. We support science-based, cost-effective approaches to remediation that utilize consistent criteria and seek to align the interests of a broad array of stakeholders. In 2013, EMES used an organic capping approach to treat marshland and a cove impacted by the Pegasus Pipeline incident. This technique promotes the most effective cleanup with the least environmental disturbance. Some of the affected soil and sediment in the cove was targeted for removal and reactive capping was employed in the open water area using a mixture of sand and clay. This multi-dimensional risk-based approach addresses residual sheening conditions observed in isolated areas in the western part of the cove.

Up Close: Offshore decommissioning in the Gulf of Mexico

The deepwater Gulf of Mexico is one of the largest sources of oil production in the United States and will likely play a key role in meeting rising global energy demand. However, Gulf of Mexico operations present a unique set of technological, environmental and social challenges throughout the life of an asset. ExxonMobil has been safely conducting exploration and production operations in the Gulf of Mexico for more than 60 years. Technological advances have enabled ExxonMobil to produce offshore oil and gas deposits in water depths that seemed unreachable a generation ago.

While ExxonMobil uses a systematic process for decommissioning offshore assets, our site-specific approach varies depending on the type of structure and unique characteristics of a location. In all cases, we evaluate potential strategies based on a number of factors including safety, environmental and social considerations. Certain decommissioning strategies have the potential to provide continued benefits to the environment. Accordingly, we use comparative assessments as well as ecological data to determine the best strategy.

One example of our approach to offshore decommissioning was demonstrated at a deepwater platform site offshore of Louisiana. To help understand the unique ecological environment supported by this offshore platform, ExxonMobil's Upstream Research Company (URC) used remotely operated vehicles (ROV) to complete an ecologically focused deep sea survey. URC partnered with a Gulf of Mexico fisheries expert from Louisiana State University, Dr. Mark Benfield, who assisted in developing new detection methodologies and reviewing the ROV data.

The survey data confirmed that the platform hosts a healthy and diverse biological community, including thriving communities of *Lophelia pertusa*, a deepwater coral species.

Lophelia pertusa is an important species because it provides habitat for other invertebrates and fish in a similar manner to shallow water coral reefs. Many other deepwater invertebrates were also identified, including squat lobsters, sea stars, anemones and crabs. A variety of deepwater fish species were also identified on or very near the structure.

"At this offshore platform site is a large oasis of healthy coldwater coral reef in an otherwise low-diversity, soft-bottom region of the northern Gulf of Mexico. The scientific analysis completed to date supports the opportunity of reefing in place. This overall area available for cold-water corals and their associated fish and invertebrate populations has established an important habitat for large, reproductively important groupers and other deepwater fishes and an opportunity to study the expansion of a cold-water coral reef community. Maintaining this habitat will also help to eliminate a population of invasive orange cup coral and associated Indo-Pacific lionfish."

Dr. Mark Benfield

Professor, Louisiana State University

Decommissioning

Throughout the Upstream asset life cycle — from exploration to decommissioning — care is taken to limit disruptions to local communities and protect the environment. Accordingly, ExxonMobil ensures that decommissioning activities are planned and conducted to appropriately manage risks. For our fixed manufacturing assets, the same care is taken. For example, in 2015, we completed decommissioning a steam cracker at our Fawley refinery in the United Kingdom, the largest demolition project ExxonMobil has carried out in Europe.

As part of the project, ExxonMobil worked to preserve materials that could be reused or recycled for other purposes. In total, we segregated and recycled around 15,000 metric tons of materials, which represented 89 percent of all materials recovered from the demolition site. Ferrous and non-ferrous metals were sold as scrap and the concrete was crushed and reused for land reclamation. Material that was unable to be recycled was disposed of according to local regulations. Additionally, the project incorporated environmental considerations. For example, some activities were rescheduled to avoid potential impact on nesting birds and annual bird migrations. The Fawley site also features a small population of wild bee orchids and particular care was taken not to damage the orchids during the flowering season.

"It really is the end of an era. I hope this project can stand as an example to the petrochemical industry of how the demolition of large-scale units can be achieved in a safe and controlled manner."



Rob Tarbard Project manager, Fawley demolition

>) End of an era for a steam cracker at Fawley

Offshore assets present unique and complex decommissioning challenges due to a combination of factors, including the specific marine ecosystem at each site and the size and weight of facilities, as well as the inherent risks of removing such facilities in marine environments. As a result, the planning and preparation for decommissioning some offshore assets can start up to 10 years prior to the actual execution. During the planning phase, we seek to incorporate lessons learned from other decommissioning projects as well as expert advice from interested parties. These parties may include fishing communities, environmental organizations and academia. We believe stakeholder engagement is critical to helping us gain public support for the facility decommissioning recommendations we submit to the government.

In recognition of the unique challenges associated with offshore assets, we created an offshore decommissioning center of expertise (COE) in 2015. This COE is tasked with planning and managing the decommissioning of our offshore assets.

Case Study

Technological innovations in Arctic wildlife protection

Our Point Thomson project along the Beaufort Sea coast in Alaska. We have implemented technological advancements to improve our understanding of the tundra, wildlife, aquatic resources and subsistence activities near our operations.



ExxonMobil's Point Thomson project is located on state acreage along the Beaufort Sea coast, 60 miles east of Prudhoe Bay, Alaska. The Point Thomson reservoir holds an estimated 8 trillion cubic feet of natural gas and associated natural gas condensate, a high-quality hydrocarbon similar to diesel. These resources represent about 25 percent of the known natural gas reserves in Alaska's North Slope. From the outset of the project, ExxonMobil has worked to understand the local physical, biological and social environment.

It is our goal to develop Point Thomson safely and responsibly. We believe that strong safety, security, health, environmental and social performance is integral to the overall success of the project. Throughout the planning, design and construction of





A radar panel and camera system are used to detect polar bears, including in dark and foggy conditions.

Point Thomson, ExxonMobil has made it a priority to effectively manage environmental impacts. We have implemented comprehensive measures to mitigate potential impacts on tundra, wildlife, aquatic resources and subsistence activities.

As part of the project, care is taken to ensure wildlife and wildlife habitat in the area are protected. We use marine mammal and wildlife protection plans that are recognized by the U.S. Fish and Wildlife Service as a North Slope industry best practice. We continually look for technological advancements to improve our understanding of the wildlife near our operations.

In 2015, we piloted and enhanced a series of emerging technologies in the oil and gas industry, including the use of satellite-based remote sensing technology, ground surveillance radar (GSR) and unmanned aerial systems (UAS) to monitor local wildlife and improve our environmental performance in the vicinity of our Point Thomson project site. Polar bears, which are a protected species under the Marine Mammal Protection Act and a threatened species under the Endangered Species Act, travel through the Point Thomson area. ExxonMobil has taken several measures to identify and avoid potential contact with polar bears and polar bear dens, including the use of forward-looking infrared cameras to survey surrounding areas. We also provide training to Point Thomson employees and contractors on best practices for avoiding and mitigating interactions with wildlife. Early detection of polar bears helps workers to maintain a safe distance, improves our ability to monitor bear movement and, if necessary, allows us to warn workers to seek safe haven or safely redirect bears away from our facilities in accordance with procedures approved by the U.S. Fish and Wildlife Service.

In April 2015, we upgraded and expanded the use of GSR technology to detect polar bears and other large animals approaching from distances greater than one kilometer. This pilot program combines state-of-the-art radar with pan-tilt-zoom infrared and visual spectrum cameras to provide visual confirmation of objects detected by the radar.

The technology put in place at Point Thomson is believed to be one of the most advanced detection and avoidance systems ever deployed in a remote Arctic environment — where both human safety and polar bear protection are vital concerns. We are enhancing the system in 2016 with additional radar panels and cameras to provide greater coverage around the facility.

A core component of ExxonMobil's vision for Point Thomson is to be a good neighbor. We work with the local communities and government authorities in the project area to understand their concerns and avoid conflicts with their lifestyle. Through a comprehensive assessment approach and regular engagement, we are able to identify areas of concern to the local residents, and we have adopted corresponding measures to address these concerns. We also engage with stakeholders in local communities and with government and regulatory agencies to help address biodiversity and sustainability challenges. For example, ExxonMobil participates in meetings and workshops with North Slope Borough officials and residents to develop a deeper understanding of local concerns and priorities.



A worker launching a PrecisionHawk fixed-wing UAS near the Point Thomson project.

ExxonMobil monitors caribou in the Point Thomson project area to assess herd migration patterns. Traditional aerial surveys were conducted in June 2013 and June 2014 to count caribou in the project area and document calving locations. Between May and September 2013, we deployed motion-activated cameras to document caribou movements near planned infrastructure, and in 2014, we monitored caribou behavior around constructed facilities.

In response to feedback from North Slope communities about the use of low-flying aircraft in caribou surveys, we tested the capabilities of satellite-based remote sensing techniques to monitor the annual summer caribou migration near our project location in 2015. Following three years of monitoring, the number of caribou moving through the area suggested that the presence of the pipeline did not deter caribou movements.

Using remote sensing technology enabled us to augment aerial surveys and reduce the use of low-flying aircraft for caribou surveys. We used high-resolution imagery collected from three satellite platforms, in coordination with an



aircraft survey and caribou collar GPS data, to determine known caribou locations. Data from all three platforms were evaluated for visual and unique spectral signatures. The preliminary results from this initiative proved promising, and we will continue to test remote sensing and other emerging technologies to further enhance our wildlife monitoring initiatives. To our knowledge, this is the first attempt to use remote sensing methodologies to monitor caribou populations on the North Slope of Alaska.

ExxonMobil also seeks to protect wetlands, streams, lakes and marine waters in the Point Thomson area. For example, we designed roads, bridges and culverts in a manner that maintains natural drainage patterns and stream flows to the extent possible. Additionally, where appropriate, ExxonMobil uses bridges instead of culverts to mitigate potential impacts on fish passage and stream flows. In 2015, our engineers and scientists experimented with two UAS surveys at Point Thomson to evaluate tundra vegetation and water bodies as an alternative to traditional helicopter-based surveys.

The UAS proved to be more accurate and provided superior imagery for photographic monitoring of these important environmental sites. During the same experiment, we evaluated the ability to survey pipelines in the vicinity of our Point Thomson operations.

Point Thomson marks a new era both for ExxonMobil in Alaska and on the North Slope. ExxonMobil's investments will open the eastern North Slope to new development and lead to the prolonged use of the trans-Alaska pipeline system. Throughout the planning, design and construction of the Point Thomson project, ExxonMobil has made it a priority to avoid or reduce environmental and social impacts and their related risks. We have implemented a variety of mitigation measures with a focus on the tundra, wildlife, aquatic resources and subsistence activities to ensure our operations are conducted in a responsible manner.

 (\triangleright) Unmanned aerial systems pilot at the Point Thomson project

Community and social impact

Members of ADPP, an ExxonMobil Foundation grant recipient, participating in women's farmer clubs in Angola. ExxonMobil strives to have a positive impact around the world on the individual communities in which we live and operate.



We seek to contribute to the social and economic progress of the local communities where we operate. We believe that maintaining a fundamental respect for human rights, responsibly managing our impacts on communities and making valued social investments are integral to the success and sustainability of our business.

The socioeconomic aspects of our business fall into seven broad categories, as depicted below. While all of these socioeconomic aspects are discussed in this report, in this chapter we focus on the following five topics: human rights; community relations; indigenous peoples; cultural heritage and diversity; and land use and resettlement. For information on transparency and anti-corruption, see the corporate governance chapter beginning on page 81, and for economic development, see the local development and supply chain management chapter beginning on page 74.



Respecting human rights

ExxonMobil is committed to respecting human rights. Our approach to human rights is consistent with the United Nations (UN) *Guiding Principles on Business and Human Rights*, which outline the distinct, yet complementary, roles of government and business with regard to human rights: the government's duty to protect human rights, and business' responsibility to respect them. We believe that understanding and addressing the interests of communities where we operate, and the potential impact of our operations on them, is critical to maintaining a sustainable business. ExxonMobil actively engages with stakeholders in local communities and integrates these discussions into decision-making processes to identify any issues or concerns early on in a project. In 2015, we developed a risk assessment tool — as part of our *Environmental, Socioeconomic and Health Impact Assessment* (ESHIA) process — that enhances operational due diligence by strengthening awareness of potential human rights impacts and risks.

ExxonMobil operates in environments where engagement with host governments is needed to support security and respect for human rights in local operations. We have been a member of the Voluntary Principles on Security and Human Rights since 2002, and in 2015 we became one of the corporate representatives on the steering committee of the Voluntary Principles. Through our role on the steering committee, we work closely with governments, nongovernmental organizations (NGOs) and industry to share and promote best practices in security and human rights.

Our Statement and Framework on Security and Human Rights includes guidance on working with both host governments and private security personnel in a manner that respects human rights. We also have agreements with private security firms with which we work that contain requirements to uphold human rights. These agreements include expectations for training and compliance with relevant local, UN and other security-related frameworks. In 2015, we updated our Upstream Operations Integrity Management System (OIMS) for security to address expectations regarding the Framework, including responsibilities for employees and contractors in our Upstream operations. We conduct assessments to verify implementation of the Framework as part of our OIMS process.

ExxonMobil complies with all applicable laws and regulations and seeks to work with suppliers and business partners who share our commitment to human rights. For information on detecting, preventing and managing human rights risks in our supply chain, see page 78. Within our own workforce, our commitment to human rights is supported by our Standards of Business Conduct and our Statement on Labor and the Workplace. Our Statement reinforces support for the principles of the International Labor Organization (ILO) 1998 Declaration on Fundamental Principles and Rights at Work, notably the elimination of child labor, forced labor and workplace discrimination.

Up Close: Human rights general awareness training

ExxonMobil has conducted human rights training in select regions for many years. We believe our training builds understanding of human rights and awareness of potential impacts. In late 2015, we rolled out a new computer-based human rights training module to further enhance internal awareness of human rights. This training primarily targets employees working in locations with higher potential human rights risks, and it includes information about what human rights entail as well as their relevance to ExxonMobil. As of year-end 2015, more than 1,200 employees in over 40 countries have participated in the training, including personnel working on the development of the Chad-Cameroon pipeline system. This newest training module complements existing training programs that have been underway for several years in security and socioeconomics.

"The Chad-Cameroon development project involves complex operational, environmental and social issues. We believe a commitment to respect human rights is critical to our license to operate in our producing areas and along the pipeline route. The computer-based training provides our employees with a more in-depth understanding of potential human rights risks, and helps increase awareness of employee responsibilities regarding this issue."



Christian Lenoble General manager, Esso Exploration and Production Chad Inc.

Managing community engagement

ExxonMobil works in communities all over the world, each with their own unique cultures, needs and sensitivities. We strive to have a positive impact on the individual communities in which we live and operate. We believe proactively managing potential issues, while also enhancing community benefits, is integral to developing long-term, positive relationships.

ExxonMobil believes a consistent approach helps our employees, contractors and partners effectively manage socioeconomic issues. We use our *Upstream Socioeconomic Management Standard* to identify potential socioeconomic impacts and their associated risks early in the Upstream asset life cycle, and then develop and implement appropriate avoidance, reduction, remedy and monitoring measures.

In 2010, ExxonMobil established a socioeconomic management center of expertise (COE) to ensure a systematic approach to a dynamic and evolving arena. The COE utilizes a functional advisory team with various representatives from relevant company business lines, such as procurement, treasurers, land, security, medical and occupational health, and public and government affairs. The advisory team meets semiannually to review and discuss strategy, alignment and direction regarding socioeconomic considerations. The COE also meets with our External Citizenship Advisory Panel annually to review initiatives and gain insights and direction for future efforts.

Further, a socioeconomic management course regarding implementation of the *Upstream Socioeconomic Management Standard* and its elements is held twice a year. This course has provided a forum for more than 100 ExxonMobil employees from 18 countries to collaborate as well as exchange ideas and lessons learned.

We have found that in order to optimize opportunities for creating and enhancing positive socioeconomic effects and to successfully implement appropriate risk management measures, identifying actual and potential impacts early is essential.



Up Close: The Hebron project in Canada

Located offshore Newfoundland and Labrador, Canada, the Hebron project is estimated to produce more than 700 million barrels of recoverable resources over the next 30 years. The project requires a number of components, including a gravitybased structure (GBS) that stands on the seafloor and supports the topsides modules, which contain living quarters and drilling and processing operations. Several of these components are being built at Bull Arm, one of Hebron's main construction sites in Newfoundland and Labrador. Since 2009, a number of programs have evolved from our ongoing community consultation, including construction site tours and ocean education programs.

The project launched a public tour program in 2013, through which more than 2,600 visitors have taken bus tours of the Bull Arm construction site. The tour route includes a view of the camp facilities and two lookout points: one overlooking the former dry dock area and the second overlooking the deepwater site. A dedicated tour facilitator accompanies each group and provides a safety overview, history of the site and an overview of activities to date for both the GBS and topside modules. Through our consultation with various community groups in Newfoundland and Labrador, we learned of a common desire to increase the public's ocean awareness and education. In response, project personnel worked with local organizations to develop ocean education programs that support science education while reflecting the local community's oceanic culture and economy. Contributions made by the project also facilitated the establishment of the Oceans Learning Partnership, a multistakeholder organization dedicated to enhancing the awareness and interest in the ocean and ocean-related careers among the youth of Newfoundland and Labrador.

In 2012, the Hebron project funded the "Floating Classroom," a 42-foot-long, state-of-the-art research vessel designed to help K-12 students develop skills in oceanographic, biological and meteorological fields. The program engages students through hands-on learning experiences at sea, including identifying marine species and habitats and measuring water quality and weather conditions.

The project also contributed to the establishment of the Petty Harbour Mini Aquarium, a seasonal small-scale aquarium that showcases marine life found in Newfoundland's coastal waters. As a seasonal program, all of the marine life in the tanks is returned to the local waters at the end of each season. In each of its first three years of operation, more than 17,000 people have visited the aquarium.

Up Close: Community advisory panels in Appalachia

Many areas in Appalachia have a long history of energy development. However, unconventional oil and gas development is still relatively new. Our approach to community relations is grounded in general principles that allow us to tailor our efforts to address the needs of a given community where we live and operate.

In order to tailor our approach to local issues, we have developed community advisory panels (CAP) near our operations in areas of Pennsylvania and Ohio. To form a CAP, we partner with community leaders who live and work in the areas where we operate — local officials, leaders in education, business community members, emergency and first responders, land and mineral rights owners and local charitable organizations. Recognizing that there is no substitute for face-to-face communication, XTO Energy employees engage regularly with these community leaders to discuss the phases of our operations, including drilling, hydraulic fracturing, production and processing. Additionally, in order to give context to our discussions, we provide site tours to give an up-close look at our operations.

We believe that engaging in open dialogue with members of the community is vital to our long-term success in the region. Our regular meetings help us stay in direct contact with the community as we strive to address concerns that arise in real time, and help keep the community up to date about our activities. In addition to providing context to our operations,

By outlining different expectations based on the identification of relevant socioeconomic aspects, the *Standard* ensures that our Upstream activities proactively identify socioeconomic risks and implement timely well-balanced solutions.

Community relations

Working collaboratively and transparently with local communities is essential to promoting positive long-term relationships and fostering ongoing support for our activities. We make every effort to consult with community stakeholders on a regular basis for the purpose of exchanging information and proactively identifying issues or concerns. By integrating the results of these discussions into our decision-making processes, we can help avoid or reduce our impacts on communities, enhance benefits, avert delays, reduce costs and prevent the escalation of issues.

ExxonMobil defines our location-specific community awareness programs and government relations protocols using our *Best Practices in External Affairs* (BPEA) coupled with ESHIAs and/or *Environmental, Social and Health Management Plans* (ESHMPs). Our BPEA process is designed to help identify the specific needs, expectations and interests of host communities and aligns those needs with our community investment programs. We utilize ESHIAs to identify the actual and potential impacts of a specific project and ways to avoid, reduce or remedy those impacts. Together, BPEA and ESHIAs help build and maintain a positive and transparent relationship in the communities in which we operate.

We seek to ensure interested stakeholders are fairly represented as community issues are discussed and decisions are made. Once a project starts, we provide local groups and individuals with communication channels to voice concerns. Our *Upstream Socioeconomic Management Standard* includes provisions for establishing a systematic and transparent grievance management process to address individual and community concerns about a project. When appropriate, dedicated personnel are responsible for developing and managing a process to map, track, analyze and respond to community grievances.

Indigenous peoples

Our operations sometimes take place in areas inhabited or historically used by indigenous peoples. In locations such as this, we work with indigenous communities to respectfully protect their cultures and customs. XTO Energy engineers and geologists explain the steps we take to safeguard the community and the environment and to combat the misinformation about our industry that is prevalent in the media.

"There is no 'one-size-fits-all' solution to community engagement. Every community has its own unique needs and challenges, and we work to maintain an ongoing dialogue with our neighbors, partners and local leaders. By developing strong relationships, we can better understand the needs of our communities and help ensure the work we do is creating a lasting benefit."



Amy Dobkin

Community relations manager, XTO Energy Appalachia Division

Our approach to interacting with indigenous peoples around the world is consistent with the following four guidelines:

- ILO Convention 169 Concerning Indigenous and Tribal Peoples in Independent Countries
- United Nations Declaration on the Rights of
 Indigenous Peoples
- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability
- World Bank Operational Policy and Bank Procedure on Indigenous Peoples

When working with indigenous peoples, one of our key objectives is to determine how they prefer to engage. For example, communities can decide if they want us to meet with elected leaders, community elders or other representatives, and if those engagements are conducted in a public forum, either formal or informal. We empower the communities to establish their preference for how often and how long their members meet with ExxonMobil representatives, and who will provide their viewpoints or represent their wishes.

Up Close: Working with indigenous peoples in Kaktovik, Alaska

The village of Kaktovik, located within the Arctic National Wildlife Refuge Coastal Plain on Barter Island, is home to approximately 250 to 300 residents of Inupiat Eskimo descent whose ancestors have lived in the area for centuries. During the 1890s and early 1900s, Barter Island was an important trading site for commercial whalers. Early inhabitants of the region were semi-nomadic and relied heavily on the availability of fish, game and marine mammals. Today, Kaktovik residents continue to maintain a strong connection to the cultural heritage of their ancestors.

Our Point Thomson project is located on state acreage along the remote Beaufort Sea coast, 60 miles west of Kaktovik. A

central tenet of our vision for Point Thomson is to be a good neighbor. Through regular and consistent communication with Kaktovik community leaders and residents, we learned about their long-standing desire to reconnect with a collection of more than 3,000 artifacts that were excavated and removed from the area in 1914 and curated at the Canadian Museum of History (CMH). The collection includes antler arrowheads, ivory harpoon heads, traditional copper slate knives and other remarkably preserved artifacts that represent a way of life extending back 1,000 years.

The Point Thomson project's multi-year cultural resources management program culminated in the return of this collection to Alaska for the first time since 1914. As part of a museum-to-museum loan, the CMH sent this iconic collection to the University of Alaska Museum of the North in Fairbanks, where ExxonMobil sponsored Kaktovik cultural experts to visit and assist researchers in the documentation and analysis process. The program soon evolved into a cultural exchange where village residents were able to reconnect with the collection, helping bolster local elementary and secondary education programs that preserve and advance their rich Inupiat cultural heritage.

 (\triangleright) Return of artifacts to Alaska fulfills century-old promise



Kaktovik artifacts preserved at the University of Alaska Museum of the North in Fairbanks, Alaska.

In addition, we seek to provide mutually beneficial training, employment and business opportunities to indigenous peoples through local content programs and strategic community investments. For additional information on our strategic community investment initiatives, see page 64.

A core component of our operations is ensuring the safety of our employees as well as neighboring communities. In 2015, ExxonMobil partnered with the Marine Exchange of Alaska, a nonprofit maritime organization, and two local indigenous villages to upgrade safety technology in their communication centers near our operations at Point Thomson, Alaska. Vessel tracking software and communication devices were used to help village residents monitor marine vessel traffic in relation to their traditional subsistence hunting areas. As a result of this effort, marine users were able to avoid conflicts with subsistence activities and carry out their operations in a safe manner.

We continue to participate on the global oil and gas industry association for environmental and social issues, IPIECA's, task force on free prior and informed consent, which focuses on gaining clarity on the definition and best practices for working with indigenous peoples. In 2015, IPIECA continued to monitor developments related to this topic and held periodic calls, sessions and webinars to share local knowledge and discuss emerging trends.

Cultural heritage and diversity

We are sensitive to concerns around balancing cultural heritage with the desire for economic development. Our respect for the cultural heritage and customs of local communities carries into our everyday business practices. For our Upstream projects, we incorporate into our project planning, design and execution considerations such as cultural, spiritual or sacred heritage sites and areas, biodiversity conservation, traditional knowledge and sustainable resource management.

Prior to starting work in an area, we identify potential sites of cultural significance using a cultural heritage identification process. Additionally, we leverage relevant studies to deepen the knowledge among our workforce and provide training to our construction and field contractor personnel on managing cultural heritage challenges. Our objective is to preserve cultural sites and artifacts appropriately.

Land use and resettlement

ExxonMobil employs practices and policies to respect property rights in the locations where we operate, and we pay particular attention to those areas populated by indigenous peoples. Whenever land is necessary for projects, we adhere to applicable host-country regulatory requirements that govern land acquisition. If projects are externally financed, we also comply with land use, access and resettlement requirements stipulated by the lender(s). Additionally, consistent with the 2012 IFC *Performance Standards*, when working on traditional lands, we endeavor to obtain the free, prior and informed consent of indigenous peoples before initiating significant development activities.

We understand that community members often have concerns about how our activities may affect their land and way of life. When managing land-use-related impacts, we aim to minimize involuntary resettlement through a disciplined multidimensional site selection process. Several potential locations are typically assessed based on technical criteria such as availability, accessibility, safety, security and constructability, as well as environmental and social considerations. All of these factors are then evaluated and locations are ranked to determine the lowest-risk options. There are several cases where we have rerouted infrastructure or chosen an alternative site for a facility to address resettlement-related concerns.

When physical or economic displacement is unavoidable, we seek to ensure the restoration of the livelihoods of displaced persons by developing and implementing location-specific resettlement action plans that are informed by consultations with landowners as well as surveying and mapping of housing structures, gardens, wildlife, natural products, harvesting areas and other assets. Assessment teams also identify resettled individuals or groups who may be more affected by the displacement than others. When appropriate, we closely monitor these individuals or groups and assign them to priority resettlement assistance programs. ExxonMobil was not involved in the resettlement of any individuals in 2015.

We did, however, complete our resettlement and livelihood restoration process in Papua New Guinea (PNG), including a two-year monitoring process. The project conducted internal outcome evaluation for both standard of living and livelihood restoration of affected households. This program, which was a lender requirement and part of the ESHMP for the PNG liquified natural gas project, was well-defined, wellcommunicated and well-managed. Closeout was achieved via a formal audit by the lenders, and ExxonMobil was commended for its overall performance and management of the program.

Strategic community investments

ExxonMobil strives to be a good corporate citizen by working with governments, engaging with stakeholders and partnering with local and international organizations to help enhance the quality of life in the communities where we operate around the world. Whether through the U.S.-based ExxonMobil Foundation, the corporation or international affiliated company operations, we strategically invest in long-term social programs that directly impact our business and align with a host country's economic and social goals. In 2015, we contributed \$268 million to communities around the world.

2015 community investments by focus area¹

Millions of dollars



ExxonMobil seeks to make meaningful community investments in a variety of focus areas. In 2015, total community investments were \$268 million, with the greatest investment in civic and community initiatives.

¹Total contributions include donations from Exxon Mobil Corporation, our divisions and affiliates, and the ExxonMobil Foundation, as well as employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs. Investments do not include environmental capital and operating expenditures, which totaled approximately \$5.6 billion in 2015.

We focus the majority of our spending on our corporate-led signature initiatives: improving education, combating malaria and advancing economic opportunities for women. We concentrate on these three areas because we believe they help build a foundation for human progress.

In addition to our signature initiatives, we provide local investments tailored to address community-specific social and economic challenges such as workforce development, access to health care and natural disaster recovery support. We consider the development goals of each community when deciding where, when and how best to invest.

2015 community investments by geographic region²

Millions of dollars



ExxonMobil's community investments span across the many geographic regions in which we operate. In 2015, we invested a total of \$268 million in communities around the world.

²Total contributions include donations from Exxon Mobil Corporation, our divisions and affiliates, and the ExxonMobil Foundation, as well as employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs.

One example of our local investment efforts in 2015 included the completion of a three-year community health center restoration project in Batete, Equatorial Guinea. This community-specific investment by ExxonMobil affiliate Mobil Equatorial Guinea Inc. is designed to provide local community members with access to the latest medical equipment and a full-time doctor on site. The health center in Equatorial Guinea supports around 3,000 residents in Batete and its surrounding villages. Members of the Batete community are already experiencing the benefits of the ExxonMobil-funded improved health care services. Just two weeks after the center was completed, the first baby was successfully delivered in the facility under enhanced hygienic conditions. Additional information on our community-specific investments can be found on the global stories section of our website.

"Batete is a good example of our community investment philosophy — how we not only prioritize large urban communities, but also rural areas of the country."



David Findley Lead country manager, Mobil Equatorial Guinea Inc.

Global stories

To help understand the impact of our strategic community investment program and maximize the long-term sustainability and benefits of our efforts, we work in close collaboration with our partners to design and implement robust measurement and evaluation plans. We also conduct research intended to contribute to the broader fields in which we invest. For example, in 2015, we made efforts to identify a set of common metrics that enable community investment program implementers and supporters to measure the qualitative and quantitative impact of programs aimed at providing economic opportunities for women. For the following examples, and wherever possible in this report, we seek to describe the outcomes of our investments beyond dollars spent and activities conducted.

Up Close: The Teach For All Global STEM Initiative

Science, technology, engineering and mathematics (STEM) skills are critical to ensuring today's students are prepared for the jobs of the 21st century. At ExxonMobil, we believe we can have the greatest impact on education by helping train highly qualified teachers in math and science, encouraging students from all backgrounds to pursue math and science, and preparing students for STEM-related college degrees and careers. For more than a decade, we have focused our education initiatives on a variety of programs that help address the STEM challenge.

The ExxonMobil Foundation is the founding partner of Teach For All's Global STEM Initiative. The Initiative, launched with our support in 2015, has enabled Teach For All to help its nearly 40 partner organizations improve their recruitment, training, placement and support of STEM teachers across the network. The goal of the program is to increase the number and impact of STEM teachers around the world, including in Argentina,



A teacher participating in Enseña por Colombia mentoring his students on STEM subjects.

Colombia and Mexico. The initiative will also help Teach For All support network partner alumni who are leaders in STEM fields.

With funding from ExxonMobil, Teach For All has started prioritizing STEM education as part of their teacher recruitment, placement and development initiatives around the world. For example, nearly three-fourths of Teach For Qatar participants teach STEM subjects, as well as more than one-third of Enseña por Argentina and Enseñá por México participants. Additionally, Teach For Sweden directs nearly 100 percent of its teacher participants toward STEM subjects, while Teach First United Kingdom has increased the number of teachers it assigns into STEM subjects by almost 50 percent over the past five years.

"We are thrilled to have ExxonMobil join our global effort for educational and social equity. This important collaboration will give the students we serve a chance to learn the STEM skills they will need to solve the global challenges of the future, as well as improve their daily lives."



Wendy Kopp Co-founder and CEO, Teach For All

In 2015, with the help of ExxonMobil, Teach For All also began identifying network-wide best practices for STEM. Part of this effort involved expanding STEM-related data collection to include the number of participants that partners place in STEM fields, as well as their targets for participant placement in each subject area. The data collected from the 4,322 STEM teachers currently in the Teach For All network will offer valuable insights and serve as a reference point to further enhance the STEM Initiative. Teach For All is also administering student-perception surveys to 20 network partners to help assess teacher effectiveness. These surveys will help Teach For All better understand teacher impact on students so partner organizations can improve by reflecting on their teacher development efforts.



Two young girls participate in the ExxonMobil Girls Engineering Festival at the Lonestar Convention Center in Conroe, Texas, in May 2015.



With the help of ExxonMobil, USAID collects blood samples for malaria tests at the Lucala municipal hospital in the Kwanza Norte province of Angola.



A Solar Sister participant uses a neighbor-to-neighbor distribution system to deliver solar technology solutions to her community.

Education initiative

We believe global economic growth in today's high-tech world relies upon highly skilled individuals, particularly those well-trained in STEM. In the United States alone, the U.S. Department of Commerce estimates that STEM occupations are projected to grow almost twice as fast as non-STEM-related occupations from 2008 to 2018.

For this reason, we invest in education and teacher development programs designed to encourage students to pursue careers in the STEM fields. Over the past 16 years, we have contributed more than \$1.2 billion to education programs around the world. In 2015, we invested nearly \$100 million in education programs around the world.

In 2015, ExxonMobil continued to support the Alaska Native Science and Engineering Program (ANSEP) through a twoweek middle school academy program designed to help students learn and complete Algebra I curricula. During the middle school academy, participating students in grades five through eight explore engineering and science career options and complete a hands-on activity designed to help prepare them for post-secondary STEM curricula. As a result of the program, more than 75 percent of ANSEP students complete Algebra I by the end of the eighth grade, compared with just 26 percent of students nationwide. Additionally, 95 percent of participating students advanced a full grade level in math or science for each summer they enrolled in the program. For more information on our efforts on education initiatives in 2015, see the Up Close on the previous page.

Malaria initiative

We care about the health of our employees, their families and members of the communities where we operate, which is why we invest in community health programs that help combat preventable or treatable illnesses. In several countries where we operate, including sub-Saharan Africa, malaria continues to have a significant impact on local communities. Each year, this preventable and treatable disease claims the lives of nearly half a million people. The good news, however, is that significant progress has been made in the global fight against malaria and the number of deaths and infections continues to decline. We believe ending deaths from malaria requires an integrated approach, including education, prevention and access to proper diagnosis and treatment.

In 2015, ExxonMobil contributed \$12.5 million to fight malaria. We are proud to say that 2015 marks ExxonMobil's 15th anniversary year working to reduce the human and economic toll of this disease. These contributions have supported a variety of research, educational and treatment programs in countries and communities that lack adequate health care systems. To date, the antimalarial programs we have funded were able to reach more than 125 million people, and our support has resulted in the distribution of almost 14 million bed nets, 3.8 million doses of antimalarial treatments and 2.6 million rapid diagnostic kits, as well as the training of more than 520,000 health workers. Our cash grants during the past 15 years total more than \$146 million, making us the largest private-sector grant-maker in the fight against malaria. For more information on our community malaria initiatives in 2015, see the Up Close on page 69.

Women's economic opportunity initiative

Economically empowering women is essential to enhancing local economic development. According to a 2014 World Bank report, *Gender at Work*, women are key drivers of economic progress and development because they consistently invest in their children and communities. Women also tend to help propel other women forward, creating a powerful multiplier effect that benefits society as a whole.

To promote economic opportunities for women, we invest in programs proven to provide the skills and resources needed to increase their productivity and income. Over the past 10 years, ExxonMobil has invested approximately \$94 million for the purpose of helping women fulfill their economic potential and improve their well-being and that of their families and communities. Our investments focus on three key areas: supporting research to identify effective interventions; developing women farmers, entrepreneurs and business leaders; and improving women's access to technology. Our support has reached tens of thousands of women in more than 90 countries. In 2015 alone, our contributions totaled nearly \$12 million. See the adjacent Up Close and visit the ExxonMobil Foundation website for additional information on our efforts to improve women's economic opportunities.



Employee participation

Volunteering and charitable giving are integral to ExxonMobil's culture. Around the world, our employees support local communities by becoming mentors to students, assisting local food banks and providing environmental education opportunities, among other activities. We encourage employees to contribute to the communities where they live and work by granting time off to volunteer with charitable organizations. Where applicable, ExxonMobil's modified workweek program provides supervisors the flexibility to work with employees to adjust their work schedules to participate in such events. For additional information on ExxonMobil's workplace flexibility programs, see page 28.

ExxonMobil offers several programs that allow our employees and retirees to maximize their charitable impacts. Our volunteer involvement program encourages employees, retirees and their families to volunteer and contribute their time and talent to charitable organizations, either individually or in teams. In the United States, the program provides a \$500 donation on their behalf for every 20 hours volunteered, up to four times per volunteer per year.

Additionally, our educational matching gift program matches employee and retiree donations to U.S. higher education institutions at a ratio of 3-to-1. In 2014, 6,000 employees and retirees donated \$19 million to nearly 4,000 colleges and universities, as well as minority scholarship programs — which the ExxonMobil Foundation then matched with \$34 million in 2015.

Up Close: Empowering women with access to mobile savings

As part of ExxonMobil's commitment to empowering women economically, the ExxonMobil Foundation joined forces in 2012 with the United Nations Foundation to produce *A Roadmap for Promoting Women's Economic Empowerment*, a study outlining the most effective interventions to directly advance women's economic opportunities. The *Roadmap* identified providing women access to savings opportunities through mobile phone technology as a high-potential community investment. To build on the research findings from the *Roadmap*, the ExxonMobil Foundation began collaborating with TechnoServe, Mercy Corps and the Center for Global Development (CGD) in 2015 to pilot mobile saving opportunities and financial literacy training for women entrepreneurs in Indonesia and Tanzania.

A large number of women in Indonesia and Tanzania do not have access to banking and other financial services, live long distances from a bank branch or are deterred by burdensome bank fees and administrative requirements. This program, which runs through the end of 2016, will test the theory that women entrepreneurs and farmers with access to basic banking and insurance services through mobile telephones will be able to save more, invest their increased savings in their businesses and see increased income from those businesses. To streamline program efforts, TechnoServe and Mercy Corps are simultaneously providing mobile savings access and financial literacy training to 3,000 women farmers and entrepreneurs in Indonesia and Tanzania.

As part of our ongoing effort to evaluate program results and maximize positive outcomes, CGD is conducting a two-phase impact evaluation of the women entrepreneurs and farmers participating in the program. This evaluation will study the efficacy of the program and test the theory that access to mobile savings can increase business income. In 2015, key evaluation efforts included developing the initial surveys, piloting survey instruments and conducting preliminary research on methodologies for the pilot. Once approved, CGD will implement the study design and select a third-party organization to conduct the surveys in Tanzania and Indonesia.



Local Tanzanian, Asia Diwala, applies the skills she learned from the enterprise development training she received through support from the ExxonMobil Foundation, Cherie Blair Foundation for Women and the Tanzania Gatsby Trust.

In total, nearly 15,000 ExxonMobil employees, retirees and their families donated more than 629,000 volunteer hours to almost 5,000 charitable organizations in 34 countries in 2015.

ExxonMobil 2015 Worldwide Giving Report

Since our initial investment in pro bono legal services in 1917, ExxonMobil's U.S. program has evolved from a grassroots effort to a fully defined program, and our attorneys give hundreds of people free legal support each year. In 2015, 171 volunteers in the United States, including 137 attorneys and 31 support staff, devoted 3,624 hours to pro bono service. These services included helping veterans, children, domestic violence survivors, immigrants and citizens with various legal issues, including family law matters, tax issues and will preparation. Our U.S. law management sponsors a pro bono committee in Houston that includes representatives from the various practice groups. The global stories section of our website has additional examples of our employee volunteerism activities around the world.

"As lawyers, we have a duty to give a voice to those who don't have one. It seems so simple to share something you already know, but it's a big deal to the clients we help."



Susan Barrington Sanchez Co-coordinator of ExxonMobil's pro bono committee, 2010–2015



ExxonMobil volunteer Bill Carpenter participates in Introduce a Girl to Engineering Day in February 2015.

Up Close: Fighting malaria in West Africa

ExxonMobil has witnessed the devastating human and economic toll malaria takes on our workforce and the communities in which we operate. In 2015, we continued making progress in the fight against malaria in high-endemic African countries where we have operations in particular Angola, Nigeria, Tanzania, Equatorial Guinea, Chad and Cameroon.

Angola

For 11 years, ExxonMobil has supported Africare, an NGO committed to finding solutions for health challenges, through its community-based malaria projects in Angola. This year, ExxonMobil helped Africare scale up its community-based malaria intervention program in Quipungo, Angola.

This project focuses on the control and treatment of malaria for children and pregnant women with the following goals:

- Ensuring 85 percent of pregnant women and children under the age of five sleep under long-lasting, insecticide-treated bed nets;
- 85 percent of pregnant women and children under the age of five receive appropriate malaria treatment within 24 hours of exhibiting symptoms;
- 85 percent of pregnant women receive two doses of malaria prophylaxis; and
- Local nurses are trained in malaria prevention, management and treatment.

In 2015, a network of 285 trained volunteers conducted 136,800 house visits focusing on these four international malaria control goals. Additionally, the ExxonMobil Foundation, in partnership with Africare, supports the Child Survival Collaborations and Resources (CORE) Group community malaria program in Angola. The CORE Group is a network of nonprofit international organizations committed to improving the health of women and children in high-risk malaria communities.



Africare volunteers provide bed nets and malaria awareness training to local community members in Angola.

In 2015, the CORE Group, working in 12 of the 16 provinces in the country, improved the health skills of more than 2,600 community volunteers, helped administer the first and second doses of malaria prophylaxis treatment for more than 35,000 pregnant women and disseminated key malaria messages to around 265,000 Angolan families.

Nigeria, Tanzania and Equatorial Guinea

For the past four years, the ExxonMobil Foundation has supported Grassroot Soccer (GRS), an NGO that educates local youth in Nigeria, Equatorial Guinea and Tanzania on how to prevent malaria, HIV/AIDS and other infectious diseases. The program's success stems from its community-based approach that uses soccer-based games and activities to engage and educate participants.

As part of this community-based approach, GRS recruits high-profile Africans, such as national team soccer players and local celebrities, to become ambassadors for the program. Since 2012, ExxonMobil has invested nearly \$2.3 million to expand the program to involve more than 63,000 boys and girls in Nigeria, nearly 10,000 in Tanzania and nearly 3,000 in Equatorial Guinea. In 2015, GRS was able to scale up its program in Equatorial Guinea by strengthening the organizational capacity of its national partners and working closely with the ministries of health and sport. More than 1,500 boys and girls graduated from the program in Equatorial Guinea in 2015. By the end of 2015, the total number of graduates supported by ExxonMobil was more than 76,000.

With the help of ExxonMobil, GRS was also able to find new opportunities in 2015 to educate young people on malaria

prevention. GRS and its local partner, Youth Empowerment and Development Initiative (YEDI), partnered with Special Olympics to launch SKILLZ for Life. This new program uses the organization's proven model for behavior change in public health among youth to educate children with intellectual disabilities. As part of the new partnership, YEDI and Special Olympics collaborated with GRS to offer malaria testing on World Malaria Day, which involved more than 2,600 attendees, including many families and individuals with intellectual disabilities.



Children at the Federal Housing Estate Primary School in Lagos, Nigeria, participate in Grassroot Soccer's mosquito net education program.

Chad and Cameroon

For the past nine years, ExxonMobil has supported Jhpiego, an affiliate of Johns Hopkins University, in its efforts to fight malaria using global best practices in disease prevention and treatment. In 2015, the ExxonMobil Foundation provided funding to Jhpiego to provide quality malaria prevention and treatment for more than 700,000 people living along ExxonMobil's 1,070-kilometer Chad-Cameroon pipeline.

Key activities included enhancing the quality and range of malaria-specific services for women in the parts of Chad and Cameroon where basic health care is limited; providing health education tailored to pregnant women; and procuring malaria prevention commodities like bed nets and anti-malarial drugs to ensure clinics in these areas are appropriately stocked. In 2015, the program was responsible for training 150 health providers and 30 supervisors to better oversee and provide malaria prevention and treatment services, as well as helping 159 community health volunteers educate communities about malaria at 71 health facilities.

"For decades, malaria seemed to have the upper hand, claiming the lives of countless women and their families. But today, with leadership from governments and innovative partnerships like the one Jhpiego is privileged to have with the ExxonMobil Foundation in Chad and Cameroon countries where few are willing to invest resources — we are seeing real progress in ending deaths from this preventable and treatable disease. As Jhpiego's longest-standing corporate partner, ExxonMobil has been an incredible colleague in our fight to improve the health of vulnerable populations in low-resource countries. Their flexibility, commitment to data-driven impact and willingness to tackle new challenges head-on inspires us to push the envelope of what is considered possible and save lives."



Leslie Mancuso President and CEO, Jhpiego

Community and social impact exxonmobil.com/citizenship

Case Study

New country entry in Guyana for the Upstream business

Kaieteur Falls in Guyana, located on the northern mainland of South America. When ExxonMobil discovers new resources in countries where we do not have a significant footprint, we take a diligent, respectful approach to starting activities. This is the case for our new operations in Guyana.

In May 2015, ExxonMobil announced an oil and gas discovery in the Stabroek block, located approximately 120 miles offshore Guyana. This marks the first significant discovery for the country. We initiated oil and gas exploration activities in Guyana in 2008, collecting and evaluating substantial 2-D and 3-D seismic data that led to the company safely drilling its first exploration well. ExxonMobil works in many countries around the world and in a range of physical and socioeconomic environments, including regions with established industry presence and those where oil and gas is a newly emerging sector. Everywhere we work, we are committed to conducting business in a manner that is compatible with the environmental and economic needs of the communities in which we operate. We work in ways that protect the safety, security and health of our workers, our customers and the public.



Environmental, regulatory and socioeconomic considerations

Guyana is an example of the collaborative and thoughtful approach we take when entering a new country. Before drilling the first well, we engaged the Guyanese government, communities and environmental and socioeconomic experts to gain an understanding of the potential interactions and impacts of our activities with the environment and communities surrounding our operations.

Our early engagement included consultations with key government agencies and stakeholders, including the general public, industry associations and non-governmental organizations. We worked closely with these stakeholders to identify and address potential impacts in our plans and develop appropriate protective measures. For example, engagement with the local community was instrumental in conducting coastal sensitivity mapping. This mapping included environmental and socioeconomic features along the Guyana coast, such as locations of coastal communities, farms, fisheries and other sensitive areas.



A Guyanese high school student studies rock properties during an ExxonMobil-funded science camp led by the Volunteer Youth Corps.

The effort also supports emergency response planning through identification of coastal access points and priority protection areas.

"Our studies found a high level of biodiversity that included potential for the presence of dozens of marine mammals, several kinds of sea turtles and sensitive habitats with three kinds of mangrove species. The northwest coast also includes Shell Beach, a protected area known to be a valuable turtle nesting habitat. Project plans take into account proximity to densely populated communities, commercial and artisanal fishing, public health and safety, cultural heritage sites and Amerindian indigenous populations. All of these areas were considered prior to beginning any drilling activities."



Kari Ehmling

Environmental, regulatory and socioeconomic advisor

Engaging with the Guyanese government

ExxonMobil's commitment to responsible development extends beyond our own operations. We are also committed to supporting Guyana in its effort to achieve sustainable environmental, social and economic development. To this end, we are working with a number of government agencies to understand stakeholder priorities and objectives for industry growth, including a vision for responsible industry oversight and regulation.

ExxonMobil, in collaboration with the Guyana Geology and Mines Commission and the Guyana Environmental Protection Agency, has launched a technical workshop series covering topics such as oil and gas development, globally recognized best practices, international standards and environmental management technologies. Early engagement and continuous open dialogue have helped foster mutual understanding and effective relationships.



Touchau, a village leader, and teachers of the indigenous Mainstay-Whyaka Amerindian Reservation receive training in STEM subjects through the Youth Challenge Guyana program.

Engaging with local communities

Before beginning exploration activities in a new country, ExxonMobil endeavors to establish meaningful relationships that benefit communities and the company for the long term. Based on consultation with stakeholders and an initial community needs assessment, our early entry support in Guyana primarily focused on promoting education, especially in the areas of science, technology, engineering and math (STEM). Since 2012, we have supported the Volunteer Youth Corps, a nonprofit organization in Georgetown that engages ninth- and tenth-grade students in a variety of STEM after-school learning programs. The programs include practical lessons in physics, chemistry, integrated science and information technology, as well as a three-day science camp at a local environmental facility.

For the past four years, we have also supported Youth Challenge Guyana, which provides STEM education training to teachers and science kits to primary school students. In 2015, we expanded our education support to include a sports, literacy and leadership program in a traditionally Amerindian community as well as teacher training for a special needs school in Georgetown.

We are still in the early stages of our exploration in Guyana, and will continue to evolve and tailor our support for the community to reflect the needs and long-term goals of the Guyanese people, as learned through our ongoing community engagement.

Local workforce and supplier development

Our vision of sustainability in Guyana is one in which stakeholders benefit from resource development today, while protecting and building opportunities for the future. To realize this vision, ExxonMobil will continue to safeguard people and the environment, support government endeavors to be responsible stewards of their natural and economic resources and invest in the community of which we have become a member. Everywhere we operate, we strive to develop employment opportunities for local workers and suppliers. Our local office in Guyana is staffed by more than 40 nationals performing work in various disciplines including accounting, office administration, procurement, public and government affairs, and security, safety, health and environment. ExxonMobil is working with local businesses to help identify opportunities to develop local service providers and a skilled workforce.

As we study the commercial viability of the discovered resource and build our presence in Guyana, we remain committed to responsible corporate citizenship by engaging with the local government and communities, evaluating and developing a local workforce and supplier base, and protecting biodiversity by implementing responsible environmental standards and sound management practices. Local development and supply chain management

Hilda Wagia, instrumentation technician trainee, working in the Hides gas conditioning plant in Papua New Guinea. We have a responsibility to help advance economic development for the areas in which we operate.



As we develop oil and gas resources to meet the world's growing energy needs, we work to contribute to the economic and social development of the countries in which we operate. We also seek to ensure a healthy supply chain, one that respects human rights and the environment while creating opportunities for economic growth in the communities where we conduct business. ExxonMobil's local content and supply chain management strategies are designed to deliver lasting and shared value to host countries, local communities and our business. We do this by employing systematic and clearly defined processes, templates and global best practices to integrate local development into overall project planning and execution.

Local economic growth and development

We believe local content — the added value brought to a host nation through the activities of the oil and gas industry — provides shared value to ExxonMobil and to the communities in which we operate, ensuring local participation is integrated into our daily processes. We align our goals with those of our partners to focus on establishing long-term economic benefits. We develop a local content plan specific to each country or area, taking into account social and economic conditions, the nature of the project and the community's needs.

Our efforts focus on employing and training the local workforce, supporting local suppliers and service providers, and improving the livelihoods of community members. This multi-tiered approach, combined with our strategic community investments, allows us to provide sustainable economic benefits, both direct and indirect, to the local communities where we operate. For additional information on our approach to community investments, see page 64.

As part of ExxonMobil's commitment to operational excellence, we participate in organizations and initiatives that improve local content management around the world. We are active participants in IPIECA, the global oil and gas industry association for environmental and social issues, and the Organization for Economic Cooperation and



Kanu Okechukwu, a production operator for Esso Exploration and Production Nigeria Limited, opens a manual valve to supply compressed air to equipment at the Erha North phase two project in Nigeria.

Development (OECD). In 2015, we contributed to IPIECA's local content task force and assisted in the development of IPIECA's Local Content: A Guidance Document for the Oil and Gas Industry and the OECD's Framework on Public-Private Collaboration for Shared Resource-Based Value Creation from Extractive Projects. Both of these documents were published in 2016.

Local hiring and training

We believe we have a responsibility to create local employment opportunities to help advance economic development and contribute to the continuity of our operations. As part of our effort to enhance the long-term capability of local workforces, we provide locally hired individuals with opportunities to develop technical and leadership skills that will benefit them throughout their careers, including after their work on ExxonMobil projects. We continued to make progress in hiring, developing and retaining host country nationals in 2015.

For example:

- In Angola, 82 percent of our personnel are Angolan, of whom 16 percent are in supervisory or managerial positions.
- In Chad, 94 percent of our personnel are Chadian; 72 percent of supervisory or managerial positions are held by Chadians.
- In Equatorial Guinea, nearly 75 percent of our personnel are Equatoguinean, of whom 13 percent are in supervisory or managerial positions.
- In Indonesia, 87 percent of our personnel are Indonesian; local staff hold 83 percent of supervisory or managerial positions.
- In Nigeria, 94 percent of our personnel are Nigerian; 21 percent of local staff are in supervisory or managerial positions.

Up Close: Partnering with the Institute of International Education to invest in local workforces

ExxonMobil is committed to providing long-term strategic investments related to the education and professional development of local workers, targeting various types of positions and levels. One of our key partners in developing local individuals for senior management positions is the Institute of International Education (IIE). IIE is a private, not-for-profit organization that creates programs of study and training for students, educators and professionals from all sectors. We have partnered with IIE since 2006 to provide academic scholarships to motivated students in Angola, Indonesia, the Middle East, North Africa, Romania and Russia.

To date, ExxonMobil scholarships have supported the educational and cultural development of 208 scholars in 13 countries. Scholarship recipients have pursued 36 different fields of study, and of those students who have graduated, 40 are currently employed by ExxonMobil.

Hakima Taoufiq, native to Rabat, Morocco, is one such student. Hakima earned her MBA from Tulane University in New Orleans, Louisiana, where she graduated first in her class in 2011. After graduation, Hakima joined ExxonMobil as a senior business analyst supporting the power and gas services group. Hakima is currently a senior business analyst supporting the liquefied natural gas group in Houston.

From 2014 to 2015, Hakima served as the supply and logistics coordinator responsible for the reliable and optimal supply of more than 15 terminals across the midwestern United States, which translates to more than 120,000 barrels per day of gasoline, distillate and biofuel.

"IIE opened doors I did not know existed. Through this program, IIE enabled me to define the sky as the limit and a world beyond my hometown as a playing field. It solved the major stumbling block of financing my education — since a loan was never an option where I came from. IIE gave me the wings to choose where, how and what I wanted to study, instead of defaulting to what was an available and femaleappropriate career path back home."

Hakima Taoufiq

Senior analyst



Hakima Tauofiq, senior analyst, joined ExxonMobil following her studies with the Institute of International Education at Tulane University.

Our ability to hire locally depends on the availability of appropriately qualified individuals. We actively work to overcome challenges related to developing and retaining a local workforce, identifying and attracting skilled labor, and matching workforce skills with business requirements. For example, as economic activity in a particular area increases, the demand for local skilled workers also increases, which can result in a shortage of available workers.

We address such situations by supporting education and training initiatives aimed at increasing the pool of individuals from which we can recruit. Training programs include the provision of information on ethical business conduct, health and safety, management skills and fundamentals of the oil and gas industry, as well as relevant technical and vocational skills such as welding, construction and equipment operation. To help develop the skills of locally hired individuals, we place experienced ExxonMobil expatriates — individuals working in a country other than their country of permanent residence in countries where they can share their expertise and mentor local workers for operational and leadership roles. Additionally, a large number of local workers are placed in developmental assignments at ExxonMobil facilities around the world as a way to broaden their experience and accelerate their learning with the goal that when they return home, they will use and share this knowledge in their home countries' operations.

For example, Andreia Prata, a local hire in Angola, was placed on an assignment in the United States from 2010 to 2013. While in the United States, Andreia occupied several roles, including a senior planning and reporting analyst supporting the Downstream business and a project procurement associate supporting Upstream drilling and exploration. After this experience, Andreia returned to Angola where she is currently working as the area procurement manager overseeing acquisitions, warehousing and payables in the country.

"My time in the United States contributed to both my professional development and personal maturity. I was able to gain a deeper understanding of ExxonMobil's global operations as well as expand my professional network, both of which helped prepare me for my management role today."



Andreia Prata Area procurement manager, Angola

Up Close: Local contractor development in Nigeria

The Esso Exploration and Production Nigeria Limited Erha North project started production in September 2015, five months ahead of the planned February 2016 start date. The project, which is estimated to produce an additional 165 million barrels annually from the previously in-production Erha North field, was completed with more than 6 million man-hours in-country without a lost-time incident, and the final cost was \$400 million under budget.

The overall success of this project was in part due to strong performance by the local Nigerian suppliers and contractors that ExxonMobil employed, as well as a robust local content plan. The project team collaborated early in the project process with the Nigeria Content Management Board to identify local content opportunities to increase local supplier participation. The team also participated in regular communication with key stakeholders, including the Nigerian National Petroleum Corporation, co-venture partners, technical teams and suppliers to ensure strategic alignment and stay on schedule.



Personnel in Nigeria work with cargo barges and installation vessels belonging to a local supplier.

For example, more than 130 Nigerians were trained in various fields such as project engineering, scaffolding and fabrication, and 52 percent of trainees are now working full time on ExxonMobil projects. We also worked with several Nigerian companies to obtain necessary materials for the project, including sub-structures, pipes and mud mats. Throughout the project, ExxonMobil held multiple workshops with suppliers to help ensure that suppliers understood and complied with ExxonMobil's supplier standards.

In 2015, ExxonMobil was recognized for its extraordinary local content program in Nigeria as the **Best Company in Local Content** in Nigeria by **Businessday**, one of Nigeria's most respected business newspapers. The award further recognizes ExxonMobil's investments in Nigeria and the positive economic impact that our business has on communities where we operate.

"The Erha North project demonstrates ExxonMobil's disciplined management approach and expertise, and leveraged strong performance from Nigerian contractors, which accounted for more than \$2 billion of project investment for goods and services, including subsea equipment, facilities and offshore installation. These contracts will bring direct and indirect benefits to the Nigerian economy through project spending and employment, consistent with project objectives."



Nolan O'Neal Lead country manager, Nigeria We operate several business support centers (BSC) that offer services to our global operations. We have 10,000 people working in centers around the world, including in Argentina, Czech Republic, Hungary and Thailand. These centers support our operations with a broad range of services, including financial, IT and customer services, and provide jobs and business opportunities for the communities in which they are located. In December 2015, ExxonMobil held an opening ceremony for a new BSC in Bengaluru, India. One of the purposes of this office is to leverage the significant pool of technical talent in India. To date, there are more than 250 locally hired individuals working at the BSC, half of whom are women.

Local supplier development

ExxonMobil works with a range of stakeholders, including host country governments, non-governmental organizations (NGOs) and local communities to develop local vendors for the supply of goods and services. We seek to build and maintain a qualified and globally competitive supply chain wherever we operate. Our goal is to nurture entrepreneurship and foster competitive businesses capable of contributing to the sustainable economic progress of host countries.



From left: Tom Walters, president of ExxonMobil Production Company; Alan Kelly, president of ExxonMobil Fuels, Lubricants and Specialties Marketing; and Bryan Milton, president of ExxonMobil Global Services Company celebrate the opening of the new business support center in Bengaluru, India.

In order to be a supplier for ExxonMobil, a local vendor must be able to meet our safety, technical, environmental and human rights expectations and requirements. In some of the more remote locations where we operate, we face difficulties with identifying qualified local suppliers due to limited local capacity. ExxonMobil routinely assists suppliers in understanding our requirements, developing business processes and procedures and increasing their technical skills to become more competitive. Our long-term goal is to develop globally competitive suppliers. When a supplier is unsuccessful in competing for work with us, we provide them with advice and guidance on how to become better positioned for future opportunities with ExxonMobil or other companies.

In October 2015, we held a workshop in Sakhalin, Russia, to educate potential contractors about our prequalification and bidding processes. The workshop included presentations by ExxonMobil personnel as well as roundtable interviews with local companies. In addition, participants received training on our safety, health and environmental expectations and requirements, and on how to effectively complete prequalification documents. In total, 26 companies from both Sakhalin Island and Russia's mainland attended, and we identified a number of potential opportunities for business between ExxonMobil and these contractors.

Since 2013, ExxonMobil Cepu Limited (EMCL) has partnered with local and national NGOs to offer training and capacity-building programs to local communities in the Banyu Urip project area on the island of Java in Indonesia. As part of this initiative, in 2015, EMCL collaborated with the Bina Swadaya Foundation and the local community to establish a new learning center. The center is intended to help build local capacity by assisting 550 local residents in Bojonegoro and Tuban regarding product development, financial management and business mentoring. In addition, the learning center will provide longterm marketing and supply chain opportunities that will help the community develop diversified businesses for long-term sustainable growth. The learning center has already helped the community identify business opportunities with various buyers around key commodities, including rice, goats, koi fish and water spinach seeds.

To help promote safety among local suppliers, we implemented a driver training program for local driver personnel in lvory Coast in 2015. The program was based on an earlier initiative in Madagascar, where ExxonMobil-employed drivers drove approximately 100,000 kilometers without any accidents or incidents. The goal of the training is to provide local drivers with practical skills as well as tools to respond to and mitigate driving risks. The extensive driver training includes a two-day defensive driving course, a first aid and passenger safety course and regular driver meetings to share lessons learned. The training program has helped the lvory Coast venture office develop a local supply base while simultaneously improving the safety performance of our operations.

Supply chain management

Because our global reach expands well beyond our fence line, we know the success of our operations and reputation are influenced by those who support our operations beyond the workplace sites. ExxonMobil works with more than 165,000 suppliers of goods and services, and we develop relationships with suppliers that uphold our commitment to safety, the environment and human rights. We support supplier efforts for continuous improvement in these areas.

When surveying the market for potential suppliers, ExxonMobil seeks suppliers that can meet our safety and operational requirements. Our procurement staff is trained to conduct supplier prequalification assessments, which include anti-corruption due diligence when appropriate. Additionally, we seek out local suppliers or suppliers from historically underrepresented groups including, but not limited to, women, minorities and indigenous peoples.

ExxonMobil is committed to respecting human rights, and we expect the same of our contractors and suppliers.



Local personnel Luis Almeida and Diwalter Fortunado inspect equipment at our Kizomba project in Angola.

Up Close: Meet the member event in Mexico City

At ExxonMobil, we strive to assist women business owners in finding opportunities to connect with our various business lines. Since 2011, the ExxonMobil Foundation has supported WEConnect International, an organization that empowers women business owners to access global supply chains. In November 2015, ExxonMobil Mexico hosted a "meet the member" event for women suppliers that are part of WEConnect's Mexico chapter. This one-day workshop afforded women business owners the opportunity to network with ExxonMobil representatives from our various businesses and service lines. The event included interactive workshops and one-on-one meetings between the women and ExxonMobil representatives as well as an overview of ExxonMobil's supplier diversity strategy and goals.

In total, 60 women business owners and ExxonMobil personnel attended the event. To date, the meet the member event resulted in three new business opportunities for women-owned businesses in Mexico. These opportunities included catering services for the ExxonMobil venture office, design and event planning services for public and government affairs, and a supplier of hand sanitizer for medicine and occupational health. We expect new opportunities to emerge as we continue our efforts to develop women-owned suppliers in Mexico.



Women in Mexico City participate in a meet the member event.

In 2014, we conducted a pilot supplier human rights assessment program. In 2015, we tailored our efforts and engaged a selected group of key suppliers across various commodities. This process allowed us to gauge the level of human rights awareness among suppliers, as well as to gain a better understanding of how human rights practices, training and grievance mechanisms are used.

To improve social performance along the supply chain, in 2016 we will continue to use learnings from our supplier awareness assessments to provide key inputs to the tools we are developing. For example, we recently developed and published ExxonMobil *Supplier Expectations*, a set of guidelines that outlines our expectations of contractors and suppliers inclusive of human rights. These *Expectations* include references to key international human rights frameworks such as the United Nations *Guiding Principles on Business and Human Rights* and the ILO *Declaration on Fundamental Principles and Rights at Work*. We believe that by increasing our suppliers' awareness of human rights, we can facilitate improvement in their own supply chains, creating a wider scope of positive impact and influence. For additional information on ExxonMobil's positions and activities on human rights, see page 60. In addition to respecting human rights, we require that all of our suppliers maintain our environmental performance standards. For example, ExxonMobil Nigeria conducts site visits at its local contractors' sites and performs environmental inspections as a way to monitor supplier environmental performance. If a concern is identified, ExxonMobil will meet with that contractor's leadership to provide feedback and assist in correcting the issue. In addition, expectations for our suppliers about environmental performance are included in the *Supplier Expectations*.

Promoting supplier diversity

ExxonMobil values its diverse workforce and works to promote a diverse supply chain. In the United States, we have cultivated diversity across our supply chain through our supplier diversity program for more than 40 years. For the past 15 years, we have tracked our annual spending with minority- and women-owned business enterprises (MWBEs). In 2008, we began to consider the full reach of our supply chain, and not just our direct spending, by making efforts to encourage and track the progress of our primary suppliers in the development and use of MWBEs. We refer to this as our Tier 2 program. As an example of our Tier 2 efforts, in 2015 the ExxonMobil Baytown facility sponsored a "meet and greet" session that attracted more than 75 attendees in an effort to provide diverse suppliers with an opportunity to engage with primary suppliers. As a result of this event, more than 25 diverse suppliers secured business contracts with a variety of primary suppliers. We believe this approach helps ensure the sustainability of our supplier diversity program by encouraging our primary suppliers to join in our efforts.

As part of our supplier diversity efforts, we take steps to encourage our suppliers to develop their own supplier diversity programs. We have started including discussions of best practices for supplier diversity in regular supplier relationship management meetings with our key suppliers. As a result of this engagement, several suppliers are now tracking and reporting their spending with diverse suppliers as part of their supplier stewardship.

We work closely with the **National Minority Supplier Development Council** (NMSDC) and the **Women's Business Enterprise National Council** (WBENC) to help identify and develop relationships with certified diverse suppliers in the United States.



ExxonMobil spending with U.S. diverse suppliers¹

Millions of dollars



Since 2011, we have consistently spent over \$1 billion a year on minority- and women-owned business enterprises in the United States. In 2015, we met our target by spending \$1,064 billion on diverse suppliers in the United States with the set of diverse classifications listed below.

¹Includes direct ExxonMobil spending and that of our suppliers (Tier 2 spending). Total spending includes suppliers classified as minority-owned businesses; women-owned businesses; small businesses; lesbian-, gay-, bisexual- and transgender-owned businesses; veteran-owned businesses; service-disabled veteran-owned businesses; and businesses owned by people with disabilities.

ExxonMobil is consistently recognized as a leader in supplier diversity efforts. WBENC named ExxonMobil among **America's Top Corporations for Women's Business Enterprises** in 2015. This national award recognizes corporations with world-class programs and leadership in supplier diversity. In addition, at the **NMSDC National Conference**, ExxonMobil was awarded the **Gazelle Company Award** for a substantial increase in spending with minority-owned suppliers.

National Minority Supplier Development Council

Women's Business Enterprise National Council

In 2010, we set a goal to spend \$1 billion annually on MWBEs in the United States by 2012. We met this goal in 2011 and have maintained a level of spend with minority- and women-owned suppliers greater than \$1 billion per year for the past four years.

In 2015, we met our target of \$1 billion in spending with diverse suppliers in the United States, with the following classifications: minority-owned businesses; women-owned businesses; small businesses; lesbian-, gay-, bisexualand transgender-owned businesses; veteran-owned businesses; service-disabled veteran-owned businesses; and businesses owned by people with disabilities. Suppliers from these groups have contributed to our total diverse spending in order to ensure a more inclusive supply chain. To complement this effort, our supplier diversity database allows suppliers from traditionally underrepresented groups in the United States to register an interest in being an ExxonMobil supplier.

Supplier diversity database

Our supplier diversity program is steadily expanding into the international arena. In total, we spent \$277 million with women-, indigenous- and other minority-owned businesses in select areas outside the United States in 2015. We continue to partner with WEConnect International to increase the participation of women-owned businesses in our supply chain around the world. In addition to providing financial support, we have participated in WEConnect International advisory councils in Brazil, Canada, Europe, India, Mexico, Nigeria, Peru and South Africa.

In May 2015, ExxonMobil participated in the first WEConnect International Exhibition and Matchmaker event to help provide networking opportunities for women business owners drawn from the 36 states in Nigeria. At this event, ExxonMobil Upstream companies in Nigeria received two awards recognizing our support of WEConnect supplier diversity programs. One award was for contributing to the growth of WEConnect and recognized the success of a "meet the buyer" event that was sponsored by ExxonMobil and attended by representatives from more than 300 women-owned businesses in Nigeria. At this event, attendees received training on how to conduct business with multinational programs and on ExxonMobil Foundation programs. The second award was for distinguished corporate sponsorship of WEConnect and our contributions toward inclusive economic growth in Nigeria. The event contributed to an increase in the number of registered suppliers and business contracts awarded in Nigeria. In 2015, ExxonMobil spending with women-owned businesses in Nigeria was \$16.8 million, an increase of 6.3 percent from 2014.





ExxonMobil supports WEConnect supplier diversity programs in Nigeria.

Corporate governance

ExxonMobil headquarters in Irving, Texas. A commitment to ethics and integrity is a core value of our corporate culture. a state

Good governance is essential to ensuring the long-term viability of our business, promoting economic development of the communities where we operate and responsibly providing the energy needed to power the world's progress. ExxonMobil employs a variety of policies and processes to uphold good corporate governance, avoid corruption and promote transparency underpinned by a majority independent board of directors that provides oversight on our corporation's affairs.

Ethics and integrity

For ExxonMobil, upholding the highest ethical standards of business conduct is critical to maintaining our global license to operate. A commitment to ethics and integrity is a core value of our corporate culture. All employees, officers, directors and those working on our behalf are required to comply with all applicable laws, including U.S. anti-corruption, anti-trust, anti-boycott, trade sanctions and export controls laws, as well as laws of other countries applicable to our business.

Standards of Business Conduct

Our Standards of Business Conduct, adopted and administered by the board of directors, ensure we operate at the highest level of operational integrity by setting the ethical conduct expectations of our corporation and majority-owned subsidiaries. These Standards cover a range of topics including labor, the environment and anti-corruption. While ExxonMobil is not a formal signatory of the United Nations Global Compact, its values represent key elements of our Standards.

To establish a consistent understanding of our ethical standards of business integrity, all ExxonMobil employees receive training on our *Standards of Business Conduct* every four years, including a detailed review of the company's ethics, anti-trust, anti-corruption and gifts and entertainment policies.

Employees are required to read the *Standards* annually and confirm compliance. In addition to these business practice reviews, regular training is provided on anti-boycott, trade sanctions and export controls for employees with relevant job functions. No one has authority to make exceptions or grant waivers to the *Standards*. Employees are subject to disciplinary action, up to and including termination, for violations of our policies.

Internal audits

We conduct regular internal audits and self-assessments to help ensure the rigorous implementation of our control systems and the *Standards of Business Conduct*. ExxonMobil's internal team of more than 200 auditors annually reviews approximately one-third of the corporation's operations, including detailed assessments of facilities, business units, personnel and records. We thoroughly investigate any suspected acts of noncompliance with the *Standards* across all functions of the company.

Systems and practices for reporting violations

ExxonMobil encourages employees and contractors to ask questions, voice concerns and report any suspected violations of company policies. In addition to our open-door communication procedures, ExxonMobil has several confidential mechanisms for reporting, including a 24-hour phone number and a mailing address. Employees can also report violations during supervisory reviews. Confidentiality is respected throughout the process, subject to legal requirements; retaliation against any employee is strictly prohibited.

As part of our commitment to reinforcing ethics and high standards of business conduct, a hotline steering committee comprising personnel from security, internal audit, law and human resources reviews reports of suspected violations. The board audit committee receives a quarterly report that summarizes the steering committee's findings, including any violations or major issues. Confirmed violations lead to disciplinary actions, up to and including dismissal.

Anti-corruption efforts

We seek to maintain the highest anti-corruption compliance in all aspects of our operations. Our *Anti-Corruption Legal Compliance Guide* outlines ExxonMobil's commitment to comply with the U.S. Foreign Corrupt Practices Act (FCPA), the United Kingdom Bribery Act and global anti-corruption standards in our business relationships. The *Guide* also describes elements of the corporation's anti-corruption compliance program. To ensure continued relevance and accuracy, ExxonMobil reviews the *Guide* annually and provides updates as needed.

ExxonMobil employees and contractors acting on our behalf are prohibited from making payments to or engaging in

transactions with government officials that improperly influence the performance of their official duties. Our standard language for procurement contracts includes requirements to keep accurate books and records, and, where appropriate, contains specific anti-bribery commitments.

Anti-Corruption Legal Compliance Guide

Because we operate in parts of the world with changing political and regulatory climates, we believe it is imperative to train our employees on our anti-trust and anti-corruption policies. ExxonMobil's law department conducts comprehensive annual training sessions for employees on anti-trust and anti-corruption compliance. In 2015, approximately 19,000 employees participated in anti-corruption training. Employees in relevant job functions receive in-person training soon after entering their positions and every year thereafter. Other managers and professional employees receive training every two years. We monitor legal and regulatory developments and advise employees as appropriate. To ensure continuous improvement, we evaluate the effectiveness of our compliance program regularly.

Transparency

For years, ExxonMobil has supported multi-stakeholder engagement in countries around the world for the purpose of increasing transparency of government revenues from the extractive industries. Our efforts to promote revenue transparency have helped reduce corruption, improve government accountability and promote greater economic stability worldwide. We believe the most successful transparency initiatives are those that ensure each relevant public, private and societal entity is fully engaged and properly represented. Successful initiatives must respect national sovereignty and local norms and apply to every company in all relevant sectors.

We continually monitor and participate in public policy and regulatory developments with respect to transparency initiatives. In 2012, the U.S. Securities and Exchange Commission (SEC) published a proposed rule for global government payment reporting as required by the Dodd-Frank Act. A U.S. District Court vacated the initial SEC rules in 2013, as they were deemed to cause potential commercial

Standards of Business Conduct

and competitive harm to U.S. companies. The American Petroleum Institute (API), of which ExxonMobil is a member, submitted recommendations to the SEC outlining a potential new approach to transparency reporting that focuses on government receipts by resource type and production method and that protects companies from disclosing commercially sensitive information. The recommendations would also give citizens the information they need to determine their government's resource revenues.

In July 2013, the European Union (EU) approved a revised accounting directive that mandates government payment reporting. The United Kingdom implemented its reporting rule in 2015, and more EU member states are expected to do so this year. We remain concerned about the new EU rules, which impose a fragmented approach that will not give civil society a means to compile and analyze government revenue or give companies protection from disclosing commercially sensitive information. Nevertheless, we are preparing data gathering, verification and reporting systems and processes to comply with new requirements as the directive is transposed into local law in each EU member state.

The SEC published a revised draft payment disclosure rule on December 11, 2015, which largely adopts the EU model rather than the approach API is advocating. We oppose the SEC's new proposed rule on the same grounds of our opposition to its 2012 proposed rule and continue to encourage the adoption of a rule that generates data that host country citizens can access and use while simultaneously protecting companies from competitive harm.

A global program that encourages transparency and collaboration among governments, companies, civil society and financial institutions is the Extractive Industries Transparency Initiative (EITI). This initiative is dedicated to strengthening governance by improving transparency and accountability in the extractives sector. Companies and governments participating in EITI separately report payments and revenues, respectively, allowing EITI to reconcile any differences between the totals and publish validated total government revenues. Since EITI's inception more than a decade ago, ExxonMobil has had an active role at both the secretariat and country levels. An ExxonMobil representative has served on the EITI board as either a primary or alternate member since it began. In 2013, the program released an expanded *EITI Standard* outlining how countries can implement the EITI. The *Standard* requires commitment from all participants as stated in Principle 5: "We underline the importance of transparency by governments and companies in the extractive industries and the need to enhance public financial management and accountability."

Our efforts in 2015 focused on helping the EITI member countries where we operate comply with expanded requirements of the 2013 *Standard*. ExxonMobil supports the EITI application, validation and implementation processes in 20 countries, and we are working with governments in a number of other countries including Equatorial Guinea and Mexico, which are considering joining EITI. There are currently about 50 countries that are compliant members or have been accepted as candidates to begin reporting under the *EITI Standard*.

Board of directors

ExxonMobil's board of directors provides independent oversight of the corporation's affairs. All directors are required to stand for election at our annual meeting of shareholders. At year-end 2015, 11 of 12 directors, including the presiding director and all members of the audit, compensation, public issues and contributions, and board affairs committees, were independent as defined by New York Stock Exchange guidelines. In 2015, the board met 11 times, including a board visit to Papua New Guinea to learn more about our Upstream activities and practices in that area. For more information about that visit, see the Up Close on the following page.

Corporate citizenship topics fall under the purview of the public issues and contributions committee (PICC), the board affairs committee and the compensation committee, and are routinely reviewed at board committee meetings. While risk oversight is the responsibility of the entire board, committees help the board focus on risk aspects relevant to each committee. For example, the PICC is charged, among other duties, with reviewing the effectiveness of the company's policies, programs and practices with respect to the environment. The committee hears reports from operating units on environmental activities and also visits operating sites to observe and comment on current practices. The entire board receives briefings by internal experts on environmental stewardship and climate change.

Board leadership structure

Each year, board members select an independent director to serve as the presiding director, with the expectation that person will serve for a minimum of two years. The presiding director sets the agenda and chairs executive sessions of the independent directors and coordinates with the chairman on the agenda for meetings of the full board. At this time, the board believes the interests of shareholders are best served through a leadership model that combines the roles of chairman of the board and chief executive officer (CEO). With more than 40 years of service in both domestic and international positions with the company, our current CEO possesses in-depth knowledge of the corporation and the challenges of an evolving energy industry. For more information about our board structure, visit the corporate governance section of our website.

Corporate governance

Board selection process

Maintaining a diverse board in regard to gender, race, geography, experience and fields of expertise is important for the company to succeed in a globalized market. The board affairs committee recommends board of director candidates in accordance with the *Guidelines for the Selection of Non-Employee Directors*, and diversity is a key consideration.

Up Close: Board visit to Papua New Guinea LNG operations

In April 2014, ExxonMobil began liquefied natural gas (LNG) production in Papua New Guinea (PNG), an oceanic country in the southwestern Pacific Ocean that occupies the eastern half of the island of New Guinea and offshore Melanesia islands. Current operations include gas production wells and a processing plant in the highlands; LNG production and shipping facilities on the south coast; and more than 500 miles of pipeline. Over the life of the PNG LNG project, ExxonMobil expects to produce and sell more than 9 trillion cubic feet of gas. In June 2015, ExxonMobil directors and executives visited the PNG LNG operations to view how ExxonMobil's holistic approach to managing key sustainability and community issues has been successfully implemented in this unique area. The visit encompassed an overview of the mountainside gas wells and the Hides gas processing plant, as well as a review of the pipeline that transports treated gas from the highlands to the LNG plant. The visit also included a tour of the LNG production and shipping facility, during which board members witnessed an LNG ship preparing for departure.

Through the visit, the board observed that the transition from construction phase to production is complete and appropriate environmental monitoring programs have been established. For example, the board saw that revegetation of our construction sites is progressing well. As part of ExxonMobil's biodiversity strategy in PNG, local and international scientific research organizations specializing in tropical forest research are conducting regular biodiversity monitoring to ensure biodiversity values of the upstream area are retained. During the project's onshore construction, 16 plant and 77 animal species new to science were identified.

In addition to learning more about ExxonMobil's Upstream operations in that area, the board members had an opportunity to engage with the PNG community through presentations by local employees and villagers, as well as a meeting with the prime minister and the first lady of PNG.



CEO Rex Tillerson meets with local workers at our Papua New Guinea operations.



ExxonMobil directors and executives tour our liquefied natural gas operations in Papua New Guinea.



ExxonMobil directors and executives at our Papua New Guinea liquefied natural gas operations.

Supported by an independent executive search firm, the board affairs committee looks for highly qualified non-employee candidates with demonstrated leadership, competency and a commitment to represent the interests of our shareholders. Other desirable qualities include:

- Experience as the CEO or senior executive of a significant company or organization with responsibilities for global operations;
- Financial expertise;
- Experience on one or more boards of significant public organizations or non-governmental organizations (NGOs); and
- Expertise resulting from significant professional or academically based scientific or research activities.

In 2015, 40 percent of the board's independent directors were female, African-American or from outside the United States. Four of the seven most recent additions to the board demonstrate this diversity. Also in 2015, Doug Oberhelman joined the board following election by shareholders. Currently, the ExxonMobil board stands at 13 directors, 11 of whom are non-employee directors; an additional independent director candidate has been nominated for election in the 2016 proxy statement. We describe current director qualifications in our proxy statement.

🔊 2016 proxy statement

Board committees overview

Executive compensation and strategic advantage

ExxonMobil's business model is reflective of a capital-intensive industry, requiring long investment lead times and a significant focus on risk management. The structure of our compensation program fully supports this business model and is designed as such that it aligns the interests of our executives with those of our long-term shareholders.

Our most senior executives — including the CEO, named executive officers and more than 1,000 other executives in the United States — participate in a common compensation

program. Compensation for executives is highly differentiated, based on a rigorous annual individual performance assessment that takes into account several key factors, including results in the areas of safety, security, health and environmental performance, corporate governance, diversity and other goals pertinent to the financial and operating performance of the company. ExxonMobil executives understand their compensation reflects how effectively they manage risk and contribute to operations integrity and sustainable growth in shareholder value.

ExxonMobil's compensation committee carefully considers the feedback on executive compensation we receive from our shareholders, some of whom have held ExxonMobil stock for more than a decade. During the 2015 proxy season, the advisory vote on executive compensation received 90.1 percent of votes "for" the company's program as outlined. During our extensive dialogue with shareholders, we also received positive feedback on our newly disclosed performance award matrix, which details how industry-leading operating and financial results over investment lead times of the business are linked to the level of individual bonus and stock-based awards.

Additionally, our stock-based awards have long holding periods, i.e., for executive officers 50 percent vests in five years and the other 50 percent vests in 10 years from grant date or retirement, whichever is later. Unvested stock awards are not accelerated upon retirement and remain at risk of forfeiture. These features of the compensation program provide executives with a strong incentive to maintain a sharp focus on operations integrity, which in turn protects the safety and security of our employees, the communities and environments in which we operate. For more details on our executive compensation program, see ExxonMobil's 2016 proxy statement.

Communicating with directors

Constructive engagement allows us to identify areas of opportunity and improvement throughout our business. ExxonMobil's directors encourage open and transparent communication on corporate citizenship topics. Individuals can email our non-employee directors through the corporate governance page of our website or send written correspondence in care of the secretary of the corporation. ExxonMobil employees work with directors as appropriate in responding to these letters and emails. Directors will sometimes request that senior managers meet with shareholders to address particular topics.

Shareholder relations

We value the dialogue we have with our shareholders on a variety of governance, social and environmental topics throughout the year. Management considers suggestions and engages with shareholders as appropriate. Our direct engagement with shareholders provides an effective forum to address issues, share relevant information and viewpoints, and align on the facts. In 2015, we had 42 shareholder dialogues with institutional investors, pension funds, and labor, religious, and NGO organizations. These dialogues have generally allowed us to reach common ground with our shareholders, in some cases avoiding the need for more formal shareholder proposals at the annual shareholders meeting.

At the corporation's 2015 annual meeting, shareholders owning approximately 3.5 billion — or nearly 84 percent — of outstanding shares were represented. In 2015, shareholders voted on directors, independent auditors, executive compensation and eight shareholder proposals. The summary table below shows the 2015 proxy vote results.

We seek to report transparently on issues important to our shareholders. The Corporate Citizenship Report, Outlook for Energy and ExxonMobil's website help communicate the company's strategic outlook, performance and risk

2015 proxy vote summary

Percent vote for

Proxy item	2015
1. Election of directors (average) ²	97.1
2. Ratification of independent auditors ²	99.1
3. Advisory vote on executive compensation ²	90.1
4. Independent chairman	33.8
5. Proxy access bylaw ³	49.4
6. Climate expert on board ³	21.0
7. Board quota for women ³	4.3
8. Report on compensation for women ³	5.8
9. Report on lobbying	21.0
10. Greenhouse gas emissions goals	9.6
11. Report on hydraulic fracturing	24.9

¹Abstentions count for quorum purposes, but not toward voting on these proposals. ²Proposals submitted by the board. ³First-year proposal.



management practices. In some cases, we publish additional reports to provide further information about certain issues. In response to our shareholder proposals, in 2014 we published three such reports — two on climate change and one on unconventional resources — which provide shareholders an enhanced description of global energy demand and supply, climate change policy, carbon asset risks and unconventional resource development. These reports continue to inform shareholders on how we evaluate and manage risks associated with these issues.



Unconventional resources report

Political advocacy and contributions

Public policy decisions made at all levels of government can have significant effects on ExxonMobil's current and future operations. We believe that sound public policy is best achieved when a variety of informed voices participate in the political process. For this reason, ExxonMobil exercises its right to support policies that promote a stable investment climate for long-term business viability.

ExxonMobil, like many U.S. companies, labor unions and NGOs, communicates its positions to the U.S. Congress and state legislatures. Lobbying activities include direct communication with members of Congress, state legislators, administration and regulatory officials, as well as support for trade associations and other groups that engage in lobbying activities. We fully comply with registration and reporting regulations related to our lobbying activities. In 2015, the corporation reported total federal lobbying expenses of about \$12 million in its disclosure reports to Congress.

ExxonMobil engaged on a variety of issues last year in support of responsible economic, energy, education and environmental policies. Our positions on a few key issues are described below.

- Energy infrastructure: ExxonMobil supports the continued development of necessary energy infrastructure, which will increase energy security and help grow the economy.
- Hydraulic fracturing and horizontal drilling: ExxonMobil
 supports the global use of horizontal drilling and hydraulic

Corporate governance

fracturing — safe and successful technologies that have been used for decades — to enable energy development. With the combination of these technologies, energy security is enhanced through expanded oil and gas production.

- Cybersecurity: ExxonMobil is committed to protecting all information and assets related to our global operations. We support and participate in the development of risk-based industry guidelines and existing public-private frameworks to protect against cyber threats. Because of ExxonMobil's global operations, we are concerned about the potential fragmentation of mandatory security requirements. To the greatest extent possible, cybersecurity requirements need to be harmonized globally.
- Tax policy: ExxonMobil supports stable tax policies that enable the energy industry to remain competitive in the global marketplace. Energy development benefits our economy and sound tax policy is needed to encourage investment, job creation and productivity.
- International trade: Trade liberalization is among the top global issues for ExxonMobil. The company supports free trade policies for all products, including energy products such as oil and natural gas. ExxonMobil supports lifting restrictions on exports of energy products because expanding markets can benefit all consumers, since it encourages the development of new technologies, new business models and the efficient production and distribution of products. Robust trade policies benefit consumers and encourage more investment, sustain high-paying jobs and foster economic growth.
- Regulatory improvement: Common-sense reforms to improve transparency, accountability and objectivity of regulations would enable effective enforcement, improve public safety and minimize economic costs.
- Renewable fuel standard (RFS): ExxonMobil opposes fuel mandates such as the RFS because they distort free markets, do not provide claimed environmental benefits and ultimately increase costs to consumers. Transportation fuels should be reliable and affordable to meet consumer needs, consistent with automobile and engine

manufacturers' recommendations, and compatible with transportation fuel infrastructure.

- Toxic Substances Control Act (TSCA): ExxonMobil supports TSCA reauthorization and modernization to strengthen safety standards, mandate safety reviews for all new and existing chemicals, and balance state and federal regulations of chemicals. Reforming chemical regulation strengthens oversight and provides consumers with more confidence in the safety of chemicals, while also providing companies the certainty needed to support future investments.
- Education: Improving educational performance is vital to the success of our industry and to global competitiveness. We support sensible, forward-looking efforts to raise academic standards and help teachers and students. We support science, technology, engineering and mathematics education initiatives as part of a path to competitiveness.

In light of the importance of sound public policies, ExxonMobil will continue to engage actively with stakeholders who have an interest in key issues that affect the company and industry.

ExxonMobil Perspectives blog

ExxonMobil makes political contributions to candidate committees and political organizations as permitted by applicable laws. These contributions are authorized by the board of directors. The corporation refrains from making political contributions in any country other than the United States and Canada. In 2015, we contributed almost \$230,000 to state candidates and caucuses in 13 U.S. states. Corporate political contributions are subject to an internal review process that requires approval from the chairman. The political contributions of the corporation, as well as the contributions from the company-sponsored political action committee (PAC), are reviewed with the board of directors annually and are routinely verified during internal audits of the corporation's public affairs activities.

Eligible employees and retiree shareholders may participate in the U.S. political process by contributing to a voluntary company-sponsored federal PAC. PAC contributions are reported monthly to the Federal Election Commission (FEC) and are a matter of public record. During 2015, ExxonMobil's PAC disbursed nearly \$822,000* to federal and state candidates. Based on 2015-2016 election cycle disbursements, Congressional Quarterly's *Political MoneyLine* lists the ExxonMobil PAC No. 52 in size relative to other corporate PACs. The ExxonMobil PAC ranks No. 43 in terms of receipts from employees and retiree shareholders. The rankings are compiled from publicly available data filed with the FEC.

Our *Political Activities Policy and Guidelines*, as well as an itemized list of our corporate political contributions, are available on our website.

Political Activities Policy and Guidelines

*Totals may not reflect some candidates' failure to deposit, or returned contributions not yet posted.
About this report

This 2015 Corporate Citizenship Report was created in accordance with the reporting guidelines and indicators of IPIECA — the global oil and gas industry association for environmental and social issues, the International Association of Oil and Gas Producers (IOGP) and the American Petroleum Institute (API) Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (2015). ExxonMobil was a key contributor to the updated industry guidance, and this report reflects the new indicators at a common reporting level. The majority of these indicators are also consistent with the indicators used by the Global Reporting Initiative (GRI) in its G4 Sustainability Reporting Guidelines; this report is informed by the G4 guidelines but has not been prepared to a particular GRI in accordance model. To help interested stakeholders easily access our key sustainability indicators, we have mapped relevant IPIECA and GRI indicators on page 93 of this report.

This report covers ExxonMobil's operations from January 1, 2015, through December 31, 2015, unless otherwise indicated. The report uses both qualitative descriptions and quantitative metrics to describe our policies, programs, practices and performance. For environmental and climate change data, units of measure are metric where noted. Financial information is reported in U.S. dollars. Exxon Mobil Corporation has numerous affiliates, with many names that include *ExxonMobil, Exxon, Mobil, Esso and XTO Energy.* For convenience and simplicity, those terms (and terms such as corporation, company, our, we, us and its) are sometimes used as abbreviated references to specific affiliates or affiliate groups. ExxonMobil includes the above-mentioned operations as part of our company performance data, which starts on page 90.

The term "project" as used in this publication can refer to a variety of different activities and does not necessarily have the same meaning as in any government payment transparency report.

Continual improvement

External feedback on our report is a key component of our engagement strategy and commitment to improve our annual *Corporate Citizenship Report*. Management reviews all comments, which, in many instances, are incorporated into the materiality assessment and report content. We welcome all feedback on this 2015 report. For additional information, to view previous reports or to provide comments, visit *exxonmobil.com/citizenship* or contact:

Jeremy Eikenberry, Corporate Citizenship Report Exxon Mobil Corporation 5959 Las Colinas Blvd. Irving, Texas 75039 citizenship@exxonmobil.com

Assurance

Third-party assurance provides an independent evaluation of how well we report our corporate citizenship information and gives our reporting practices additional integrity. Lloyd's Register Quality Assurance Inc. conducts an annual third-party assurance of ExxonMobil's safety, health and environmental reporting system. For the full assurance statement, see page 94.

Cautionary note

Statements regarding future events and conditions in this publication are forward-looking statements. Actual future results, including energy demand growth and supply mix; demographic changes; project plans, results, costs and capacities; the impact of new technology; future emission reductions and efficiency gains; and future capital expenditures may differ materially due to changes in oil and gas prices and other factors affecting supply and demand for oil, gas and petrochemicals; changes in government policy and regulation; future technological developments; the occurrence and duration of economic recessions; the outcome of commercial negotiations; unexpected technical and operating difficulties; and other factors discussed in this publication and in Item 1A of ExxonMobil's most recent annual report on Form 10-K. These factors are also set forth under the heading "Factors Affecting Future Results" on the Investors page of ExxonMobil's website.

Incorporating stakeholder feedback

Each year, we hold face-to-face and telephone dialogues with a variety of our stakeholders — including representatives from NGOs, academia, investors, industry experts and employees about our *Corporate Citizenship Report*. We have identified several recurring comments from stakeholders on our 2014 report and describe where we have incorporated changes within this year's report.

Discuss the technology and science ExxonMobil uses in greater detail. We have dedicated a case study and several Up Close examples to provide more information about the leading-edge technology our employees are using each day.

Describe the linkage between sustainability and ExxonMobil's key business objectives. We have expanded our discussion on our business and how ExxonMobil contributes to progress by providing the energy the world needs. We also have featured our OIMS framework, which establishes common worldwide expectations for addressing the safety, security, health and environmental risks inherent in our business.

Incorporate more third-party perspectives. We have incorporated quotes from eight ExxonMobil academic partners and NGOs in this report to show our continual approach to collaborating with our stakeholders. We have also incorporated our External Citizenship Advisory Panel's statement on our citizenship activities directly in this year's report.

Provide more context for performance data. We have incorporated explanatory text with every chart throughout the report. Additionally, our performance data table beginning on page 90 has an expanded description of the scope of coverage in our company-wide data.

Materiality

A key step in developing this *Corporate Citizenship Report* is ensuring the content reflects ExxonMobil's most material issues. According to IPIECA, the global oil and gas industry association for environmental and social issues, material issues for sustainability reporting are those that, in the view of both the company's management and its external stakeholders, have the potential to affect sustainability performance significantly. ExxonMobil has been conducting a materiality assessment to guide our reporting since 2006. For this 2015 report, we refreshed and built upon the process that was used to determine content for our 2014 report. We outline this materiality process below.

1 Issue identification

Using our list of potential material issues from 2014, we used the following sources to identify if there were any new issues to add or issues that may need to be reassessed:

- Media review
- Feedback sessions with external stakeholders
- Benchmarking of peer company reports
- Feedback sessions with ExxonMobil business line representatives
- Review of new IPIECA reporting guidance

2 Issue prioritization

We then prioritized the identified new issues or those that needed to be reassessed based on the following criteria:

- Frequency that stakeholders raised the issue
- Presence in the public domain
- Occurrence under international standards and frameworks
- Coverage by our industry and peers
- Online and media coverage
- Strategic importance to ExxonMobil
- Future business opportunities and challenges

3 2015 material issues

In 2015, two new issues emerged compared with last year: decommissioning and rehabilitation of the environment. While we have reported on these topics in the past, we have not addressed them in detail in recent years. Our materiality assessment results guided us to add them to the list of material topics in 2015.

Safety, health and the workplace

- Emergency preparedness and response
- Employee benefits
- Employment practices
- Personnel safety
- Process safety
- Product safety and responsibility
- Product transportation safety
- Retention and engagement
- Training and development
- Workplace security
- Worksite health and wellness

Managing climate change risks

- Climate change policy and planning
- Energy use/efficiency
- Greenhouse gas emissions

Environmental performance

- Air quality
- Biodiversity and ecosystem services
- Decommissioning
- Environmental compliance
- · Rehabilitation of the environment
- Spill performance
- Water

Community and social impact

- Community relations
- External stakeholder engagement
- Human rights
- Indigenous peoples

Local development and supply chain management

- Economic impacts and development
- Supply chain management

Corporate governance

- Board leadership
- Ethics and integrity
- Executive compensation
- Political advocacy and contributions
- Shareholder relations/returns
- Transparency

Business operations

(included throughout report)

- Arctic operations
- Canadian oil sands
- Energy future
- Management systems
- Offshore drilling
- Unconventional oil and gas operations

Performance data

We are committed to continual improvement in all six of our corporate citizenship areas. This means we assess our performance at many levels of the organization, from individual operational sites to the business lines. Starting in 2011, performance data include XTO Energy information. As part of our commitment to continual improvement, in 2014 we started reporting our data over a 10-year period to demonstrate performance trends over time. For data that is discussed in more detail in this report we reference the corresponding page number in the table.

Performance data table*	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Page #
Safety, health and the workplace											
Fatalities – employees	3	0	0	4	0	0	1	0	0	0	19
Fatalities – contractors	7	8	5	4	3	9	4	6	3	2	19
¹ Fatal accident rate — total workforce (per 1,000,000 work hours)	0.021	0.018	0.011	0.017	0.006	0.017	0.010	0.011	0.006	0.004	N/A
¹ Fatality incident rate — total workforce (per 1,000,000 work hours)	0.021	0.013	0.011	0.012	0.006	0.017	0.010	0.009	0.006	0.004	N/A
² Lost-time incident rate — employees (per 200,000 work hours)	0.050	0.031	0.054	0.043	0.048	0.064	0.042	0.050	0.032	0.043	N/A
² Lost-time incident rate — contractors (per 200,000 work hours)	0.052	0.065	0.049	0.040	0.031	0.086	0.049	0.041	0.030	0.029	N/A
² Lost-time incident rate — total workforce (per 200,000 work hours)	0.051	0.048	0.051	0.041	0.038	0.077	0.046	0.044	0.031	0.034	19
² Total recordable incident rate — employees (per 200,000 work hours)	0.33	0.33	0.37	0.32	0.25	0.30	0.25	0.21	0.19	0.21	N/A
² Total recordable incident rate — contractors (per 200,000 work hours)	0.43	0.43	0.49	0.39	0.34	0.41	0.37	0.32	0.29	0.26	N/A
² Total recordable incident rate — total workforce (per 200,000 work hours)	0.39	0.38	0.43	0.36	0.30	0.37	0.33	0.28	0.25	0.24	19
Process Safety Tier 1 Events (API RP 754 guidance)	N/A	N/A	N/A	69	62	70	63	62	65	74	21
^{3,4} Number of regular employees at year end, thousands	82	81	80	81	84	82	77	75	75	73	26
⁴ Percent of workforce – outside the United States	63	63	63	63	60	61	59	59	58	59	26
⁴ Percent women — global workforce	24	25	25	26	26	26	28	28	28	28	27
Percent management and professional new hires — women	41	38	39	38	40	44	39	39	40	41	27
Percent management and professional new hires — outside the United States	72	71	69	63	70	79	68	66	61	61	N/A
Number of non-unique employee participants in corporate and technical training, thousands	52	35	48	52	61	65	76	87	79	85	28
Total corporate and technical training expenditures, millions of dollars	60	61	69	71	77	80	88	96	117	124	28
Managing climate change risks											
5 Greenhouse gas emissions, absolute (net equity, CO $_{2}^{-}$ equivalent emissions), millions of metric tons	139	135	126	123	126	128	126	127	123	122	35
⁶ Direct (excluding emissions from exported power and heat)	129	125	117	114	117	119	118	119	115	114	N/A
⁷ Emissions associated with imported power	10	10	9	9	9	9	8	8	8	8	N/A
Greenhouse gas emission consituents (excludes emissions from exported power and heat), millions of metric tons											
CO_2 (excluding emissions from exported power and heat)	134	131	122	119	122	124	120	119	116	115	N/A
Methane (CO ₂ -equivalent)	4	3	3	3	3	3	5	7	6	6	N/A
Other gases (CO ₂ -equivalent)	1	1	1	1	1	1	1	1	1	1	N/A
Emissions from exported power and heat	14	14	13	14	13	15	15	16	7	4	N/A
By-region greenhouse gas emissions (net equity, CO ₂ -equivalent emissions), millions of metric tons											
Africa/Europe/Middle East	50	50	45	43	45	45	44	44	43	44	N/A
Americas	69	65	62	62	64	66	68	70	66	65	N/A
Asia Pacific	20	20	19	18	17	17	14	13	14	13	N/A

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Page #
Managing climate change risks (continued)											
By-division greenhouse gas emissions (net equity, CO ₂ -equivalent emissions), millions of metric tons											
Upstream	57	53	49	47	50	54	56	58	56	56	N/A
Downstream	60	59	57	56	55	54	51	49	47	45	N/A
Chemical	22	23	20	20	21	20	19	20	20	21	N/A
Carbon dioxide – captured for sequestration, millions of metric tons	N/A	N/A	N/A	N/A	N/A	5.0	4.8	5.9	6.9	6.9	34
⁵ Greenhouse gas emissions, normalized (net equity, CO ₂ -equivalent emissions), metric tons per 100 metric tons of throughput or production											
Upstream	22.6	21.7	21.0	20.1	20.5	20.7	22.3	22.8	23.4	23.4	35
Downstream	21.8	21.5	21.0	21.0	20.8	20.0	19.6	19.7	19.2	18.9	35
Chemical	60.9	62.1	59.8	60.7	57.9	57.2	56.3	57.0	53.4	52.3	35
Energy use (billion gigajoules)	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	36
Energy intensity, normalized versus Global Energy Management System (GEMS) base year (2002) — refining	94.8	94.2	93.7	92.8	91.8	90.9	90.0	90.5	90.3	91.2	N/A
Energy intensity, normalized versus GEMS base year (2002) — chemical steam cracking	90.4	89.6	90.4	88.6	87.6	87.3	88.2	88.8	86.4	86.6	N/A
Hydrocarbon flaring (worldwide activities), millions of metric tons	8.2	8.0	5.7	4.4	3.6	4.1	3.6	3.7	4.5	5.3	36
⁸ Cogeneration capacity in which we have interest, gigawatts	4.3	4.5	4.6	4.9	4.9	5.0	5.2	5.3	5.5	5.5	37
Environmental performance											
⁸ Number of acres of managed wildlife habitat	370	370	370	380	6,400	6,900	7,000	7,000	7,200	7,100	48
Freshwater withdrawn, millions of cubic meters	N/A	N/A	N/A	N/A	N/A	550	520	430	420	430	N/A
Freshwater consumption, millions of cubic meters	N/A	320	350	340	330	370	330	280	270	300	48
Freshwater intensity, metric tons of water consumed per metric tons of throughput or production											
Upstream	N/A	0.07	0.08	0.09	0.10	0.26	0.26	0.22	0.17	0.33	N/A
Downstream	N/A	0.81	0.90	0.85	0.87	0.88	0.82	0.74	0.74	0.73	N/A
Chemical	N/A	2.36	2.56	2.46	2.41	2.64	2.41	1.98	1.79	1.67	N/A
Marine vessel spills (owned and long-term leased), number of hydrocarbon spills > 1 barrel	0	0	0	0	0	0	0	0	0	0	51
°Significant spills to the environment	N/A	N/A	N/A	N/A	N/A	N/A	20	18	19	11	51
Spills (not from marine vessels), number of oil, chemical and drilling fluid spills > 1 barrel	295	253	211	242	210	484	356	330	334	319	51
Oil spills, number of oil spills > 1 barrel	249	224	185	208	186	387	294	280	288	280	N/A
Other spills, number of chemical and drilling fluid spills > 1 barrel	46	29	26	34	24	97	62	50	46	39	N/A
Hydrocarbons spilled (oil spilled), thousands of barrels	35.3	7.5	20.3	17.4	7.7	17.8	8.5	9.3	9.1	10.8	51
Other spills, thousands of barrels	4.7	0.5	0.4	0.5	40.4	2.0	1.6	0.9	4.1	0.4	N/A
Controlled hydrocarbon discharges to water, thousands of metric tons	1.9	1.7	1.8	1.4	1.3	1.3	1.2	1.1	1.3	1.1	N/A
Upstream	1.4	1.2	1.3	1.1	1.1	1.1	1.0	1.0	1.2	1.0	N/A
Refining	0.5	0.5	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	N/A
Sulfur dioxide (SO ₂) emitted, millions of metric tons	0.24	0.21	0.19	0.16	0.14	0.13	0.13	0.12	0.10	0.10	53
Nitrogen oxides (NOx) emitted, millions of metric tons	0.18	0.16	0.15	0.13	0.12	0.15	0.14	0.14	0.14	0.14	53
Volatile organic compounds (VOCs) emitted, millions of metric tons	0.31	0.29	0.23	0.21	0.20	0.21	0.17	0.16	0.17	0.15	53

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Page #
Environmental performance (continued)											
VOCs emitted, metric tons per 100 metric tons of throughput or production											
Upstream	0.074	0.073	0.059	0.058	0.061	0.063	0.056	0.059	0.061	0.053	N/A
Refining	0.016	0.015	0.012	0.011	0.012	0.011	0.010	0.009	0.008	0.008	N/A
Chemical	0.043	0.039	0.043	0.036	0.036	0.032	0.036	0.034	0.029	0.024	N/A
Environmental expenditures, billions of dollars	3.2	3.8	5.2	5.1	4.5	4.9	5.5	6.0	6.2	5.6	53
Total hazardous waste disposed from remediation, millions of metric tons	0.1	0.1	0.2	1.2	0.6	1.3	1.7	1.1	1.0	1.4	N/A
¹⁰ Total hazardous waste disposed from operations, millions of metric tons	0.1	0.1	0.4	0.8	1.3	1.9	2.0	0.3	0.3	0.2	N/A
Community and social impact											
¹¹ Community investments, millions of dollars	170.0	206.6	225.2	235.0	237.1	278.4	255.6	269.5	279.5	267.8	64
United States	109.1	124.1	144.6	143.0	154.8	161.3	156.5	156.3	150.2	145.6	64
Rest of world	60.9	82.5	80.6	92.0	82.3	117.1	99.1	113.2	129.3	122.2	64
Local development and supply chain management											
¹² ExxonMobil spending with U.S. diverse suppliers, millions of dollars	576	582	615	887	841	1,068	1,001	1,024	1,108	1,064	80
Corporate governance											
¹³ Number of Extractive Industries Transparency Initiative (EITI) participating countries	6	6	8	8	7	7	7	9	10	11	N/A
Percent of shares represented at Corporation's Annual Meeting	84.0	84.9	84.8	82.9	80.7	81.9	83.0	82.3	82.9	83.9	85
Corporate political contributions — U.S. state campaigns and national 527s, millions of dollars	0.41	0.27	0.45	0.49	1.10	0.51	1.03	0.70	1.17	0.58	N/A

Notes on performance table:

¹Workforce includes employees and contractors. Accidents or incidents include both injuries and illnesses. From 2006 through 2015 all fatalities were injury-related.

²Workforce includes employees and contractors. Incidents include both injuries and illnesses. Depending on the reporting year, around 5 to 10 percent of the incidents are illness-related.

³Reduction from 2011 is primarily due to divestment and restructuring activity in the Downstream business.

⁴Regular employees are defined as active executive, management, professional, technical and wage employees who work full-time or part-time for ExxonMobil and are covered by ExxonMobil's benefit plans and programs. Employees at our company-operated retail stores are not included.

⁵The net equity greenhouse gas emissions metric was introduced in 2011 as a replacement for the direct equity greenhouse gas metric. Information has been restated back to 2005 according to the new metric. The net equity greenhouse gas metric includes direct and imported greenhouse gas emissions and excludes emissions from exports (including Hong Kong Power through mid-2014). ExxonMobil reports greenhouse gas emissions on a net equity basis for all our business operations, reflecting our percent ownership in an asset.

⁶The addition of direct emissions and emissions associated with exported power and heat is equivalent to World Resources Institute (WRI) Scope 1.

⁷These emissions are equivalent to WRI Scope 2.

⁸Cumulative figure.

°ExxonMobil began measuring significant spills to the environment, the number of spills of any fluid type that warrant greater focus, in 2012.

¹⁰The value for hazardous waste from ongoing operations includes produced water classified as hazardous waste by one local authority, which is approximately 95 percent of the reported figure in 2008 through 2012.

¹¹Total contributions include ExxonMobil corporate and foundation donations, and employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs.

¹²In 2015, our spending encompassed an expanded set of diverse classifications that includes: minority-owned businesses; women-owned businesses; lesbian-, gay-, bisexual- and transgender-owned businesses; veteran-owned businesses; service-disabled veteran-owned businesses; and businesses; owned by peoples with disabilities. Prior to 2014, spending included minority- and women-owned businesses.

¹³In countries where ExxonMobil has an Upstream business presence.

*Some uncertainty exists in performance data, depending on measurement methods. Data in the report and performance data table represent best available information at the time of publication. Performance data are reported for our affiliates and those operations under direct ExxonMobil management and operational control. Includes XTO Energy performance beginning in 2011. N/A is used to indicate that data are not available.

IPIECA/GRI content index

Our corporate citizenship reporting is guided by our materiality process (see page 89), through which we determine the most important issues to our stakeholders and our business. Our reporting is also consistent with the IPIECA, the International Oil and Gas Producers Association (IOGP) and the American Petroleum Institute (API) Oil and gas industry guidance on voluntary sustainability reporting (2015). This report also cross-references the Global Reporting Initiative (GRI) *G4 Sustainability Reporting Guidelines*. These standards can be downloaded at *ipieca.org* and *globalreporting.org*.

Report section	IPIECA/IOGP/API	GRI	Page reported
Company overview			
Chairman's letter		G4-1	3
About ExxonMobil and Contributing to progress		G4-4, G4-6, G4-8, G4-9, G4-17, G4- EC1	4-6
The Outlook for Energy		G4-2, G4-EC2	7
Sustainability and Engaging with our stakeholders	SE1, SE16	G4-2, G4-24, G4-26, G4-27	8-9
External Citizenship Advisory Panel		G4-26, G4-27	10-11
Key sustainability issues and challenges		G4-2, G4-26, G4-27, G4-36	12-14
Case study: ExxonMobil's Operations Integrity Management System	HS1, HS2, HS5, SE17	G4-14, G4-15, G4-LA10	15-17
Safety, health and the workplace			
Safety	HS1, HS3, HS4, HS5	G4-14, G4-56, G4-LA6	18-22
Emergency preparedness and response	E9, SE17	G4-14, G4-LA10	22-23
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ExxonMobil fully reports on all GRI indicators listed above, unless they are in italics, in which case they are partially addressed. Where indicators require multiple pieces of information located in different sections of the report, we list the indicator in every section where the related information appears. The IPIECA indicators in this index include, at minimum, all common reporting elements.





LRQA Assurance Statement

Relating to Exxon Mobil Corporation's Corporate Citizenship Report for the calendar year 2015.

This Assurance Statement has been prepared for Exxon Mobil Corporation in accordance with our contract but is intended for the readers of this Report.

Terms of engagement

Lloyd's Register Quality Assurance, Inc. (LRQA) was commissioned by Exxon Mobil Corporation (ExxonMobil) to assure its processes for reporting safety, health, and environmental IPIECA performance indicators used in the *Corporate Citizenship Report* (CCR) for the calendar year 2015, to a reasonable level of assurance using LRQA's verification approach.

Our assurance engagement covered ExxonMobil's operations and activities worldwide and specifically the following requirements:

- Verifying the integrity of the processes used for determining which material issues to report
- Evaluating consistency with the following industry guidelines:
 IPIECA/API, Oil and Gas Industry Guidance on Voluntary Sustainability
 - Reporting (2015) - API, Compendium of Greenhouse Gas Emission Estimation
 - Methodologies for the Oil and Gas Industry (2009)

Our assurance engagement did not include verifying the accuracy of data and information reported.

LRQA's responsibility is only to ExxonMobil. LRQA disclaims any liability or responsibility to others as explained in the end footnote. ExxonMobil's management was responsible for preparing the CCR and for maintaining effective internal controls over the reporting processes and CCR. LRQA's responsibility was to carry out an assurance engagement on the reporting processes in accordance with our contract with ExxonMobil. Ultimately, the CCR has been approved by, and remains the responsibility of, ExxonMobil.

LRQA's opinion

Based on LRQA's approach, we believe that ExxonMobil's reporting processes were effective in delivering safety, health, and environmental indicators that are useful for assessing corporate performance and reporting information consistent with IPIECA/API Guidance.

The opinion expressed is formed on the basis of a reasonable level of assurance and at the materiality of the professional judgement of the Verifier.

LRQA's approach

LRQA's assurance engagement was carried out in accordance with our Verification procedure; the following tasks though were undertaken as part of the evidence gathering process for this assurance engagement:

- Reviewing the reported information to confirm the inclusion of all core safety, health and environmental performance indicators referenced in the IPIECA/API Guidance
- Reviewing the documented reporting requirements against the applicable industry guidelines to assure consistency of scope, definition, and reporting for each of the relevant indicators
- Reviewing the reporting processes at Headquarters and at each of the functional business levels to evaluate the processes used by ExxonMobil to assure completeness, consistency and conformance to reporting requirements across its global operations
- Reviewing the stakeholder engagement processes
- Reviewing the processes used to aggregate the data and information at the corporate level for inclusion in the CCR
- Reviewing ExxonMobil's data collection tools to assess use in the reporting processes
- Reviewing the data-reporting processes at a sample of nine operating sites selected by LRQA to assess local understanding and implementation of reporting requirements. Sites selected were Rotterdam manufacturing complex, Netherlands; Paulinia solvents plant, Brazil; Imperial Oil Resources Limited Cold Lake, Canada; ExxonMobil Chemical Company headquarters, United States; ExxonMobil Development Company headquarters, United States; and lubricant facilities in Serviburnu, Turkey; Vado, Italy; Gravenchon, France; and Tai Cang, China.

Observations

Further observations and findings, made during the assurance engagement, are:

- Processes were in place to ensure that sites contributing to core safety, health and environmental metrics understood corporate reporting obligations and were included in corporate safety, health, environmental and climate change reporting
- Methods used for calculating each metric were defined clearly and communicated
- Processes were in place to ensure that the quantitative indicators were checked for completeness, consistency and accuracy
- Responsibility for annually reviewing and updating reporting guidelines
 was clear, with improvement in methodology regularly undertaken
- Guidelines for greenhouse gas emissions reporting were consistent with, and specifically refer to, the API Compendium for Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry (2009)
- Active engagement with external stakeholders provided information for determining material issues

Observations and areas for potential improvement were provided in a report to ExxonMobil's management. These recommendations do not affect our opinion.

LRQA's competence and independence

LRQA ensures the selection of appropriately qualified individuals based on their qualifications, training and experience. The outcome of all verification and certification assessments is then internally reviewed by senior management to ensure that the approach applied is rigorous and transparent.

LRQA is ExxonMobil's certification body for ISO 9001 and ISO 14001 (lubricants operations) and Responsible Care® (chemicals operations) and the California Air Resources Board greenhouse gas verification. The certification assessments are the only work undertaken by LRQA for ExxonMobil and as such does not compromise our independence or impartiality.

Signed

Dated: March 30, 2016

Anne frem

Andrea M. Bockrath

LRQA Lead Verifier On behalf of Lloyd's Register Quality Assurance, Inc.

LRQA Reference: UQA0110889

LRQA's Verification procedure is based on current best practice and uses the principles of AA1000AS (2008) – Inclusivity, Materiality, Responsiveness and Reliability of performance data and processes defined in ISAE3000.

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ExonMobil



Explore our complete 2015 Corporate Citizenship Report at exxonmobil.com/citizenship.

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ExxonMobil is a publicly traded company. The New York Stock Exchange (NYSE) is the principal exchange on which Exxon Mobil Corporation common stock (symbol XOM) is traded. The term "project" as used in this publication can refer to a variety of different activities and does not necessarily have the same meaning as in any government payment transparency reports.

Exxon Mobil Corporation 5959 Las Colinas Blvd. Irving, Texas 75039-2298 exxonmobil.com

Exhibit 24

ExonNobi

2016 Corporate Citizenship Report



Zach Myers, ExxonMobil drilling engineer, aboard the Stena Carron drill ship offshore Georgetown, Guyana.



On the cover: Since 2000, ExxonMobil has spent approximately \$8 billion to develop lower-emission energy solutions.

Throughout this report, additional content is available by clicking the icons below.



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This year, we have modified our *Corporate Citizenship Report* compared with prior reports. This PDF report focuses on our most material sustainability issues (see page 10) with links to additional content on *exconmobil.com*, identified with an icon throughout the report. The expanded content on *exconmobil.com* showcases our approach to managing key corporate citizenship topics and highlights additional 2016 examples of our activities.

Chairman's letter

For 135 years, ExxonMobil has been built on strong business fundamentals, including operational excellence, technology leadership, financial discipline and a world-class workforce. These strengths have enabled us to safely and reliably deliver energy to our customers and value to our shareholders, even in the low-price environment that our industry has experienced recently. We are committed to doing what is in the best interests of our company and society. This requires us to remain focused on safety, environmental performance, community engagement and corporate governance.

I am pleased to share ExxonMobil's 2016 Corporate Citizenship Report, which details our performance and commitments in several key areas. As you will read, we continue to apply a rigorous, results-oriented approach to corporate citizenship in our business.

Our efforts to protect the safety and health of our employees, contractors and communities are at the heart of what we do every day. We strive to ensure *Nobody Gets Hurt*. We are proud to be an industry leader in safety culture and performance. In 2016, we achieved our best-ever workforce lost-time incident rate of 0.029 incidents per 200,000 work hours, an improvement of more than 80 percent compared to our performance in 2000.

As we provide the energy to meet growing needs around the world, we are also working to manage the risks of climate change. Climate change risks warrant action by businesses, governments and consumers, and we support the Paris Agreement as an effective framework for addressing this global challenge.

For our part, ExxonMobil continues to take action to mitigate our emissions and help consumers lessen their greenhouse gas impact. Since 2000, our investments to develop lower-emission energy solutions totaled about \$8 billion. We are deploying technologies such as cogeneration and carbon capture and storage while researching next-generation energy sources such as algae biofuels. Continued research in technological breakthroughs will be critical to managing future environmental and climate change risks.

As a science and technology company with more than 2,200 Ph.D. scientists, we will continue pursuing technologies that benefit both our company and society. Through our research organization, I have seen the transformative power of innovation - I believe it is vital to achieving progress.

We also value our long-standing relationships with communities and host governments worldwide. We work to enhance the social benefits from our operations, placing an emphasis on hiring qualified local workers and supporting a variety of strategic community investments. In 2016, we contributed \$242 million to communities around the world.

I am proud of ExxonMobil's corporate citizenship performance, and I look forward to building upon our progress to secure an even stronger future for our company and the society we serve.

We welcome feedback from all of our stakeholders at exxonmobil.com/citizenship.

Darren Woods Chairman and CEO

About ExxonMobil

As the world's largest publicly held oil and natural gas company, ExxonMobil uses technology and innovation to safely and responsibly deliver the energy and products the world needs. Every day, our employees work diligently to address the challenges of meeting growing global energy demand. In 2016, ExxonMobil supplied about 1.5 percent of the world's energy demand, equivalent to about 10 percent of U.S. energy demand. The reliable and affordable energy we supply is vital to fueling economic activity and helping improve the living standards of people around the world.

As we make significant investments around the world to help meet the world's growing energy needs, we also invest in the communities in which we work. In 2016, we contributed \$242 million to communities around the world.

ExxonMobil has a diverse portfolio of high-quality assets, projects and resources across our Upstream, Downstream and Chemical businesses. Our technical expertise, global reach and integrated business model provide ExxonMobil with a competitive advantage. Our flexibility and focus on fundamentals enable us to deliver value irrespective of the industry environment.

In 2016, we continued to demonstrate strong financial and operating performance across our business despite very challenging industry conditions:

- Achieved earnings of \$7.8 billion and return on average capital employed of 3.9 percent.
- Spent \$19.3 billion on capital and exploration expenditures.
- Completed five major Upstream projects with a working interest production capacity of almost 250,000 oil-equivalent barrels per day.
- Made significant oil discoveries offshore Nigeria and Guyana, and a gas discovery onshore Papua New Guinea.
- Progressed construction of a new hydrocracker project at our refinery in Rotterdam, Netherlands.
- Advanced construction of a world-scale specialty polymers facility in Singapore that will produce halobutyl rubber and performance resins.

For more in-depth analysis of our financial performance and investment decisions, see our 2016 Summary Annual Report and 2016 Financial and Operating Review.





ExxonMobil's integrated businesses

Upstream

We have an active exploration or production presence in 39 countries.

We use our unique geoscience capabilities, technology and understanding of global hydrocarbon resources to identify and prioritize all quality opportunities.



million oil-equivalent barrels of net oil and gas production per day¹

Downstream

Our balanced Downstream portfolio includes refining facilities in 14 countries.

We are one of the largest integrated refiners and manufacturers of fuels and lube basestocks and a leading marketer of petroleum products and finished lubricants.









Lubricants



Research & & Specialties Engineering

million barrels of petroleum product sales per day²



Chemical

We manufacture high-quality chemical products in 16 countries.

Our unique portfolio of commodity and specialty businesses delivers strong returns across the business cycle.



Elastomer & Butyl



¹Gas conversion to oil-equivalent barrels using 6 million cubic feet to equal 1,000 barrels.

²Petroleum product sales data reported net of purchases/sales contracts with the same counterparty.

³Prime product sales are total product sales excluding carbon black oil and sulfur. Prime product sales include ExxonMobil's share of equity company volumes and finished-product transfers to the Downstream.



Introduction

The Outlook for Energy

The Outlook for Energy is ExxonMobil's global view of energy demand and supply through 2040. We use the data and findings in this annual publication to help guide our long-term investments. It also highlights the dual challenge of providing the world with access to affordable and reliable energy supplies while reducing emissions to address the risks of climate change. We share *The Outlook* with the public to promote a better understanding of the issues shaping the world's energy needs. Why is this important? Because energy is fundamental to modern life. It is critical to human progress and to improving living standards for 7.5 billion people across the globe, including those without electricity, clean running water and clean-burning cooking fuels.



The Outlook for Energy: A View to 2040

The world's energy to 2040: Seven things to know

Modern energy is one of mankind's most complex endeavors, and its path is shaped by countless forces. We see seven key themes that will play a major role in defining our global energy landscape through 2040.

Energy underpins economic growth:

High levels of growth mean rising living standards. Across the world, the middle class will more than double in the next 15 years. As this growth accelerates so does consumption. Demand for energy increases with more people expecting access to air-conditioned homes, cars and appliances like refrigerators, dishwashers and smartphones

Natural gas leads growth in energy:

Natural gas is the largest growing fuel source, providing a quarter of global energy demand by 2040. The abundance and versatility of natural gas is helping the world shift to less carbon-intensive energy for electricity generation while also providing an emerging option as a fuel for certain types of transportation.

Oil remains the world's primary energy source:

Oil will continue to play a leading role in the energy mix with demand being driven by fuel for transportation and feedstock for the chemicals industry. These feedstocks help to make plastics and other advanced materials that provide advantages to manufacturers and consumers including energy efficiency gains.

Cost-effective options to reduce CO₂ emissions:

Delivering on the increased demand for energy needs to go hand in hand with finding constructive solutions that mitigate the risks of climate change. This is supported by the continuing shift to less carbon-intensive energy for power generation and increased energy efficiency in every sector. Global energy-related carbon dioxide (CO_2) emissions are likely to peak during the 2030s, even as global GDP doubles by 2040.

Non-OECD countries lead the way for energy demand:

Continuing urbanization in China and India, with people moving from rural areas to cities, will help to drive economic growth. China is likely to be the largest contributor of gross domestic product (GDP) gains. India is also growing strongly with its share of global GDP doubling.

The global energy mix is evolving:

As global economies grow and government policies change, the energy mix will continue to diversify. Nuclear and renewables will grow strongly and natural gas will grow the most. The diversification of energy supplies reflects economics and advanced technologies as well as policies aimed at reducing emissions.

The potential of technology:

As the pace of technology development continues to accelerate, new — and still uncertain — solutions are likely to emerge to contribute to meeting energy and environmental goals. Recent advances in technology are promoting energy efficiency gains to slow demand growth, and also opening up new energy supply options including unconventional oil and natural gas, nuclear and renewables.

Sustainability

Sustainability is critical to our business. At ExxonMobil, we work to expand the supplies of reliable and affordable energy needed for economic progress. In doing so, we take a balanced approach that considers the impact of our operations on local economies, communities and the environment. We design our approach to sustainability around six key areas:

- Safety, health and the workplace
- Managing climate change risks
- Environmental performance
- Community engagement, human rights and strategic investments
- Local development and supply chain management
- Corporate governance

ExxonMobil is committed to aligning our long-term business objectives with these six areas.

In September 2015, the United Nations published the Sustainable Development Goals (SDGs), providing a framework for governments, civil society and business to work together in progressing sustainability. The SDGs cover a range of sustainable development issues — through 17 goals and specific targets that will inform countries' planning through 2030. ExxonMobil, as a major provider of reliable and affordable energy and a partner in community health, education and economic development, helps achieve progress in many of the areas set forth in the SDGs.



Stakeholder engagement

We recognize the significant responsibilities we have to our shareholders, neighbors, customers and communities as we find ways to bring affordable energy to the global market. For a company of our size and scope, building and maintaining relationships with a diverse group of stakeholders is critical. Regular stakeholder engagement helps us understand a variety of perspectives and improve our company's performance.

Because our business directly affects many people around the world, we seek to understand their viewpoints. We interact with our diverse stakeholders through a variety of mechanisms, including community meetings, web and social media content, corporate publications, and one-on-one and group discussions. Examples of stakeholder engagement are included throughout this report. The following list provides examples of common areas of interest.

Communities

Community development; economic development; grievance management; human rights; operational impacts; environmental performance

Customers

Product safety and sustainability; supply chain management; greenhouse gas emissions

Employees

Benefits; diversity; development opportunities; safety, health and wellness

Governments

Taxes and other revenue sources; climate change; local supplier development; job creation; human rights; impact assessments; ethics; health; education; energy supply and security

Nongovernmental organizations

Biodiversity; water management; climate change; human rights; transparency; social issues

Shareholders

Governance practices; board composition; policy engagement; risk management; climate change

Suppliers

Expectations for suppliers; local business opportunities; supplier diversity; capacity building; environmental performance

External Citizenship Advisory Panel

ExxonMobil's External Citizenship Advisory Panel (ECAP) provides an annual independent review of the company's corporate citizenship activities, including this report. The ECAP consists of academics, nongovernmental organization (NGO) representatives and former government employees who have expertise in social, governance and environmental topics. In addition to providing input on ExxonMobil's annual *Corporate Citizenship Report*, the ECAP discusses key topics with company executives at least once a year. We thank Sarah Labowitz for sharing her perspectives with us as a member of the panel from 2014 to 2016.

Mark Cohen

Professor of Management and Law Vanderbilt University Owen Graduate School of Management

Frank Loy

Former Under Secretary of State for Global Affairs U.S. Department of State

Jane Nelson

Director of Corporate Responsibility Initiative Harvard University Kennedy School of Government

Salil Tripathi

Senior Adviser, Global Issues Institute for Human Rights and Business



ECAP members visited XTO Energy operations near Fort Worth, Texas, as part of the panel's December 2016 meeting with executives.

External Citizenship Advisory Panel statement

ECAP statement on 2016 Corporate Citizenship Report

To the readers of this report,

As in prior years, we were asked to share our independent opinion on ExxonMobil's 2016 *Corporate Citizenship Report*. We reviewed and provided feedback on a draft of the report. In addition, we had the opportunity to engage across all levels of the company, including senior business executives, through in-person meetings, a site visit to XTO Energy Inc., telephone and email to discuss policy and strategy issues.

This letter is not an official endorsement of the report, the corporation or its policies and strategies, but rather our individual and collective views on the quality and progress made in ExxonMobil's citizenship reporting and transparency. In recognition of the time spent, ExxonMobil provided a donation on behalf of the panelists to nonprofit organizations of our choice and reimbursed relevant travel expenses.

We would also like to recognize the valuable contribution of our colleague, Sarah Labowitz, who resigned from the ECAP in late 2016, and wish her well.

2016 Commentary

Taking strategic action and engaging with critics on climate change

As one of society's greatest challenges, climate change requires urgent action on the part of governments, business and civil society. The 2015 Paris Agreement, the world's first comprehensive climate agreement, adopted in the presence of leaders of 195 countries, became effective in 2016. ExxonMobil states that it shares the Paris Agreement's view of the seriousness of climate change, and we commend the company for urging the new U.S. administration to remain a party to the Agreement.

However, the company is engaged in a legal and public dispute with visible social actors centering on what the company knew about the implications of climate change, and when and what it decided to do about it. Although the company has every right to defend itself in the litigation, these criticisms highlight the need for more proactive and constructive dialogue with critics. The panel suggests that ExxonMobil's credibility on this issue would be strengthened if it took additional measures to promote public policies that reduce climate change-inducing greenhouse gas emissions, such as taking a leadership role to bring about a revenue-neutral carbon tax. Further, the company may want to more explicitly describe how it is aligning its long-term corporate strategy and research priorities with climate change risks and opportunities. Since this letter was originally drafted based on 2016 company performance, we take note of significant movements in that regard, such as the recent letter to the President urging continued U.S. participation in the Paris Agreement, the company's participation as a founding member of the Climate Leadership Council, and the appointment to the board of Susan Avery, a climate scientist.

Providing more data context and comparative analysis

We appreciate ExxonMobil's robust reporting, including the synthesis of its quantitative performance through a summary data table. To enhance its reporting, ExxonMobil could explain why the particular metrics reported were chosen and how they align with methodological sources such as the Global Reporting Initiative, IPIECA, CDP, reporting under the United Nations *Guiding Principles on Business and Human Rights*, etc. It is also important to show both aggregate and normalized metrics similar to the approach taken for emissions or injury rates.

Lastly, additional context could be provided to demonstrate the strength of performance over time and, where appropriate, comparative performance with industry standards or competitors.

Leading voluntary initiatives

The current regulatory landscape for a range of environmental, social, human rights and governance issues is complex and uncertain. In times such as this, it is particularly important that leading companies take proactive and constructive voluntary actions. With this in mind, the company may want to play a greater role in supporting collective action and advocacy on key issues and report on what it is doing. For example, we commend ExxonMobil's decade-long leadership in revenue transparency and encourage the company to continue to take a strong position on this topic, including ongoing support for initiatives such as the Extractive Industries Transparency Initiative, despite the potential repeal of the Dodd-Frank Wall Street Reform and Consumer Protection Act Section 1504.

We applaud ExxonMobil's recent advocacy efforts on amendments to the Toxic Substances Control Act. In other areas where regulations may be rolled back, it will be important for the company to discuss its position and the extent to which it supports regulatory or voluntary initiatives. Lastly, ExxonMobil has developed an impressive suite of national content programs, encompassing skills development, local businesses and strategic community investment. We encourage the company to continue to strengthen these strategies and communicate how it is aligning itself with national development goals in countries of operation and with the Sustainable Development Goals.

Keeping pace with the maturing human rights landscape

With the maturing of human rights initiatives, there is a need for the company to keep pace in responding to stakeholder expectations and building industry-wide or multi-stakeholder coalitions to address human rights issues. As a participant in the *Voluntary Principles* (VPs) on *Security and Human Rights*, we encourage ExxonMobil to share good practices and lessons learned and participate actively in efforts to develop common standards of performance. This will be particularly important as the VPs shift to on-the-ground implementation. The company is right in letting its suppliers and contractors know about what it expects from them with regard to human rights initiatives such as the VPs. In the future, ExxonMobil should communicate the extent to which these expectations are part of supply contract requirements.

Lastly, the company should continue to reach its own decisions, but it should engage in a meaningful dialogue with affected stakeholders, including critics, and respond to the feedback it receives.

Leadership transition

As the bar continues to rise for good corporate citizenship, ExxonMobil will face increasingly higher expectations from investors and other stakeholders related to the company's management of environmental, social and governance issues. Strong leadership is more important than ever to demonstrate a sound management approach to these issues. Early 2017 brought a number of important leadership changes to the company, including the appointment of two new board members, as well as a new chairman and CEO. These changes reflect a diversity of gender, background and perspective, which we hope will better position the company to address these demands. We welcome these new leaders and look forward to working with them and the company's senior executives as they set the direction for the years ahead.

Sincerely,

Mark Cohen, Frank Loy, Jane Nelson, Salil Tripathi June 2017

Discussion of challenges on key issues

ExxonMobil announced significant oil discoveries offshore Guyana. How does ExxonMobil approach social, environmental and safety considerations when starting offshore development and production activities?

We work in over 100 countries around the world that span a wide range of natural, economic and social conditions. In some places, our industry has had a long presence. In others, oil and natural gas is an emerging sector. Everywhere we work, we are committed to conducting business in a manner that is compatible with the environmental and economic needs of the communities in which we operate.

When we go into a new country for our major Upstream projects, we conduct research and engage with local stakeholders including government, communities and local experts to develop a thorough understanding of current conditions from a safety, social and environmental perspective. During this process, we undertake environmental, socioeconomic and health assessments to understand the potential impacts from our operations. We incorporate this understanding into our project design and management plans to effectively mitigate risks. Such assessments are often required by host-country governments, but we go through the process even when it is not mandatory. This allows us to identify opportunities and risks early on in the planning process and take appropriate steps.

We followed this approach in Guyana, where in 2015 ExxonMobil announced the first major oil and gas discovery in the country. Prior to drilling even the first exploration well, ExxonMobil engaged with government and community stakeholders, including local scientists and experts, to build an understanding of our potential project impacts and appropriate protective measures.

We also consulted with the Guyana Geology and Mines Commission and the Guyana Environmental Protection Agency to develop a technical workshop series on oil and gas development, globally recognized best practices, international standards and environmental management technologies. Our partnership will help Guyana develop the capabilities it needs to manage oil and gas development, and we will continue working with local stakeholders through the duration of our project in the country.

What is ExxonMobil doing to promote respect for human rights within its operations and in the supply chain?

ExxonMobil actively promotes respect for human rights everywhere we work. We operate in some challenging environments where human rights issues — such as security, land and water access, forced labor and treatment of indigenous peoples — are a key concern to local communities. We believe the quality of the relationships we develop with local communities has a direct impact on the long-term success of our activities, and that our business presence can and does have a positive influence. We work with suppliers and business partners who share our commitment to human rights. We also actively engage with host governments to support security and respect for human rights in and near our operations.

In 2016, we made progress in a number of human rights-related areas:

- We published our ExxonMobil Supplier Expectations, a set of guidelines for our contractors and suppliers that covers human rights. These Expectations include references to key international human rights frameworks such as the United Nations Guiding Principles on Business and Human Rights and the International Labor Organization Declaration on Fundamental Principles and Rights at Work. Starting in 2017, the Supplier Expectations will become part of ExxonMobil's annual letter to our suppliers.
- We supported the creation of an in-country network to support the further implementation of the Voluntary Principles on Security and Human Rights in Nigeria. This network will enhance local collaboration on security and human rights among governments, nongovernmental organizations, companies and other stakeholders.
- We continued to train our workforce on human rights issues. For example, since late 2015, more than 1,200 of our key employees in 46 countries have completed our new computer-based human rights training.



Suzanne McCarron, ExxonMobil vice president of public and government affairs, has worldwide responsibility for the company's public policy, government relations, communications, media relations and corporate citizenship activities. Suzanne authors the Perspectives blog on our Energy Factor website, which encourages discourse on constructive solutions to energy challenges.

There have been several safety incidents associated with contract labor in the oil and gas sector. What is ExxonMobil doing to ensure its contractors receive the same safety training as its employees?

Our efforts are driven by our world-class Operations Integrity Management System. This system sets the foundation for our company's focus on safety throughout our worldwide operations. Employees and contractors alike are properly trained to perform their work in a safe manner.

We develop work plans tailored to our projects to ensure our workers get both the basic and specialized safety training they need for their specific jobs. We provide standardized training at regional safety training centers and work directly with contractors to make sure everyone working at our sites understands ExxonMobil's safety procedures and is competent to perform assigned tasks prior to starting work. For higher-risk activities, we have more stringent expectations, such as requiring certification prior to engaging in a particular activity. In some locations, we have helped build training centers where none previously existed. For example, we sponsored Survival Systems Training Limited in Nova Scotia, Canada. This organization provides training to employees and contractors working offshore on topics such as helicopter safety and firefighting.

Safety briefings conducted at our operating sites give employees and contractors an opportunity to share safety observations and encourage safe behaviors.

In addition, our procurement staff uses safety criteria to screen potential contractors that will be working on construction projects or at our major operations. The guidelines include having a robust safety program and leadership commitment to strong safety performance. Our goal is to work with companies to promote excellent safety performance across all aspects of our business.

Our strong safety culture has proven results. For example, our global contractor lost-time incident rate continues to be well below the industry average.

In light of the recent repeal of the U.S. Securities and Exchange Commission's 2016 final rule regarding payment reporting for the extractive industry, how will ExxonMobil work to promote transparency and revenue accountability in countries where it does business?

ExxonMobil believes the most successful transparency initiatives are those that ensure each relevant public, private and societal entity is fully engaged and properly represented. In addition, initiatives must respect national sovereignty and local norms and apply to every company in all sectors: public, private, foreign and domestic. Therefore, we did not support the approach the U.S. Securities and Exchange Commission took in its final rule in late 2016.

ExxonMobil supports transparency initiatives that increase government engagement with citizens and improve governance and revenue accountability. We voluntarily disclose revenues paid to governments for the development of natural resources, subject to legal and contractual restrictions. Our long-standing efforts to promote revenue transparency help to reduce corruption, improve government accountability and promote greater economic stability worldwide.

For many years, we have actively supported the Extractive Industries Transparency Initiative (EITI), a global program dedicated to strengthening governance by improving transparency and accountability in the extractives sector. We support the EITI application, validation and implementation processes in countries where we operate, and we are working with governments in a number of other countries that are considering joining EITI. We will continue to work constructively with governments considering new reporting rules to promote transparency and revenue accountability where we do business.

Over the past year, ExxonMobil has been questioned about its research and positions regarding climate change. How is the company responding to the investigations in New York and Massachusetts?

In late 2015 and 2016, the state attorneys general from New York and Massachusetts launched investigations into our past research and policy positions on climate change. We reject allegations that ExxonMobil suppressed climate change research or misled consumers or investors. We are responding in good faith while we continue to vigorously challenge the legality of the investigations. As of May 2017, the company has provided more than 2.8 million pages of documents in response. We look forward to an outcome that will put these false allegations to rest.

ExxonMobil is a constructive participant in the discussion on climate change. We will continue to research the issue, support energy efficiency, work to reduce emissions, pursue new technologies and engage on effective policy approaches.

Last fall you stated that the Paris Agreement was an "important step forward." What is ExxonMobil doing to address the risks of climate change?

The Paris Agreement signed by world leaders in 2016 showed the global community's resolve to address climate change risks. We're encouraged that the Paris Agreement creates an effective framework for all countries to address rising emissions. In fact, our company's forecasts of greenhouse gas emissions are consistent with the aggregation of the Paris Agreement pledges.

The world already has powerful tools for meeting growing global energy demand while reducing emissions. One is natural gas. Today in the United States, nearly one-third of the electricity is produced using natural gas. Our role as the country's largest producer of natural gas — which can reduce carbon dioxide emissions by 60 percent versus power generation from coal — has helped bring carbon dioxide emissions in the United States to the lowest level since the early 1990s. Increasing use of natural gas means our overall energy mix is becoming less carbon intensive. Greater energy efficiency is also essential to addressing the risks of climate change. It might seem surprising, but a big part of ExxonMobil's business is developing products and technologies that help save energy. Examples include our advanced automotive materials that make cars lighter and more fuel-efficient, and improved plastic packaging that reduces the energy needed to ship goods around the world.

At the same time, the world will need breakthrough clean-energy technologies such as carbon capture and storage (CCS). ExxonMobil is investing heavily in CCS, including research in a novel technology that uses fuel cells that could make CCS more affordable and expand its use. We currently have an interest in a quarter of the world's CCS capacity.

We're also investing in a broad portfolio of other technologies that could significantly reduce greenhouse gas emissions. This includes pioneering research in next-generation biofuels, including sources like algae, which could reduce emissions without competing with food and water resources. And by installing equipment at our refineries and chemical plants to generate steam from waste heat — called cogeneration — we enable 6 million metric tons of greenhouse gases to be avoided each year. All told, we've invested approximately \$8 billion since 2000 to develop lower-emission energy solutions.

As our chairman and CEO Darren Woods has said, climate change is a serious topic, and it demands a serious approach. ExxonMobil is proud to be part of that discussion, and we will continue to be in the years ahead.



About this report and materiality

About this report

We developed the 2016 Corporate Citizenship Report in accordance with the reporting guidelines and indicators of IPIECA (the global oil and gas industry association for environmental and social issues), the International Association of Oil and Gas Producers (IOGP) and the American Petroleum Institute (API). ExxonMobil was a key contributor to IPIECA, IOGP and API's updated Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (2015), and this report reflects the new common reporting-level metrics. The majority of these indicators are also consistent with the indicators used by the Global Reporting Initiative (GRI) in its G4 Sustainability Reporting Guidelines; this report is informed by the G4 guidelines but has not been prepared in accordance with a particular GRI model. To help interested stakeholders easily access our key sustainability indicators, we have mapped relevant IPIECA, GRI and United Nations Sustainable Development Goals (SDG) indicators on our website. Note that many of the standards and metrics used in preparing this report continue to evolve and are based on management assumptions believed to be reasonable at the time of preparation, but should not be considered guarantees.

Oil and Gas Industry Guidance on Voluntary Sustainability Reporting

IPIECA/GRI/SDG index

This report covers ExxonMobil's operations from January 1, 2016, through December 31, 2016, unless otherwise indicated. The report uses both qualitative descriptions and quantitative metrics to describe our policies, programs, practices and performance. For environmental and climate change data, units of measure are metric where noted. Financial information is reported in U.S. dollars. For information on forward-looking statements in the 2016 *Corporate Citizenship Report*, please see the cautionary note on the back cover.

To learn more about our corporate citizenship initiatives, view previous reports or provide comments, please visit **exxonmobil.com/citizenship** or email **citizenship@exxonmobil.com**.

Materiality

A key step in developing this *Corporate Citizenship Report* is ensuring the content reflects ExxonMobil's most material issues. According to IPIECA, material issues for sustainability reporting are those that, in the view of both the company's management and its external stakeholders, have the potential to affect sustainability performance significantly. ExxonMobil has been conducting a materiality assessment to guide our reporting since 2006.

For this 2016 report, we reevaluated and prioritized key sustainability issues for our business and key stakeholders. A cross-functional team of ExxonMobil managers reviewed stakeholder feedback and business information to prioritize sustainability issues. The issues that are most critical to the success of our business and to stakeholder interest are covered in detail in this report. Additional information is available on exxonmobil.com and in other company publications. Please see our IPIECA/GRI/SDG index for a detailed mapping of where information regarding all material issues is located. Our draft materiality assessment results were reviewed and updated by internal subject matter experts and the External Citizenship Advisory Panel during fall 2016. Note that the concept of "material issues" under IPIECA guidelines used for purposes of this report is not meant to correspond to the concept of materiality for purposes of securities laws and disclosures required by the U.S. Securities and Exchange Commission's rules. Our material issues are listed below.

2016 material issues

Safety, health and the workplace

- Emergency preparedness and response
- Employee benefits and practices
- Personnel and process safety
- Product safety and responsibility
- Product transportation safety
- Workforce engagement
- Workplace security
- Worksite health and wellness

Managing climate change risks

- Developing technology solutions
- Engaging on climate change policy
- Mitigating emissions
- Providing solutions for customers

Environmental performance

- Air emissions
- Biodiversity and ecosystem services
- Decommissioning and rehabilitation of the environment
- Environmental compliance
- Environmental management approach
- Spill performance
- Water management

Community engagement, human rights and strategic investments

- Community relations
- External stakeholder engagement
- Human rights
- Indigenous peoples

Local development and supply chain management

- Local economic growth and development
- Supply chain management

Corporate governance

- Board leadership
- Ethics and integrity
- Executive compensation and strategic advantage
- Political advocacy and contributions
- Shareholder relations
- Transparency

Business operations (included throughout report)

- Energy future and portfolio management
- Management systems
- Operating in sensitive environments



Heath Eddins, facility plant superintendent, inspects equipment at our LaBarge gas plant in Wyoming.

Safety, health and the workplace

Safety

A commitment to safety is a core value and an integral part of ExxonMobil's culture. Our aim is to ensure each employee and contractor leaves work each day safe and in good health. We will never stop working toward our goal of Nobody Gets Hurt. For additional information on ExxonMobil's approach to managing safety, including our Operations Integrity Management System, visit our safety and security webpage.

Safety and security

Personnel safety

ExxonMobil expects every employee and third-party contractor to identify, assess and mitigate the risks associated with our daily operations. In 2016, we achieved our best-ever safety performance. We have reduced our workforce lost-time incident rate by more than 80 percent since 2000.

While this number is declining, safety incidents and near-misses do occur. We deeply regret that three contractors were fatally





The Hoover-Diana platform in the Gulf of Mexico.

Up Close: Hoover-Diana celebrates personnel and process safety success

One of the most significant measures of success for ExxonMobil is our safety performance. In 1998, ExxonMobil began working to develop the Hoover-Diana field, a deepwater oil and gas development located in the Gulf of Mexico. At the time of completion, the platform was the first floating drilling and production platform to develop two fields simultaneously at a depth of 4,800 feet of water. This engineering feat required diligent personnel and process safety management. ExxonMobil personnel have successfully completed more than 950 work-years of safe operations at the platform.

"I am proud of the best-ever safety performance we achieved in 2016. Even so, there is still room for improvement, and we will never stop working toward our goal of Nobody Gets Hurt."

Lynne Lachenmyer

Safety, security, health and environment vice president

injured in separate incidents related to ExxonMobil operations in 2016. The incidents were related to a maintenance accident at one of our facilities, an incident at one of our onshore drilling sites and an incident aboard a marine vessel preparing to offload supplies at one of our offshore platforms. We thoroughly investigated each incident to determine contributing factors, then enhanced our work practices and facilities accordingly to help prevent future occurrences. We have processes in place to review all incidents, even those that did not result in injuries, to identify opportunities to improve. By applying this process, we continuously work toward our goal of *Nobody Gets Hurt*. For additional information on third-party supplier and contractor safety, see the personnel safety section of our safety and security webpage.



Process safety

ExxonMobil takes a comprehensive approach to managing process safety. Process safety refers to the equipment,



ExxonMobil workforce American Petroleum Institute U.S. petroleu industry workforce benchmark

In 2016, our workforce lost-time incident rate per 200,000 work hours was 0.029, a decrease from the previous year. Over the past decade, we have reduced this rate by 40 percent. When compared with the American Petroleum Institute U.S. petroleum industry workforce benchmark, ExxonMobil continues to be below the industry average.

¹Workforce includes employees and contractors. Incidents include both injuries and illnesses. Depending on the reporting year, illness-related incidents range from 2 to 13 percent. procedures and training that prevent the uncontrolled release of hydrocarbons and hazardous substances. We identify then eliminate or mitigate process safety risks associated with our operations by employing structured processes and procedures that serve as preventive safeguards and help us avoid incidents. For information on Tier 1 process safety events, visit the process safety section of our safety and security webpage.



ExxonMobil is committed to working with scientists and local partners to develop and commercialize technologies that enhance process safety. For example, in 2016, ExxonMobil Research Qatar, in partnership with Providence Photonics LLC, conducted field tests of a remote gas detection system in Qatar. The system provides a highly sensitive and accurate early warning of hydrocarbon leaks. We evaluated the system's durability and performance by challenging it in various environmental conditions such as high heat and humidity, dust, sand and dense fog during the field test.



In 2016, ExxonMobil's total recordable workforce incident rate per 200,000 work hours was 0.20, a slight decrease from 2015. Since 2007, we have reduced this rate by 47 percent. When compared with the American Petroleum Institute U.S. petroleum industry workforce benchmark, ExxonMobil continues to be below the industry average.

²Workforce includes employees and contractors. Incidents include both injuries and illnesses. Depending on the reporting year, illness-related incidents range from 3 to 10 percent.

Product stewardship

We recognize the importance of managing and communicating product safety information to those who handle and use ExxonMobil products. Our *Product Stewardship Information Management System* applies common global processes and computer systems to capture and communicate information on the safe handling, transport, use and disposal of our products, as well as emergency contact information.

This *System* enables ExxonMobil businesses to comply with changing regional and national hazard communication regulations, including the adoption of the Globally Harmonized System of Classification and Labelling Chemicals developed by the United Nations. As of year-end 2016, more than 55,000 safety data sheets for ExxonMobil products and manufacturing streams were authored and distributed as part of the implementation of this guidance by national and regional regulatory authorities in several countries. Due to the evolving nature of regulatory requirements, we continually monitor developments to make sure our products comply with applicable regulations.

2016 emergency response data

At ExxonMobil, we routinely train emergency support group personnel on a range of possible scenarios, including simulated spills, fires, explosions, natural disasters and security incidents. In 2016, our activities included the following:



Product transportation safety

As part of our commitment to product stewardship, we manage the safety, health and environmental aspects of transporting our products, including by marine, pipeline and rail transportation. ExxonMobil's worldwide marine business, which involves about 500 vessels in daily service, logged more than 20,000 voyages and 45,000 port calls in 2016, safely transporting approximately 1.4 billion barrels of crude oil and refined products, without a spill to water. The ExxonMobil Pipeline Company and its affiliates safely transport almost 3 million barrels per day of crude oil, refined products and other important products. We operate approximately 4,000 miles of active pipelines in the United States every day. We carefully maintain and monitor our infrastructure worldwide to identify and prevent corrosion, third-party damage or illegal intrusions onto our rights of way. For information on utilization of rail transport for crude oil, please see the product transportation safety section of our safety and security webpage.

Safety and security

Emergency preparedness and response

ExxonMobil maintains a strong emphasis on training for effective emergency response capabilities. We establish strategic emergency support groups (ESGs) around the world to develop and practice emergency response strategies and assist field responders. Regardless of the size of an incident, each ExxonMobil facility and business unit has access to an array of trained responders, including our regional response teams (RRT), which provide rapid tactical support when needed. Each RRT participates in annual training programs with business line personnel, response organizations and relevant government authorities in the designated region.

Severe wildfires in 2016 resulted in one of the largest fire-related evacuations in Canadian history, impacting residents in 12 local communities and requiring production to be shut down at Imperial Oil's Kearl oil sands mine and at its Syncrude joint venture operation. Imperial Oil is a majority-owned affiliate of ExxonMobil.

In response, an ESG was assembled by Imperial Oil to manage the impacts to our business and support efforts of the Alberta government to help the community. The ESG supported the evacuation of approximately 3,000 people without incident, developed an air quality monitoring process and conducted regular communications with employees and the community to ensure their needs were being met. In support of the community, the Imperial Oil Foundation also donated \$100,000 to the Canadian Red Cross, gasoline to the Royal Canadian Mounted Police and accommodations for evacuated employees, their families and other impacted residents of Northern Alberta.



"Since the beginning of the evacuation in May 2016, Imperial Oil employees were in contact with Fort McKay First Nation to lend their support and ensure the health and safety of our community. The commitment of Imperial Oil employees to assisting Fort McKay during this crisis is something to be commended."

Chief Jim Bouchier Fort McKay First Nation

Worksite health and wellness

ExxonMobil promotes a work environment that helps our employees and their families pursue healthy lifestyles, including prevention of infectious diseases. Our goal is to address the diverse health risks prevalent in the locations where we operate and to protect the health, safety and productivity of our workers while preserving our business operations. We have addressed the threats of malaria, tuberculosis, HIV/AIDS, Ebola, Zika and other outbreaks in our workplace through effective and efficient prevention and control programs. Since 2007, no malaria deaths have been reported among our workers. Additionally, none of the approximately 100 active tuberculosis cases diagnosed in our workforce since 2010 have infected another worker on our sites, and no operational disruption has been reported due to an outbreak during that time. For information on ExxonMobil's Culture of Health program, which supports the health, safety and wellness of our employees, please visit our health and wellness webpage.



Workforce engagement

ExxonMobil maintains a culture of diversity and inclusion, upholds disciplined employment practices, and offers robust training and benefit programs that promote employee retention. We cultivate a diverse workforce of highly talented individuals who are dedicated to integrity and high-quality work. We support voluntary, employee-led networks that foster a culture of diversity and inclusion by offering development programs, community service opportunities and mentoring. For information on ExxonMobil's employment practices, see our employment practices webpage.

Employment practices

Within ExxonMobil's executive employee population, 18 percent are women. This represents an increase of 50 percent over the past decade. This increase, in part, is a result of continued focus on early identification and focused development of high-performing female employees. Additionally, approximately 15 percent of our U.S. executives are minorities, an increase of 79 percent over the past 10 years, facilitated by a consistent focus on minority management development. For information on our local hiring practices outside the United States, see page 38.

To increase the representation of minorities and female employees in our U.S. operations, we implement a wide range of education programs and recruiting activities intended to reach a diverse pool of highly qualified candidates. In 2016,



"I was fortunate to be involved as a founding member of the Asian Connection for Excellence (ACE) chapter at the Chemical Company headquarters in Houston. When I relocated to Beaumont, Texas, I realized the need to establish a chapter in Beaumont as well. Understanding inclusion and diversity is one of the most important aspects in conducting business. ExxonMobil recognizes the importance of having an open dialogue about cultural differences and how that drives better business results."

Matthew Lim

ExxonMobil Chemical Company aromatics technical supervisor

we provided 38 technical scholarships to minorities across the United States. Additionally, 43 percent of engineering hires in the United States were women, higher than the U.S. percentage of female engineering students. For additional information on the percentage of women and minorities by position in the United States, see the performance data table.

As a global organization, the diversity and inclusion of thought, skill, knowledge and culture across our company facilitates innovation and is a key competitive advantage. As demand for science, technology, engineering and mathematics workers continues to increase worldwide, we support immigration policies that will help U.S. companies fill their high-skilled workforce needs.

ExxonMobil offers robust corporate and technical training programs designed to engage employees in professional development. Our major business units spent \$108 million on training employees during 2016. Of that, we directed 76 percent toward professional and technical training. In 2016, more than 4,600 employees at various levels of the company participated in ExxonMobil's leadership development training programs, of which 32 percent were women and 58 percent were employees from outside the United States. For additional information on training expenditures and the number of employees trained, please see the performance data table.

We retain and develop our diverse workforce by providing an environment where personal and professional growth is encouraged and career objectives are developed and achieved. For additional information on ExxonMobil's employment policies, as well as our approach to retention and engagement, please see our workforce engagement webpage.

Workforce engagement

Up Close: Promoting Zika awareness and preparedness among ExxonMobil employees

We believe proactive communication and awareness is critical to limiting the consequences of outbreaks on worker health, productivity and business operations. In 2016, the World Health Organization declared Zika a Public Health Emergency of International Concern.

We established a corporate working group to educate our workers on prevention, preparedness and response techniques across our global worksites. Preparedness strategies included mitigation in active Zika areas, traveler notification of potential risks, and employee access to referrals for Zika diagnosis and treatment. Additionally, ExxonMobil took proactive steps at all potentially impacted sites to establish mosquito control plans and to identify a site Zika contact in worksites located in high-risk areas. In 2016, 40 employees and contractors were impacted by the Zika virus. We will continue to enhance our education and awareness efforts to help reduce this number.



Malick Diara, Amanda Brown, Johnnie Richard and Cathy Simmons from ExxonMobil's medicine and occupational health group host an information session about Zika prevention.

2016 workforce by geographic region³

Thousands of employees Africa/Middle East 3.6 6.7 6.7 71.1 Asia Pacific 13.3

Our global reach directly contributes to the diversity of our workforce and the success of our business. In 2016, our total workforce was approximately 71,100, slightly lower than the total workforce in 2015. The largest concentration of ExxonMobil employees is in the United States with 29,100, followed by Europe and Asia Pacific with 14,900 and 13,300, respectively.

³Data exclude company-operated retail store employees



Cali Hatch, a process apprentice, monitors equipment at ExxonMobil's Baton Rouge refinery in Louisiana.

2016 female representation in ExxonMobil worldwide workforce

40%

of our worldwide management and professional new hires over the past decade were women

32%

of our management and professional population are women

35% of our worldwide engineering hires are women 2016 minority representation in ExxonMobil U.S. workforce

30%

of our management and professional new hires in the United States over the past decade were minorities

30%

of our management and professional population in the United States are minorities

36% of our engineering hires in the United States are minorities

Up Close: Improving road safety in Nigeria

According to the World Health Organization, the total number of road traffic deaths in Nigeria is more than 35,000 per year. The Nigerian National Petroleum Corporation, Mobil Producing Nigeria and the Federal Road Safety Corps implemented the second phase of an ExxonMobil-supported road safety awareness campaign in 2016 that aims to foster safe driving practices and enhance overall safety among road users in Nigeria. This behavioral campaign utilizes a two-pronged approach that includes messaging on billboards as well as skills training for public transportation drivers and company logistics teams. The Federal Road Safety Corps cites a 20 percent reduction in road accidents due to the program's sustained efforts since 2014. We have implemented similar programs in other areas of our operations and continue to seek new opportunities to improve road safety.



In 2016, Mobil Producing Nigeria participated in a behavioral awareness road safety campaign.



ExxonMobil and Synthetic Genomics, Inc. are partnering to develop breakthroughs in algae biofuels, a critical step toward sustainable biofuel production.

Managing climate change risks

Climate change risk management strategy

Society continues to face the dual challenge of meeting the world's growing energy demand, while simultaneously addressing the risks of climate change. ExxonMobil believes the risks of climate change warrant thoughtful action.

We are committed to providing affordable energy to support human progress while advancing effective solutions to address climate change. Our climate change risk management strategy includes four components: developing technology solutions, mitigating emissions in our operations, providing solutions that reduce greenhouse gas emissions for our customers and engaging on climate change policy.



Managing climate change risks

Developing technology solutions

As society pursues energy solutions that will lower greenhouse gas emissions, technological advancements will be instrumental in providing the global economy with the energy it needs. Recognizing the challenges associated with most existing low greenhouse gas emissions energy technologies, particularly in delivering the necessary economy, scale and reliability, we are conducting fundamental research aimed at developing energy solutions that have the potential to be economically feasible without subsidies, standards or mandates. ExxonMobil is pioneering scientific research to discover innovative approaches to enhance existing — and develop next-generation — energy sources.

ExxonMobil's Emerging Technologies program brings together executives, scientists and engineers from across our businesses to identify and evaluate technology research opportunities with a long-term strategic focus. Our Emerging Technologies team seeks to understand a wide range of technology options and how they may shape the global energy system. Understanding the fundamental science serves as a basis for our broader research efforts and may lead to further technology development aimed at practical application. This awareness informs our internal analysis of the global energy landscape as reflected in our annual *Outlook for Energy*.



The Outlook for Energy: A View to 2040

At the center of our research is ExxonMobil's Corporate Strategic Research laboratory, a fundamental research institution with approximately 150 Ph.D. scientists and engineers focused on addressing the company's long-range science needs. Our in-house research portfolio includes a broad array of programs, including biofuels, carbon capture and storage, alternative energy and climate science.

In addition to in-house research, we partner with leading universities around the world — such as the Massachusetts Institute of Technology, Princeton University, the University of



"I believe, and my company believes, that climate risks warrant action and it's going to take all of us — business, governments and consumers — to make meaningful progress."

Darren Woods Chairman and CEO Texas and Stanford University – to broaden awareness of energy developments and support technology breakthroughs to reduce greenhouse gas emissions and improve energy efficiency.

Advanced biofuels

ExxonMobil funds a broad portfolio of biofuels research programs, including ongoing efforts to develop algae-based biofuels. These include programs for converting non-food based feedstocks — such as whole cellulosic biomass, algae-based feedstocks and cellulose-derived sugars — into advanced transportation fuels. We believe that additional fundamental technology improvements and scientific breakthroughs are still necessary in both biomass optimization and the processing of biomass into fuels. Specifically, further progress is needed to ensure that advanced biofuels can work on a commercial scale and be produced with lower life-cycle greenhouse gas emissions.

Our advanced biofuels research includes joint research collaborations with Synthetic Genomics Inc., Renewable Energy Group, the Colorado School of Mines, Michigan State University and the University of Wisconsin. For more information about our technology partnerships in 2016, see the Up Close on page 18.



ExxonMobil's approach to developing future energy technology



Carbon capture and storage

Carbon capture and storage (CCS) is the process by which carbon dioxide (CO_2) gas that would otherwise be released into the atmosphere is captured, compressed and injected into underground geologic formations for permanent storage. With a working interest in approximately one-quarter of the world's total CCS capacity, ExxonMobil is a leader in one of the most important next-generation, low-carbon technologies. In 2016, we captured 6.3 million metric tons of CO₂ for storage.

We believe the greatest opportunity for future large-scale deployment of CCS will be in the natural gas-fired power generation sector. While CCS technology can be applied to coal-fired power generation, the cost to capture CO_2 is about twice that of natural gas-fired power generation. In addition, because coal-fired power generation creates about twice as much CO_2 per unit of electricity generated, the geological storage space required to sequester the CO_2 produced from coal-fired generation is about twice that associated with gas-fired generation.

ExxonMobil is conducting proprietary, fundamental research to develop breakthrough carbon capture technologies that have the potential to be commercially feasible without government subsidies, standards or mandates.



FuelCell Energy plant in Bridgeport, Connecticut.

Up Close:

Next-generation technology partnerships

ExxonMobil continues to invest in research and development of next-generation technologies. Achieving large-scale changes in the energy sector will require long-term investments in research to develop cost-effective solutions that are capable of broad commercial application. We conduct cutting-edge research and development in-house and in collaboration with other industries. We also partner with approximately 80 universities around the world to explore next-generation energy technologies. Spending approximately \$1 billion per year on research and technology development over the past decade, ExxonMobil is maintaining a leading role in technological innovation in the energy industry. Below are examples of our technology partnerships announced in 2016.

FuelCell Energy

ExxonMobil and FuelCell Energy, Inc., are pursuing a novel technology in power plant carbon dioxide capture through a new application of carbonate fuel cells. A fuel cell is a device that converts chemical energy into electricity.

Advancing economic and sustainable technologies to capture carbon dioxide from large emitters such as power plants is an important part of ExxonMobil's suite of research into lower-emission solutions to mitigate the risks of climate change. ExxonMobil researchers



"The fuel cell carbon capture solution we are advancing with ExxonMobil could be a game-changer in affordably reducing carbon dioxide emissions from coal- and gas-fired power plants globally. The carbonate fuel cell solution uses a proven global platform to generate power while capturing carbon dioxide."

Chip Bottone

President and chief executive officer of FuelCell Energy, Inc.

conducted two years of comprehensive laboratory tests that demonstrated that the unique integration of two existing technologies — carbonate fuel cells and natural gas-fired power generation — allows the capture of carbon dioxide more efficiently than conventional technology. Through these tests, our scientists saw the potential for this exciting technology for use at natural gas-fired power plants to enhance the viability of carbon capture and storage while at the same time generating additional electricity. Following several years of experiments with FuelCell Energy, we advanced our research via a joint development agreement in 2016. This agreement allows scientists from both companies to work collaboratively to further develop this potentially game-changing technology.

University of Texas

ExxonMobil partnered with the University of Texas at Austin in 2016 to explore and progress innovative solutions to the world's energy challenges. As part of this effort, we are investing \$15 million in research initiatives over five years to build upon decades of research at the University of Texas and further develop existing and next-generation energy sources that have the potential to reduce emissions.

The university's renowned Energy Institute will help drive much of the research conducted through this partnership. Research projects are expected to cover a range of emerging



"The University of Texas at Austin is proud and deeply appreciative of its long history of collaboration in education and research with ExxonMobil. This investment further unites two of the world's leading energy organizations to pursue innovations for a better energy future."

Gregory L. Fenves President of the University of Texas technologies and will take advantage of the university's capabilities in renewable energy, battery technologies and power grid modeling.

Georgia Institute of Technology

Research teams from ExxonMobil and the Georgia Institute of Technology have successfully developed a new method of reverse osmosis that filters hydrocarbons through synthetic carbon membranes at the molecular level. This is a critical step in the production of certain plastics that currently requires energy-intensive separation processes.

Because the new method works at low temperatures, it may one day replace existing separation technology, dramatically reducing the amount of energy required in plastics processing.

If brought to industrial scale, this breakthrough could reduce industry's global annual carbon dioxide emissions by up to 45 million metric tons, which is equivalent to the annual energy-related carbon dioxide emissions of about 5 million U.S. homes. It could also reduce energy costs used to make plastics by up to \$2 billion a year globally.

Chemical plants account for about 8 percent of global energy demand and about 15 percent of the projected growth in

demand to 2040. As populations and living standards continue to rise around the world, the demand for auto parts, housing materials, medical devices, electronics and other products made from plastics and other petrochemicals will continue to grow. Improving industrial efficiency is part of ExxonMobil's mission to meet the world's growing need for energy while limiting environmental impacts.

Renewable Energy Group

ExxonMobil is a global leader in advanced biofuels research. In 2016, we extended this leadership by partnering with Renewable Energy Group, Inc. (REG), to study the production of biodiesel by fermenting renewable cellulosic sugars from sources such as agricultural waste. This work is part of our many investments in new technologies with the potential to increase energy supplies, reduce emissions and improve operational efficiencies.

REG has developed a patented technology that uses microbes to convert sugars to diesel in a one-step fermentation process similar to ethanol manufacturing. The ExxonMobil and REG research will focus on using sugars from non-food sources to produce biofuels.

Through this research, we will address the challenge of how to ferment real-world renewable cellulosic sugars that contain impurities capable of inhibiting fermentation. The research will explore the technical feasibility and potential environmental benefits of biodiesel produced from fermented sugars. Positive results could lead to expanded efforts to explore scalability of the technology.



"We look forward to this collaboration with ExxonMobil to advance our proprietary cellulosic sugar fermentation technology. This technology can enable us to capitalize on the combined power of cellulosic sugars and microbial fermentation to revolutionize the production of ultra-low carbon, cleaner-burning advanced biofuels."

Eric Bowen

Vice president and head of REG Life Sciences

Emissions reduction

Plastic possibilities

What if you could meet the growing demand for certain plastics while reducing energy consumption and cutting carbon emissions? A potentially game-changing process may do just that. It's called organic solvent reverse osmosis (OSRO). This breakthrough enables a building block of plastics (paraxylene) to be separated at the molecular level by using very little heat. If we used OSRO to help make certain plastics, it could:



Cut annual energy costs by



Reduce industry's annual carbon emissions by



Meet demand for plastics

45 MILLION METRIC TONS

RESPONSIBLY

Mitigating emissions in our operations

As we seek to increase production of oil and natural gas to meet growing global energy demand, we are committed to mitigating greenhouse gas emissions within our operations.

ExxonMobil has a robust set of processes to improve efficiency, mitigate emissions and contribute to effective long-term solutions to manage climate change risks. These processes include, where appropriate, setting tailored objectives at the business, site and equipment levels, and then stewarding progress toward meeting those objectives. Based on decades of experience, ExxonMobil believes this rigorous bottom-up approach is a more effective and meaningful way to drive efficiency improvement and greenhouse gas emissions reduction than simply setting high-level corporate targets. We also believe that continuing to use this approach will yield further improvements in all sectors of our business.

In the near term, we are working to increase energy efficiency while reducing flaring, venting and fugitive emissions in our operations. In the medium term, we are deploying proven technologies such as cogeneration and carbon capture and storage where technically and economically feasible. Longer term, we are conducting and supporting research to develop breakthrough technologies. Since 2000, ExxonMobil has spent approximately \$8 billion to develop lower-emission energy solutions.

In 2016, ExxonMobil's net equity greenhouse gas emissions were 125 million CO_2 -equivalent metric tons. Relative to our 2015 performance, our 2016 emissions increased by approximately 3 million CO_2 -equivalent metric tons. This increase was primarily driven by new facilities in our Upstream operations,

such as our Gorgon Jansz liquefied natural gas project in Western Australia.

2016 CDP response

Energy efficiency

In 2016, energy used in our operations totaled 1.5 billion gigajoules. Energy utilized in our operations generates more than 80 percent of our direct greenhouse gas emissions and is one of our largest operating costs. As such, we have focused on energy efficiency for many decades. Since 2000, we have used our *Global Energy Management System* in the Downstream and Chemical businesses, and our *Production Operations Energy Management System* in our Upstream businesses to identify and act on energy savings opportunities. Through our commitment to energy efficiency, application of structured processes and continued use of a bottom-up approach, we continue to yield industry-leading results.

Greenhouse gas emissions (net)¹

Net equity, CO₂-equivalent emissions Millions of metric tons



In 2016, ExxonMobil's net equity greenhouse gas emissions were 125 million CO_2 -equivalent metric tons. Relative to our 2015 performance, our 2016 emissions increased by approximately 3 million CO_2 -equivalent metric tons.

¹Our calculations are based on the guidance provided in API's Compendium of Greenhouse Gas Emission Estimation Methodologies for the Oil and Gas Industry and IPIECA's Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions. We report greenhouse gas emissions on a net equity basis for our business operations, demonstrating a share of emissions from any facility or operation in which ExxonMobil holds a financial interest, with the share reflecting the equity fractional interest.

Greenhouse gas emissions (normalized)

Net equity, CO_2 -equivalent emissions Metric tons per 100 metric tons of throughput or production



Our normalized greenhouse gas emissions from our Upstream, Downstream and Chemical operations totaled 24.5 metric tons per 100 metric tons of throughput or production in 2016. Over the past decade, increases in Upstream emissions have been largely offset by improvements in our Downstream and Chemical operations. We are committed to reducing our normalized greenhouse gas emissions through structured processes and the continued use of a bottom-up approach.

Greenhouse gas emissions avoided from ExxonMobil actions² Net equity, CO_2 -equivalent emissions Millions of metric tons



In 2016, greenhouse gas emissions avoided from ExxonMobil actions were 19.0 million metric tons, cumulative since 2007. This represents an additional avoidance of 0.8 million metric tons of greenhouse gas emissions compared with our 2015 performance.

²Cumulative since 2006.

For example, in the 2010, 2012 and 2014 Refining Industry Surveys, ExxonMobil's global refining operations achieved first quartile energy efficiency performance.*

Cogeneration

Cogeneration technology captures waste heat generated from the production of electricity for use in production, refining and chemical processing operations. Due to its inherent energy efficiency, the use of cogeneration leads to reduced greenhouse gas emissions. Our cogeneration facilities enable the avoidance of approximately 6 million metric tons per year of greenhouse gas emissions.

We have interests in approximately 5,300 megawatts of cogeneration capacity in more than 100 installations around the world. This capacity is equivalent to the annual energy needed to power 2.5 million U.S. homes. Over the past decade, we have added more than 1,000 megawatts of cogeneration capacity and continue to develop additional investment opportunities.

*The Solomon Survey provides a global benchmarking assessment of the refining industry and is conducted every two years. Results from the 2016 surveys are expected in mid-2017.

Emissions reduction

Flaring

Flaring is the process of burning natural gas as an alternative to releasing the gases directly into the atmosphere. Flaring is done for safety reasons or because barriers to the development of gas markets and gas infrastructure prevent natural gas from being used.

ExxonMobil is a charter member of the *Global Gas Flaring Reduction Partnership*, an initiative of the World Bank that seeks to reduce flaring by increasing the use of natural gas associated with oil production, by helping remove technical and regulatory barriers to flaring reduction, conducting research, disseminating best practices and developing regulatory country-specific gas flaring reduction programs. In addition, we put in place our own Upstream Flaring and Venting Reduction Environmental Standard for Projects in 2005. Our goal is to avoid routine flaring in new Upstream projects and to reduce "legacy" flaring in our existing operations.

In 2016, flaring volume from our combined Upstream, Downstream and Chemical operations totaled 5.0 million metric tons. This represents a decrease of 0.3 million metric tons compared with our 2015 performance. The decrease in flaring in 2016 was largely due to changes at our Usan field in Nigeria, where — since assuming operatorship in 2014 — we have implemented a program to eliminate routine flaring. Hydrocarbon flaring

Millions of metric tons



In 2016, flaring volume from our combined Upstream, Downstream and Chemical operations totaled 5.0 million metric tons. This represents a decrease of 0.3 million metric tons compared with our 2015 performance.



invested since 2000 at our Upstream facilities around the world on emission reduction efforts, including energy efficiency and flare mitigation



invested since 2000 at our refining and chemical facilities around the world to reduce greenhouse gas emissions



in support of Upstream and Downstream cogeneration facilities since 2001 to more efficiently produce electricity and reduce greenhouse gas emissions



Our Antwerp refinery in Belgium. ExxonMobil continues to take action to improve our energy efficiency and reduce emissions.



XTO Energy natural gas operations in Alberta, Canada.

Venting and fugitive emissions

Venting is the process of releasing methane and other gases into the atmosphere. Fugitive emissions occur when gases or vapors escape from pressurized equipment.

We recognize the importance of reducing these emissions and continue implementing cost-effective methods to reduce methane and other hydrocarbon emissions in our operations. This includes structured leak detection and repair programs in which we use optical gas imaging cameras to identify leaks for prompt repair. Additionally, we continue to replace high-bleed pneumatic devices with lower-emission technology and conduct reduced emissions completions in our ongoing efforts to enhance the environmental performance of our operations.

Our methane emissions in 2016 totaled 7 million CO_2 -equivalent metric tons, which is similar to our performance over the last several years. Most of our venting and fugitive emissions are methane, which represent approximately 6 percent of our direct greenhouse gas emissions.

Providing solutions for customers

Over the next few decades, population and income growth and an unprecedented expansion of the global middle class — are expected to create new demands for energy and hydrocarbon-based products. Meeting these demands will not just require more energy, but will also require energy to be used more efficiently across all sectors.

ExxonMobil is delivering solutions that enable our customers to reduce their emissions and improve their energy efficiency, including:

- Expanding the supply of cleaner-burning natural gas to reduce emissions in power generation;
- Creating highly efficient plastics and other chemical materials that can be applied in a range of consumer products; and
- Developing premium, high-efficiency fuels and lubricants.

Natural gas

One of the greatest opportunities for society to reduce greenhouse gas emissions is through the use of natural gas in power generation. Natural gas is a flexible, abundant and low-emissions fuel that is available across the globe. On a life-cycle basis, from extraction through electricity consumption, using natural gas yields up to 60 percent fewer greenhouse gas emissions than coal. Natural gas is also the ideal partner for intermittent renewable energy sources, such as solar or wind, as it can provide reliable power when these renewable sources are not available. We predict natural gas will be one of the most important energy sources to drive reductions in greenhouse gas emissions.

ExxonMobil is one of the largest natural gas producers in the world. Coupled with our leadership in the development of liquefied natural gas, we are well-positioned to meet growing demand for this cleaner-burning energy source.

Chemical materials

Materials developed by ExxonMobil provide manufacturers with quantifiable benefits in many consumer applications, including resilient, lightweight plastics that are used by automotive manufacturers to reduce vehicle weight and deliver greater efficiency for drivers. We have also developed advanced tire technologies that help maintain optimal tire pressure, improve rolling resistance and aid fuel efficiency, as around 25 percent of vehicle tires in the United States are underinflated. By addressing this issue, drivers could collectively save up to 1 billion gallons of gasoline per year.

Additionally, our next-generation plastic packaging reduces total product weight and allows more products per shipment, fewer trucks on the road, less gasoline and energy used, fewer greenhouse gas emissions and ultimately less material to be reused, recovered or recycled. ExxonMobil plastic products also contribute to safety within the food industry. Plastic packaging is lightweight, durable and flexible, which makes it ideal for preserving food. According to the Food and Agriculture Organization of the United Nations, one-third of the food produced in the world goes to waste each year. Plastic packaging can help reduce spoilage, increase access to food and improve food safety for consumers around the world.



ExxonMobil employees Barb Whittaker and Joan Axelrod work to develop Synergy fuels at our laboratory in Paulsboro, New Jersey.

Fuels and lubricants

ExxonMobil produces fuels and lubricants that deliver higher vehicle efficiency and lower emissions. In addition, we continue working on research and development of new fuels and lubricants. Our family of high-performance lubricants includes synthetic lubricants that have sustainable customer benefits, such as longer drain intervals than conventional mineral oils. Synthetic lubricants can be replaced with less frequency, therefore reducing the volume of used oil for disposal or recycle. In addition, extending lubrication service intervals increases efficiency and lowers maintenance costs while reducing potential risks from worker and machine interactions. There are also specific application advantages for these products, including in wind turbine applications where machinery is several hundreds of feet in the air. Mobil lubricants are used in more than 40,000 wind turbines worldwide.

Engaging on climate change policy

ExxonMobil believes the long-term objective of effective policy should be to reduce the risks of climate change at minimum societal cost, in balance with other priorities such as poverty eradication, education, health, security and affordable energy. Climate change is a global issue that requires the collaboration of governments, companies, consumers and other stakeholders to create worldwide solutions. We engage with stakeholders directly and through trade associations around the world to encourage sound policy solutions for addressing climate change risks.

Effective climate change policies

We believe that free markets, innovation and technology are essential in addressing the risks of climate change. Success in developing and deploying technologies will be highly dependent on governments creating a policy environment that enables innovation and competition. Policies should be clear and guard against duplicative, overlapping and conflicting regulations, which may distort markets and impose unnecessary costs on consumers. We believe that effective policies are those that:

- Promote global participation;
- Let market prices drive the selection of solutions;
- Ensure a uniform and predictable cost of greenhouse gas emissions across the economy;
- Minimize complexity and administrative costs;
- Maximize transparency; and
- Provide flexibility for future adjustments to react to developments in climate science and the economic impacts of climate change policies.

Given the wide range of societal priorities and limited global resources, all policies should be as economically efficient as possible. ExxonMobil believes that market-based systems that place a uniform, predictable cost on greenhouse gas emissions are more effective policy options than mandates or standards. Market-based policies more effectively drive consumer behavior and technology innovation, while mandates and standards limit consumer choice and can perpetuate ineffective technologies.

We recently joined the Climate Leadership Council as a founding member. The council advocates for a revenue-neutral carbon tax and aligns closely with our longstanding principles.

Stakeholder engagement

We engage a variety of stakeholders on climate change issues including policymakers, investors, consumers, nongovernmental organizations (NGOs), academics and the public to actively advocate for responsible policies that would be effective in addressing the risks of climate change. We offer data and policy analysis on proposals and engage in constructive debate. For example, we have had hundreds of meetings with policymakers around the world to share our views on carbon pricing policy. For additional information on ExxonMobil's approach to political advocacy and contributions, see page 45.

Our chairman and members of our management committee have primary responsibility for managing climate change risks for ExxonMobil and our operations. The board of directors receives annual in-depth briefings that cover updates on public policy, scientific and technical research, and company positions and actions related to climate change. To drive improvement, our merit-driven employee development and compensation systems integrate performance in environmental areas, including emissions and energy efficiency.

As issues related to climate change arise at the local, state, national and regional levels, our global team of experts evaluates and develops a company position consistent with our principles. ExxonMobil employees also hold key leadership positions, including board of director positions, with many trade associations that engage on climate change issues, including the American Petroleum Institute (API), the International Association of Oil and Gas Producers (IOGP) and IPIECA, the global oil and gas industry association for environmental and social issues.

We believe an effective policy response to climate change requires a thorough understanding of the climate system. Our scientists have been involved in climate change research and related policy analysis for more than 30 years, resulting in hundreds of publicly available documents on climate-related topics, including more than 50 peer-reviewed publications.

Peer-reviewed articles on climate research

ExxonMobil experts have participated in the United Nations Intergovernmental Panel on Climate Change (IPCC) since its inception. Most recently, our scientists contributed to the IPCC Fifth Assessment Report in lead author, review editor and reviewer roles. Our scientists also participated in the work of the U.S. National Academy of Sciences, including its work to review the third U.S. National Climate Assessment Report and to provide advice to the U.S. Global Change Research Program.



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Industry engagement

ExxonMobil understands that stakeholders seek a better understanding of the positions of the oil and gas industry, as well as how individual companies approach the management of climate change risks within their own businesses.

As an active IPIECA member, ExxonMobil engaged with member companies in advance of the 2015 Conference of Parties (COP) 21 meeting in Paris to develop a common industry position on global efforts to address climate change risks. That work culminated in *The Paris Puzzle* — a publication on the challenges and responses the industry believes are needed to mitigate the risks of climate change. In advance of the 2016 COP 22 meeting in Marrakech, ExxonMobil further engaged with IPIECA members to explore solutions for transitioning to an energy system with lower greenhouse gas emissions. This work resulted in *Exploring low-emissions pathways: Advancing the Paris Puzzle*, which was published in November 2016.

Exploring low-emissions pathways: Advancing the Paris Puzzle

In 2015, we also took a key role collaborating with IPIECA and its member companies to create a voluntary reporting framework for oil and gas companies to publish their climate change risk management approach in a simple, straightforward and transparent manner. The resulting framework — which is currently being piloted by several IPIECA members, including ExxonMobil — covers a wide range of climate-related issues and provides a consistent reporting methodology for the oil and gas industry. This framework enables interested stakeholders to understand an individual company's views on the issues central to addressing climate change risks.

IPIECA Climate Change Reporting Framework

Up Close:

Outlook for Energy and business planning

Each year, we update our long-term energy demand projection in our *Outlook for Energy*, taking into account the most up-to-date demographic, economic, technological and climate policy information available. This analysis serves as a foundation for our long-term business strategies and investments, and is consistent with other credible forecasts such as the International Energy Agency's (IEA) New Policies Scenario.

Our Outlook reflects increasingly stringent climate policies and is consistent with the aggregation of pledges that were submitted by signatories to the United Nations Framework Convention on Climate Change (UNFCCC) 2015 Paris Agreement. Our Outlook seeks to identify potential impacts of climate-related policies — which often target specific sectors — by using various assumptions and tools, including application of a proxy cost of carbon to estimate potential impacts on consumer demands. Key insights from The Outlook include:

- From 2015 to 2040, global demand for energy is expected to increase by about 25 percent and will require all forms of energy;
- Oil will remain the world's primary fuel through 2040 due to transportation and petrochemical demand;
- Natural gas will grow more than any other energy source, overtaking coal as the world's second-largest energy source, due to power generation and industrial use;
- Wind, solar and biofuels will average combined growth of about 5 percent per year — by 2040 these resources will comprise about 4 percent of global energy demand;
- Conventional cars will remain most popular due to cost, functionality and increasing fuel efficiency through technology improvements. Decreasing battery costs are likely to enable small, shorter-range electric cars to account for approximately 10 percent of new car sales by 2040; and
- Energy-related CO₂ emissions will peak in the 2030s, then gradually decline.

To enhance the robustness of our *Outlook*, we assess a wide range of assumptions for key supply-and-demand drivers to test the range of potential energy mix outcomes. Many third-party scenarios that represent a 2-degree Celsius pathway, including IEA's 450 Scenario, show natural gas demand continuing to grow and oil continuing to play a prominent role in meeting the world's energy demand through 2040. Even under the 450 and the New Policies scenarios, substantial upstream oil and gas investment of \$11 trillion to \$18 trillion will be needed through 2040 to meet global demand. While ExxonMobil currently contributes less than 3 percent of global production, we are well-positioned to support additional development required to meet demand as a result of our diverse resource base, superior project execution capabilities and industry-leading long-term returns on capital employed.

We evaluate potential investments and projects using a wide range of economic conditions and commodity prices; we also financially stress test our investment opportunities, which provides an added margin against uncertainties and further enables us to consider various market environments and investment drivers in our planning and investment process. All business segments are required to include, where appropriate, an estimate of the costs associated with greenhouse gas emissions in their economics when seeking funding for capital investment.

The Outlook for Energy

Energy and carbon — managing the risks

Global liquids supply

Millions of oil-equivalent barrels per day (MOEBD)





The Stena Carron drill ship located offshore Georgetown, Guyana.

3 Environmental performance

Environmental management approach

We conduct our business in a manner that is responsive to the environmental and economic needs of the communities in which we operate. ExxonMobil considers risks at every stage of development, and we continuously work to mitigate those risks and improve our environmental performance. We employ an environmental management strategy to monitor our performance in five key areas, as depicted on the right, which are discussed throughout this chapter. To describe our holistic approach to environmental management, we have ordered the topics discussed in this chapter to reflect the typical life cycle of our operations.

Our approach requires our facilities to be designed, operated and managed with the goal of mitigating adverse environmental impacts.

Our Operations Integrity Management System (OIMS) is a management framework that helps put our Corporate Environment Policy into action and establishes common worldwide expectations for addressing risks inherent in our business, including environmental risks.

Our approach is grounded in a scientific understanding of the environmental impacts of our operations and a commitment to develop, maintain and operate projects and decommission assets using appropriate standards.

For additional information on how ExxonMobil manages environmental performance, see the following resources:

Environmental management

Standards of Business Conduct

Environmental Aspects Guide

Biodiversity and ecosystem services

Biodiversity refers to the number and variety of living organisms in a given area. Ecosystem services are the food, water, shelter, clean air and cultural identity that people obtain from the environment. Safeguarding the ability of the environment to support biodiversity and provide ecosystem services is a priority for ExxonMobil.

Our approach to managing biodiversity and ecosystem services recognizes several factors, including the rarity of individual species, their roles in different ecosystems and habitats, their vulnerabilities and their cultural significance. To protect particular species and sensitive habitats, we take steps such as modifying engineering design, construction and operating practices, and enhancing wildlife habitats at our properties.

ExxonMobil closely examines the environmental context of the areas where we operate to identify biodiversity and ecosystem services risks and appropriate protective measures. We also periodically screen the locations of our major operating facilities against databases of the International Union for Conservation of Nature and World Protected Areas. In 2016, an estimated 25 percent of our major operating facilities were within 5 kilometers of designated environmentally sensitive areas. By tracking these data, we are able to ensure prioritized areas receive special protection.

Up Close: Environmental management across an asset life cycle

We believe a comprehensive approach to environmental management includes a thorough assessment of potential environmental impacts. Based on these assessments, we then implement plans to avoid or reduce impacts across an asset's life cycle.

This approach is exemplified by environmental management activities at Imperial Oil's Kearl operations in Alberta, Canada, where reducing the environmental footprint is incorporated throughout the asset life cycle. For example, the site takes advantage of electricity generated by energy-efficient cogeneration systems, an alternative dust treatment process to reduce water usage and wastewater treatment flocculation technology for accelerated tailings consolidation.

Imperial Oil's holistic environmental management strategy also includes progressive reclamation. As operational areas at Kearl are no longer needed, they are prioritized for reclamation to prevent erosion in the short term and to allow the land to return to its natural boreal forest state much earlier. Reclamation planners at Kearl aim to achieve a maintenance-free, self-sustaining landscape, which takes into account traditional knowledge, wildlife habitat and biodiversity. To date, more than 250 acres of land have been permanently reclaimed at Kearl.

Muskeg Lake, which is connected to and adjacent to Kearl Lake, was designed to provide spawning, rearing, feeding and overwintering habitat for native fish species. Construction of Muskeg Lake commenced in 2008 and was completed in 2010. Lake filling was completed in 2013. This is the first of three lakes that will be constructed to replace the fish habitat disrupted as operations in the area progress. In 2016, Imperial Oil completed four years of fish and fish habitat monitoring at Muskeg Lake. Monitoring activities included sampling of fish populations to assess natural colonization and habitat productivity of the lake. Key findings indicate the population sizes and number of fish species has steadily increased from five species in 2014 to eight species in 2016.

A northern pike found at Muskeg Lake near Imperial Oil's Kearl operations in Canada.

A frog discovered near Moro during a biodiversity survey in Papua New Guinea, currently in the process of being named.

In addition to our commitment to protecting biodiversity in our operating areas, we support advocacy, research and partnerships to protect biodiversity outside our fence lines. In 2016, we contributed approximately \$4 million to organizations, such as those focused on biodiversity protection and land conservation.

Our Papua New Guinea biodiversity offset program, which provides a strategic roadmap for the sustainable use and management of the country's biological resources, exemplifies our approach to managing biodiversity. For more information on the Papua New Guinea biodiversity offset program, see our biodiversity and ecosystem services webpage.

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Biodiversity and ecosystem services

A plant found growing on trees high above the ground. This species is known to be found only in the Hides Ridge region of Papua New Guinea.

Water management

In 2016, the net freshwater consumption at our operations was 290 million cubic meters, a decrease of more than 3 percent from the 2015 consumption of 300 million cubic meters and a more than 9 percent decline since 2007. ExxonMobil works to manage our water use and to limit adverse impacts to water resources and consumers from our withdrawals and discharges, taking into consideration factors such as quality and availability.

For example, when the Banyu Urip, Indonesia, operations required increased injection water volumes to maintain adequate reservoir pressure, we developed a large reservoir to capture and store excess water available in the wet season that would have otherwise not been used. Using the reservoir helped mitigate potential effects of our water usage on the local population during the drier months when water resources are scarcer.

Using the latest version of the global oil and gas industry association for environmental and social issues (IPIECA) global

Global freshwater consumption¹

Millions of cubic meters

ExxonMobil's global freshwater consumption in 2016 was 290 million cubic meters. This represents a 10 million cubic meter decrease when compared to our 2015 global freshwater consumption. Since 2012, we have actively maintained our freshwater consumption below our 2011 performance.

¹We report freshwater intensity alongside consumption data in our performance data (pages 46-48). Freshwater intensity is the ratio of net freshwater consumption to the amount of throughput or production. Normalized in this way, we can better understand how efficiently we are using freshwater in our operations. Data collection began in 2007. Includes XTO Energy data beginning in 2011. ExxonMobil's total freshwater consumption includes use by refineries and chemical plants, oil and gas production, and onshore shale resources development in the United States, principally onshore shale resources development.

water tool, we identified that almost 35 percent of our major operating sites are located in areas with the potential for water scarcity. We pursue opportunities to reduce our water use and develop site-specific management strategies such as the deployment of water conservation technologies, the use of alternative freshwater sources, recycling of municipal and industrial wastewater, substitution with lower-quality water sources and harvesting of rainwater.

Water management is an important aspect of hydraulic fracturing operations. Water use by basin differs due to geologic and reservoir characteristics and optimization of drilling and completion designs. For example, a Williston Basin well in North Dakota requires 6 million gallons for hydraulic fracturing, whereas a Permian Basin well in western Texas requires 15 million gallons of water. For information on how this water use compares to other forms of energy, see the infographic on our water management webpage.

Seismicity

In some instances, due to unique geological conditions, oil and gas operations may trigger seismic activity. Such operations may include underground wastewater disposal injection, reservoir depletion and, in rare situations, hydraulic fracturing. We support risk management and mitigation approaches to seismicity that take into consideration the relative risks associated with the specific context and geography of the proposed operation. Mitigation methods include assessing factors such as fluid volume, formation character, tectonic setting, operating experience and local construction standards. At XTO Energy, a subsidiary of ExxonMobil, we follow a disciplined injection well siting protocol prior to siting a disposal well using available data — including federal, state or internal seismic information — to conduct a risk assessment.

ExxonMobil and Stanford University jointly developed a freely available software modeling tool assessing the potential risk of induced seismicity from industry saltwater disposal wells. Using data such as underground stress levels and reservoir parameters, the tool evaluates the potential for fault slip near disposal well locations. The tool is being used by regulatory agencies and energy companies to reduce the risk of induced earthquakes. For information on ExxonMobil's recent seismicity research initiatives, visit our water management webpage.

🐠 Water management

Spill performance

We take a rigorous approach to assessing and managing the potential impacts of a spill on water or land with a particular emphasis on risk management, operations integrity and containment capabilities. We are proud to report that, as a result of these efforts, we had fewer spills in 2016 compared with 2015. Over the past 10 years, ExxonMobil has reduced the global number of spills greater than 1 barrel by more than 13 percent.*

We are continuously working to improve our ability to ensure a rapid and comprehensive response if a spill does occur. The total volume of hydrocarbons spilled on soil and water was 4,700 barrels in 2016, with more than 50 percent recovered at the spill sites. The majority of these spills did not affect third parties or the communities that surround our assets. For additional information on ExxonMobil's emergency response capabilities, please see page 13.

*This statistic is presented as an absolute number across ExxonMobil's global operations.

Because a significant portion of our Upstream operations are located offshore, we have developed specialized capabilities and tactics to improve offshore oil spill response and risk management. ExxonMobil has the industry's only dedicated, in-house oil spill response research program, which includes a focus on cold water and remote locations, such as the Arctic.

In 2016, we successfully stewarded completion of a field test of a full-scale prototype technology that uses nuclear magnetic resonance in the Earth's field to remotely detect oil that might be trapped in ice. The technology is designed to detect the presence of oil to allow responders to monitor and more effectively respond to oil under ice.

For information on ExxonMobil's joint industry partnerships to enhance industry offshore spill response capability, visit the following resources:

Spill performance



Air emissions

In accordance with regulatory requirements and our commitment to maintaining operational excellence, we work to reduce air emissions associated with our operations and the products we deliver. ExxonMobil's combined emissions of volatile organic compounds (VOCs), sulfur dioxide (SO₂) and nitrogen oxides (NOx) have decreased by almost 40 percent over the past 10 years across all of our businesses. In 2016, our combined emissions totaled less than 0.4 million metric tons. For additional information on ExxonMobil's air emissions, please see the performance data table on page 46.

Decommissioning

Throughout the life cycle of a producing oil field or other asset, we work to limit disruptions to local communities and protect the environment. Effectively decommissioning onshore and offshore assets is essential to reducing our overall environmental impact. We ensure that decommissioning activities are planned and conducted to appropriately manage risks and, where possible, create beneficial land use opportunities.

Recognizing the unique challenges associated with offshore assets, ExxonMobil created an offshore decommissioning center

of expertise in 2015 that is responsible for planning and managing the safe decommissioning of our offshore assets.

Rehabilitation

An important element of ExxonMobil's decommissioning strategy is rehabilitation. This is the process of safely repurposing assets that are no longer productive resources. Whenever possible, we look for opportunities to repurpose former ExxonMobil sites for environmental and societal benefits. We support science-based, cost-effective approaches to remediation that take into consideration the interests of various stakeholders.

We are committed to the sustainable stewardship of surplus properties. ExxonMobil Environmental Services (EMES) – our global organization that provides guidance and supports the remediation and stewardship of surplus sites – has managed more than \$6.6 billion of remediation work and returned more than 2,300 property parcels to beneficial end uses since 2008. In 2016, EMES monitored 5,600 active sites in more than 30 countries.

In 2016, EMES received the U.S. Environmental Protection Agency's (EPA) **Region 4 Excellence in Site Reuse Award** for our efforts to remediate and redevelop former Virginia Chemical Company (VCC) fertilizer manufacturing sites. VCC sites produced phosphate fertilizer from the late 1800s to the 1960s. While ExxonMobil never owned or operated the VCC sites, we became responsible as a corporate successor. In 2000, ExxonMobil and EPA Region 4 formed a collaborative agreement known as the VCC Initiative to address the contamination at the properties where these facilities once operated. Since then, ExxonMobil has cleaned up 27 of the 30 former VCC sites, and worked with property owners and local communities to ensure the land can be redeveloped.



Experimental fieldwork for engineered wetland research in Qatar to help improve water quality.

Up Close: Advancing the use of engineered wetlands to treat industrial wastewater

Over the past five years, ExxonMobil Research Qatar (EMRQ) has conducted extensive research to understand the feasibility of utilizing engineered wetlands to treat industrial wastewater for beneficial reuse in arid environments. Water quality characterization, influent and effluent water management and system maintenance are just a few of the important factors that need to be considered when designing such a system. In 2016, EMRQ commissioned a microbiology laboratory to study the functions and structure of microbial communities in wetlands to optimize wetland water treatment systems. EMRQ then completed a design for an experimental wetland to study the treatment of gas field-produced water to better understand the feasibility of using such systems for large-scale applications. For information on how ExxonMobil works to manage water quality from our operations, see our water management webpage.



Water management



Local fishermen in East Java, Indonesia. In 2016, ExxonMobil Cepu Limited helped build a jetty and fish monitoring station to support the local fishing community.



Community engagement, human rights and strategic investments

Managing community engagement

Understanding and addressing the interests of communities where we operate is critical to maintaining a sustainable business. ExxonMobil's multifaceted approach to engaging with communities helps us create and sustain productive relationships with the communities near our areas of operation. We work in communities all over the world, each with their own unique cultures, needs and sensitivities. In all cases, we maintain our corporate-wide commitment to responsibly managing our social and environmental impacts, upholding respect for human rights and making social investments by tailoring our engagement efforts to individual communities. In this chapter, we focus on three key socioeconomic elements: human rights, community relations and strategic investments.





Sahabat Maritim participants engaging with Malaysia Maritime Enforcement Agency officials about community safety.

Up Close:

Social outreach to support local fishermen in Indonesia and Malaysia

ExxonMobil's offshore platforms and related facilities in Indonesia and Malaysia are located near areas frequently visited by local fishermen. Social outreach efforts in both countries reduce the potential risks of fishing near oil and gas operations.

For example, in 2016, ExxonMobil Exploration and Production Malaysia Inc. joined the Malaysian Maritime Enforcement Agency to engage local members of a village in Terengganu, Malaysia, where fishermen represent around 40 percent of the population. The initiative, known as Sahabat Maritim or Maritime Mate, consisted of a two-day outreach program designed to increase safety awareness and strengthen relationships with members of the local community. Community engagement activities included a "gotong-royong" – or voluntary community clean-up – to refurbish the local jetty where fishermen can dock or moor their boats. ExxonMobil volunteers also distributed educational brochures that illustrate the 500-meter restricted zone around platforms, conducted a series of talks and exhibitions on safely fishing near offshore operations and provided attendees with life jackets. In response to Sahabat Maritim and other such education initiatives, the number of fishing vessel encroachments at our platforms in the region has been reduced by almost 60 percent in the last three years.



"This Sahabat Maritim program achieves our Operations Integrity Management System objective of building community awareness among our key stakeholders and managing risk to ensure operations integrity."

Sukiman Mohamed

Public and government affairs manager, ExxonMobil Malaysia

Respecting human rights

Our approach to human rights is consistent with the goals of the United Nations (UN) *Guiding Principles on Business and Human Rights*. These principles outline governments' duty to protect human rights and businesses' responsibility to respect them. ExxonMobil works closely with governments, civil society and industry to help advance the goals of the UN *Guiding Principles*.

ExxonMobil operates in regions where engagement with host governments is undertaken to support security and respect for human rights in local operations. The Voluntary Principles on Security and Human Rights are a set of principles designed to guide companies in maintaining the safety and security of their operations within an operating framework that encourages respect for human rights. Participants include representatives from governments, civil society and the extractives industry. We have been a member of the Voluntary Principles since 2002, and have served on multiple occasions as one of the corporate representatives on its steering committee. In 2016, we supported the *Voluntary Principles* through the facilitation of pilot groups in Nigeria, Ghana and Myanmar, which were designed to enhance local collaboration on human rights among governments, nongovernmental organizations (NGOs), companies and other stakeholders. ExxonMobil is actively participating in the Nigeria pilot group.

Our Statement and Framework on Security and Human Rights states our commitment to conduct business in a way that protects the security of our personnel, facilities and operations. It also affirms our commitment to respect human rights. The *Framework* provides guidance to all of our employees on working with both host governments and private security personnel in a manner that respects human rights. We also have agreements with private security firms with which we work that contain requirements to uphold human rights. These agreements include expectations for training and compliance with relevant local, UN and other security-related frameworks.

We expect our employees, officers and directors to comply with all applicable laws and regulations and seek to work with suppliers and business partners who share our commitment to human rights. Within our own workforce, our commitment to human rights is supported by our *Standards of Business Conduct* and our *Statement on Labor and the Workplace*. Our *Statement* reinforces support for the principles of the International Labor Organization 1998 Declaration on Fundamental Principles and Rights at Work, notably the elimination of child labor, forced labor and workplace discrimination.

ExxonMobil has conducted human rights training for our employees in select regions for many years. We believe providing human rights training helps build an understanding and awareness of potential impacts. In 2015, we launched a new computer-based human rights training module to further enhance internal awareness of human rights. To date, more than 1,200 of our key employees in 46 countries have completed the training.

Statement on Labor and the Workplace

Standards of Business Conduct

ExxonMobil is committed to respecting human rights, and we expect the same of our suppliers. In 2016, we published our ExxonMobil *Supplier Expectations*, a set of guidelines that outlines our expectations of contractors and suppliers inclusive of human rights. These *Expectations* include references to key international human rights frameworks such as the United Nations *Guiding Principles on Business and Human Rights* and the International Labor Organization *Declaration on Fundamental Principles and Rights at Work*. Starting in 2017, the *Supplier Expectations* will become part of ExxonMobil's annual letter to our suppliers.

Internally, we delivered human rights awareness training tailored to procurement professionals in the supply chain. Through early 2017, we have trained approximately 100 ExxonMobil procurement professionals, and will continue training through the rest of 2017.

ExxonMobil works closely with IPIECA, the global oil and gas industry association for environmental and social issues, to monitor human rights trends in supply chains that are relevant to the oil and gas industry. We also work with IPIECA to collect information on best practices in human rights supply chain management from the oil and gas industry as well as other industries. For additional information on ExxonMobil's approach to supply chain management, see page 39.

Community relations

We actively engage with stakeholders in local communities and include their feedback in our decision-making processes to identify any issues or concerns early on in a project. We provide local groups and individuals with communication channels — including open houses, community meetings and individual meetings — to voice concerns so interested stakeholders and community members have the opportunity to be heard. We invite interested stakeholders and community members so they are fairly represented in our public consultation activities.

We are informed by guidance from the International Finance Corporation and IPIECA, which provides for systematic and transparent grievance management processes to address concerns related to projects. Our community-tailored grievance management processes are clearly communicated through our ongoing community engagement, and allow us to track, analyze and respond to community grievances in a timely and effective manner. In 2016, we received and responded to 31 grievances concerning our liquefied natural gas project in Papua New Guinea, which has been operating for two years. At our Sakhalin-1 facilities, where we have been operating for more than 10 years, we received and responded to five grievances in 2016. By working collaboratively and transparently with local communities, we can help avoid or reduce our impacts on communities, enhance benefits, avert delays, reduce costs and prevent the escalation of issues.

Indigenous peoples

Our operations sometimes take place in areas inhabited or historically used by indigenous peoples. In these locations, we start by identifying indigenous populations and then engage with them in open and inclusive consultation, including the consideration of their traditions and cultures. In 2016, our Sakhalin-1 project in Russia received a national corporate citizenship award at an annual meeting of indigenous peoples for our efforts to develop a tripartite agreement with local government officials and indigenous peoples to restore the local reindeer population.

ExxonMobil employs practices and policies to respect property rights in the locations where we operate, and we pay particular attention to those areas populated by indigenous peoples. ExxonMobil was not involved in the resettlement of any individuals from indigenous populations in 2016. For more details on working with indigenous communities as well as information on ExxonMobil's approach to managing land use, resettlement and cultural heritage, please see our community relations webpage.



Up Close: Supporting indigenous communities in Alaska

With ExxonMobil's support, the University of Alaska at Fairbanks is creating the Northern Alaska Indigenous Leadership Academy (NAILA), which will help Alaska Natives develop the skills to implement sustainable community development initiatives and fulfill leadership roles in their communities. This new program includes a one-week on-campus training course designed to strengthen wellness, leadership and community sustainability among indigenous peoples living in the Interior and North Slope of Alaska, where our Point Thomson facilities are located. ExxonMobil's contribution will provide scholarships covering travel, tuition and fees for 25 NAILA program participants.



"Without the generosity of ExxonMobil, NAILA wouldn't be possible. Their gift underscores our shared commitment to developing a new generation of Alaska Native leaders and building sustainable rural communities."

Evon Peter

Vice chancellor of rural, community and native education for the University of Alaska, Fairbanks



The University of Alaska at Fairbanks campus.

Strategic community investments

In addition to addressing community priorities where we do business, we partner with governments and nongovernmental organizations to help enhance the quality of life in the communities where we operate around the world. Whether through the ExxonMobil Foundation, our corporation or our international affiliated company operations, we strategically invest in social programs that consider community needs and host country economic and social goals. In 2016, we contributed \$242 million to communities around the world.

We focus our efforts on our signature initiatives: improving education, combating malaria and advancing economic opportunities for women. We concentrate on these three areas because research shows they help build a foundation for economic prosperity and human progress.

Education initiative

Education is a fundamental building block for individual opportunity and economic growth. Science, technology,

engineering and mathematics (STEM) skills, in particular, are critical to ensuring today's students are prepared for the jobs of the 21st century. Additionally, we hire highly skilled scientists and engineers to perform a variety of jobs in our company. For these reasons, we invest in education and teacher development programs designed to encourage students to pursue careers in the STEM fields. Since 2000, we have contributed nearly \$1.2 billion to education programs around the world, with \$72 million invested in 2016 alone.

Up Close:

Helping prepare students for careers of the 21st century

Founded in 2007, the National Math and Science Initiative (NMSI) is a U.S.-based nonprofit organization that works to expand access to challenging coursework, improve student achievement and boost teacher effectiveness, particularly in the fields of STEM.

NMSI's College Readiness Program enables schools to improve participation in rigorous Advanced Placement[®] (AP[®]) coursework to better prepare students for college and the STEM-intensive careers of the 21st century. To date, the program has been implemented in more than 1,000 schools across 34 states. After one year, schools participating in NMSI's College Readiness Program have increased the number of qualifying AP[®] exam scores in math, science and English by 10 times the national average, while demonstrating significant gains among female, African-American and Hispanic students, who are traditionally underrepresented in STEM fields.

In 2015, with financial assistance from ExxonMobil, NMSI began expanding its College Readiness Program in Louisiana, North Dakota and Pennsylvania. ExxonMobil's partnership with NMSI will help provide schools in these states with extensive training for teachers and resources for students to support AP° coursework. In Pennsylvania alone, seven new schools joined the program for the 2015 to 2016 school year. After one year, these schools experienced a combined 51 percent increase in qualifying math, science and English AP° exam scores.



"The College Readiness Program is raising the academic bar in Pennsylvania and across the nation. We're grateful that companies like ExxonMobil realize the value of STEM education and are committed to ensuring that our future workforce is better equipped with the knowledge and skills they need to be successful."

Gregg Fleisher President of the National Math and Science Initiative

Education initiative: program spotlight National Math and Science Initiative



Up Close:

ExxonMobil's long-standing commitment to antimalarial efforts

Each year, malaria claims the lives of more than 400,000 people around the world. Thankfully, significant progress has been made in the global fight against this disease, and the number of malaria-related deaths and infections continues to decline. To continue this progress, an integrated approach is needed, including strengthened health care systems, improved prevention techniques, expanded research capabilities and increased access to proper diagnosis and treatment.

Since 2000, we have supported research and development into new front-line therapies, the search for a vaccine and improved diagnostics. We support leading product development partnerships like Medicines for Malaria Venture in its program designed to advance new drugs in the fight against P. vivax malaria, the strain most commonly found in Asia. Because there is still no approved vaccine for malaria in wide usage, we have also worked with the Malaria Vaccine Initiative at PATH since 2005 to support informed policy decision-making as the development of malaria vaccines is accelerated.

As a result of these and other such global efforts, the World Health Organization's annual *World Malaria Report* found that malaria mortality rates decreased by 29 percent around the world between 2010 and 2015. Additionally, steady declines in mortality and incidence rates have averted about 1.3 billion malaria cases and saved about 6.8 million lives since 2001. However, the significant progress in reducing malaria deaths since 2000 could be reversed by a number of looming challenges. One of the most alarming is the threat of resistance to front-line antimalarial drugs emerging in Southeast Asia and its potential spread into Africa. Accordingly, we support Dr. Dyann Wirth's laboratory at Harvard University to investigate new compounds that could overcome this drug resistance — as well as the Worldwide Antimalarial Resistance Network — which provides comprehensive, timely, quality-assured evidence to track the emergence and spread of antimalarial drug resistance.



"We're at a very special time in malaria research. If we continue to inspire health leaders, reduce knowledge gaps and translate findings into practice, we can end malaria in our lifetime."

Dr. Dyann Wirth Director of the Harvard Malaria Initiative

The World Health Organization's World Malaria Report



Several tools, such as raising awareness, using long-lasting, insecticide-treated bed nets, indoor residual spraying, and rapid diagnostics and treatments, have been key in reducing the number of malaria cases and deaths. Photo credit: Ben Moldenhauer, Medicines for Malaria Venture

Malaria initiative

We support the health of our employees, their families and members of the communities where we operate, which is why we invest in health programs aimed at combating preventable and treatable illnesses. In 2016, ExxonMobil contributed nearly \$10 million to support a variety of malaria research, educational and treatment programs. Since 2001, the antimalarial programs we have funded have reached more than 125 million people, and our support has resulted in the distribution of approximately 14.3 million bed nets, 4.3 million doses of antimalarial treatments and nearly 3 million rapid diagnostic kits, as well as the training of more than 589,000 health workers. Our cash grants during the past 15 years total \$155 million, making us one of the largest private-sector grant-makers in the fight against malaria.

Women's economic opportunity initiative

Empowering women economically is a key element to enhancing local and national development. Investing in women helps support broad economic transformation in developing regions and contributes to a more equitable society. In the developing countries where women are more fully participatory in their national economies, we find lower infant mortality, improved health and nutrition, increased educational opportunities, enhanced economic growth and food security, and lower rates of poverty.

Since 2005, ExxonMobil has invested — through our women's economic opportunity initiative — approximately \$104 million in programs that support research to identify the most effective

ways to improve women's economic status; develop women farmers, entrepreneurs and business leaders; and improve women's access to technology. Our support has reached tens of thousands of women in more than 90 countries. In 2016 alone, our contributions totaled \$10 million.



2016 community investments by focus area¹ and geographic region²

Up Close:

Expanding economic opportunities for women farmers in Mozambique

In Mozambique, women face pervasive obstacles to achieving economic empowerment. To help overcome those barriers, in 2016, the ExxonMobil Foundation partnered with Opportunity International to launch the Projecto para Empoderamento das Mulheres e Desenvolvimento da Agricultura (PEMA) program to expand economic opportunities for women farmers in Mozambique.

The initiative includes both theoretical and practical application of strategies for helping women more effectively benefit from commercial agricultural markets in Mozambique. Since the program launched in January 2016, PEMA has provided support to more than 400 farmers and gained valuable insight into the delivery of agricultural inputs, services and finance to women farmers. In 2017, we aim to significantly increase the number of program participants through innovations in agricultural finance, comprehensive agricultural support services and technology to improve the productivity, income, financial inclusion and overall empowerment of women farmers in Mozambique.



Women in Mozambique participate in the PEMA program to learn about commercial agriculture.



ExxonMobil seeks to make meaningful community investments in a variety of focus areas. In 2016, total community investments were \$242 million, with the greatest investment in civic and community initiatives.

¹Total contributions include donations from Exxon Mobil Corporation, our divisions and affiliates, and the ExxonMobil Foundation, as well as employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs. Investments do not include environmental capital and operating expenditures, which totaled approximately \$4.9 billion in 2016.

ExxonMobil's community investments span across the many geographic regions in which we operate. In 2016, we invested a total of \$242 million in communities around the world.

²Total contributions include donations from Exxon Mobil Corporation, our divisions and affiliates, and the ExxonMobil Foundation, as well as employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs.

Local community investments

In addition to our education, malaria and women's economic initiatives, we provide local investments tailored to address community-specific needs such as access to skills training and health care and support for disaster relief, including our \$500,000 contribution to the American Red Cross and the Greater Baton Rouge Food Bank to support local flooding disaster relief in 2016. For additional information on our local community investments, see page 39.

Employee participation

Volunteering and charitable giving are important values for ExxonMobil. In total, more than 19,000 ExxonMobil employees, retirees and their families donated more than 550,000 volunteer hours to nearly 4,500 charitable organizations in 29 countries in 2016.

Our educational matching gift program matches employee and retiree donations to U.S. higher education institutions at a ratio of 3-to-1. In 2015, nearly 4,600 employees and retirees donated more than \$13 million to 864 colleges and universities, as well as minority scholarship programs – which, in 2016, the ExxonMobil Foundation matched with more than \$32 million. For information on how ExxonMobil's volunteer involvement program helps facilitate employee participation, visit our employee participation webpage.





ExxonMobil 2016 Worldwide Giving Report

Case Study ExxonMobil's Growing the Gulf investment program

Over the past decade, technology pioneered by the energy industry has unlocked vast oil and natural gas resources that were previously difficult to produce. In particular, the production of natural gas in U.S. shale basins, including those found in Gulf Coast states such as Texas, has grown significantly in recent years. These opportunities have spurred local and regional economic activities in the United States.

In addition to helping grow the economy, increased natural gas production also generates environmental benefits. Natural gas is the least carbon-intensive of the major energy sources, emitting up to 60 percent fewer carbon dioxide emissions than coal when used for electricity generation.

We operate three refineries located along the U.S. Gulf Coast in Baton Rouge, Louisiana; Baytown, Texas; and Beaumont, Texas. These and other facilities will support ExxonMobil's expanded refining, chemical, lubricant and liquefied natural gas operations. Our Gulf Coast refineries have the combined capacity to process nearly 1.5 million barrels of crude oil per day to produce a range of products, including gasoline, diesel, jet fuel, lubricating oils, adhesives and resilient, lightweight plastics used in a variety of applications.

ExxonMobil plans to invest more than \$20 billion over 10 years, beginning in 2013, in our refining, chemical and joint venture businesses along the Gulf Coast as part of our Growing the Gulf investment program. ExxonMobil's U.S. Gulf expansion includes 11 major chemical, refining, lubricants and liquefied natural gas projects along the Texas and Louisiana coasts. This includes the expansion of existing facilities and construction of new facilities that will increase our refining and chemical capacity.

These projects are expected to create more than 45,000 jobs in the region. Many of these are highly skilled, high-paying jobs averaging about \$100,000 per year.

We are partnering with local, state and national leaders to positively contribute to the Gulf Coast communities. The company also partners with colleges in the Baytown, Beaumont and Baton Rouge areas to train students for high-skilled jobs in the Gulf Coast manufacturing sector.

ExxonMobil also works to maintain strong relationships with Gulf Coast communities through strategic investments and employee-driven initiatives. In Baton Rouge alone, employees, retirees and family members annually volunteer more than 40,000 hours with community organizations, earning more than \$760,000 in ExxonMobil Volunteer Involvement Program grants for local agencies and groups. ExxonMobil also annually donates nearly \$1 million to nonprofits and schools and about \$1.5 million to colleges and universities in Louisiana.

As we help drive economic progress and support local communities in the Gulf Coast, we remain committed to operating safely, protecting the environment, maintaining the highest levels of operational integrity and remaining a good corporate citizen.



ExxonMobil field engineer Teni Sulaiman at the Mont Belvieu plastics plant in Texas.



Esso Exploration and Production Nigeria employees Kanu Okechukwu and Michael Gideon discuss safety plans offshore Nigeria.

5 Local development and supply chain management

Managing our economic impact

ExxonMobil's local content and supply chain management strategies are designed to deliver lasting and shared value to host countries and local communities — as well as our business — by employing systematic processes and global best practices that support local economic growth and development.

Local economic growth and development

We work to contribute to the economic and social development of the countries in which we operate. We believe local content the added economic and social value brought to a host nation through the activities of the oil and gas industry — provides shared value to ExxonMobil and to local communities.



Local economic growth and development

Supply chain management

Our local content approach focuses on three key areas: employing and training a local workforce, supporting local suppliers and improving livelihoods of community members through local community investments. The goal of this multi-tiered approach is to provide sustainable economic benefits and ensure local participation is embedded into our daily processes.

To integrate local content into overall project planning and execution, we develop a plan specific to each country or area, taking into account social and economic conditions, the nature of the project and the community's needs. Part of this effort includes working to align our goals with those of our partners and host country governments. We also actively participate in external organizations and initiatives that improve local content around the world. These organizations include IPIECA, the global oil and gas industry association for environmental and social issues, and the Organization for Economic Cooperation and Development.

Up Close:

Local supplier development in Indonesia

ExxonMobil is committed to providing local vendors with tools and training opportunities to compete in a global supply chain. For example, in 2016, ExxonMobil conducted three capacity-building training programs for local vendors in Bojonegoro Regency in East Java, Indonesia. We shared detailed information about invoice procedures and the electronic bidding process to assist local contractors by clarifying ExxonMobil requirements and procedures. A total of 185 local contractors attended the training programs. As a result, local vendor capacity to meet internal bidding requirements has improved. In 2016, we provided contracts valued at approximately \$6 million to local vendors in Indonesia. For additional information on ExxonMobil's approach to training and developing local suppliers, see the local supplier development section of our local economic growth and development webpage.

Local economic growth and development

Local hiring and training

Hiring and training a local workforce in our areas of operation is a long-standing priority for ExxonMobil. We provide locally hired individuals with opportunities to develop technical and leadership skills that will benefit them throughout their careers, both with ExxonMobil and with future employers. By doing so, we aim to enhance the long-term capability of local workforces in areas where we operate. Our training programs include the provision of information on ethical business conduct, health and safety, management skills and fundamentals of the oil and gas industry, as well as relevant technical and vocational skills. As illustrated below, in 2016, we continued to make progress in hiring and training host country nationals. For more information, visit the local hiring and training section of our local economic growth and development webpage.



2016 local hiring statistics

Local supplier development

We understand the importance of building and maintaining a qualified and globally competitive supply chain in host countries. ExxonMobil works with a range of stakeholders, including host country governments, nongovernmental organizations (NGOs) and local communities to support the development of local vendors. To be a supplier for ExxonMobil, a local vendor must agree to meet our robust safety, technical, environmental and human rights expectations and requirements. When appropriate, ExxonMobil works with entrepreneurs and local businesses to help them understand our requirements and become competitive vendors capable of contributing to our project and the sustainable economic progress of their local community.



Local community investments

Our local community investments are designed to support social and economic development in the host countries where we operate. As we invest in communities, we pursue programs that are aligned with community and business priorities.

In addition to supporting local supplier development, in 2016, ExxonMobil established a microcredit union that helps entrepreneurs in Bojonegoro Regency in East Java, Indonesia, access capital to expand their existing businesses. The microcredit union, which has more than 400 members, also offers management assistance and training to members.

As part of this effort to invest in the community, ExxonMobil is also specifically supporting women entrepreneurs because of the unique challenges to economic development they face. ExxonMobil supports a microfinance program in Indonesia that provides technologies and training on key topics that accelerate women's economic advancement. Women in the program were provided with sustainable lighting and cooking technologies to assist in their daily lives, as well as the opportunity to become resellers of the technology in their communities. In 2016, ExxonMobil held several group training sessions for more than 500 women, covering topics such as microfinance, sales and marketing, and basic accounting. For additional information on ExxonMobil's strategic community investments, see page 33.

Supply chain management

The success of our business is influenced by the many valued suppliers who support our operations. In 2016, ExxonMobil made payments to more than 90,000 suppliers of goods and services worldwide. We strive to promote a healthy supply chain that respects human rights and the environment while creating opportunities for historically underrepresented groups.

As part of our supply chain management efforts, we have taken steps to foster a commitment to sustainability with our key suppliers. In 2016, we included a sustainability discussion in our supplier relationship management meetings with strategic suppliers representing more than \$850 million in annual spending across nine commodity groups. These discussions which cover human rights, environmental performance, local content and supplier diversity topics — opened the door to potential future collaborations to improve our mutual sustainability performance with these suppliers. For information on how ExxonMobil respects human rights in the supply chain, please see page 32.

Promoting supplier diversity

ExxonMobil seeks to build long-lasting and mutually beneficial relationships with diverse suppliers to contribute to the economic development of historically underrepresented groups. In the United States, we have cultivated diversity across our supply chain for more than 40 years.

In 2011, our spending with minority- and women-owned business enterprises (MWBEs) reached \$1 billion in the United States. We have been able to maintain that level of spending with diverse suppliers for the past five years. In 2016, we exceeded our target with a total of \$1.4 billion in spending with diverse suppliers in the United States. This represents the highest annual spending with diverse suppliers in our program's history. These suppliers included minority-owned businesses; women-owned businesses; small businesses; lesbian-, gay-, bisexual- and transgender-owned businesses; veteran-owned businesses; service-disabled veteran-owned businesses; and businesses owned by people with disabilities. Suppliers from these groups have contributed to our total diverse spending in order to ensure a more inclusive supply chain. To help identify diverse suppliers, our supplier diversity database allows businesses from traditionally underrepresented groups in the United States to register an interest in being an ExxonMobil supplier.

Supplier diversity database

We consider the full reach of our supply chain, not just our direct spending, by tracking the progress of our primary suppliers in the use of diverse suppliers in their businesses. We refer to this as our Tier 2 program. This approach helps promote the sustainability of our supplier diversity program by encouraging our primary suppliers to join in our efforts.

Beyond spending with diverse suppliers, we aim to provide long-term growth and development opportunities to diverse suppliers through coaching, training and workshops. In 2016, we continued to increase ExxonMobil leadership engagement in our supplier diversity program. Sara Ortwein, president of XTO Energy, hosted a "CEO Academy," an executive development session at the ExxonMobil Houston Campus in partnership with the Houston Minority Supplier Development Council. At the session, Ms. Ortwein shared leadership thoughts and the company's philosophy.

We work closely with the National Minority Supplier Development Council (NMSDC) and the Women's Business Enterprise National Council (WBENC) to help identify and develop relationships ExxonMobil spending with U.S. diverse suppliers¹

Millions of dollars



In 2011, our spending with minority- and women-owned business enterprises reached \$1 billion in the United States. We have maintained that level of spending with diverse suppliers for the past five years. In 2016, we spent a total of \$1.4 billion with diverse suppliers in the United States, an increase of more than 30 percent from 2015.

¹Includes direct ExxonMobil spending and that of our suppliers (Tier 2 spending). Total spending includes suppliers classified as minority-owned businesses; women-owned businesses; small businesses; lesbian-, gay-, bisexual- and transgender-owned businesses; veteran-owned businesses; service-disabled veteran-owned businesses; and businesses owned by people with disabilities.



"Many businesses, while achieving success, can struggle with transitioning from operational to strategic leadership. Overcoming this challenge is critical for sustainable growth. I was glad to share my insights from my own leadership experience in order to help diverse business leaders in the Houston area grow and develop themselves as leaders, as well as expand their businesses. Developing a stronger, more diverse supply base not only helps the community, but also ExxonMobil's business."

Sara Ortwein President of XTO Energy

Local development and supply chain management

with certified diverse suppliers in the United States. ExxonMobil is consistently recognized as a leader in supplier diversity efforts. WBENC named ExxonMobil among **America's Top Corporations for Women's Business Enterprises** in 2016 for the 10th year in a row. For the first time, we received a Platinum Distinction, which is reserved for companies with leading supplier diversity programs in the top quartile. This national award recognizes corporations with world-class programs and leadership in supplier diversity that are setting higher standards and driving innovation in support of women's business enterprises.

National Minority Supplier Development Council

Women's Business Enterprise National Council

Our supplier diversity program continues to expand into the international arena. In 2016, we spent a total of \$203 million with women-owned and indigenous-owned businesses outside the United States. Of this, we spent \$170 million with indigenous-owned businesses in Canada. Outside of Canada, we spent \$33 million with women-owned businesses, representing a 57 percent increase from 2015. We continue to work with WEConnect International to increase the participation of women-owned businesses in our supply chain around the world. Women's economic development is a global priority for ExxonMobil, and our international supplier diversity program currently focuses on women in a number of countries where we operate. For additional information on our efforts to increase women's economic development, see page 34.

WEConnect International





Participants at a recent WEConnect women's supplier conference in Lagos, Nigeria, sponsored by ExxonMobil.

Up Close:

Improving environmental performance across the supply chain

We encourage our suppliers to take action to improve environmental performance, as outlined in ExxonMobil's *Supplier Expectations*. We work in collaboration with key suppliers, where possible, to identify opportunities for continuous improvement in environmental performance that improve efficiencies and create shared value for our business and our suppliers. For example, we have worked with several suppliers in the U.S. Gulf Coast to reduce waste and improve waste handling at our facilities in Beaumont, Texas, and Baton Rouge, Louisiana.

By collaborating with Waste Management National Services, Inc., and its affiliates, to apply its comprehensive waste profiling and analysis methods across ExxonMobil's plants, we enhanced our waste disposal practices and achieved significant cost savings at our Baton Rouge and Beaumont locations. Our partnership with Waste Management has resulted in more than \$2 million in cost savings due to increased recycling, improved waste classification and container optimization. In addition, Waste Management personnel have worked more than 100,000 person-hours without incident at the ExxonMobil refineries and achieved world-class safety standards.

Through our partnership with a valued supplier to the ExxonMobil Chemical Company, we were also able to reduce waste by reusing and recycling large polypropylene bags capable of holding 500 to 2,000 pounds of product at our Baton Rouge refinery. Rather than being disposed of in landfills, used bags are now collected, cleaned and repaired by a third party before being sold back to the supplier at a lower cost. Not only does this initiative result in an 80 to 90 percent reduction in the number of bags sent to landfill, but it also results in cost savings for our supplier and our own business. We value suppliers who can help us improve our own environmental performance, and we are now looking to expand these waste initiatives to other locations.

Up Close:

ExxonMobil receives award for corporate social responsibility

In 2016, Esso Exploration and Production Nigeria Limited (EEPNL), an ExxonMobil affiliate in Nigeria, was awarded the **Best Company in Corporate Social Responsibility in West Africa** and recognized as one of the **Most Socially Responsible Companies** by Social Enterprise Report and Awards (SERAs). SERAs is an annual project that raises awareness about the roles organizations play in the social development of Nigeria and Africa.

These awards recognize several local community investment projects in Nigeria, including a back-to-school program that has provided school supplies to more than 32,500 students across the country. Additionally, our investments supported the building of science libraries to promote the development of future STEM professionals at 22 primary schools; e-learning centers at 12 schools to teach children computer skills; 32 solar-powered water pumps to provide access to clean, potable water; and general capacity-building workshops for local entrepreneurs. Overall, we have invested more than \$1.3 million into the local community through these projects.

Up Close:

Partnering to celebrate America Recycles Day

ExxonMobil works to promote women-owned businesses and, where possible, include them in our supply chain. For example, CompuCycle, a women-owned company, began working with ExxonMobil in the area of electronic waste removal and recycling in 2015. CompuCycle was the first company in the Houston area to achieve R2 Certification, the recycling industry's leading certification for electronic waste handling. This certification ensures that the electronic waste removed from ExxonMobil sites is handled in a safe, environmentally responsible and fully transparent manner.

In November 2016, ExxonMobil and the Houston campus sustainability team worked with CompuCycle to host an electronics collection event to celebrate America Recycles Day. The event helped educate ExxonMobil employees and local community members about the importance of responsible electronic waste disposal, and resulted in more than 11,000 pounds of electronic waste being disposed of safely and responsibly.



"To celebrate America Recycles Day, the Houston campus sustainability team wanted to educate ExxonMobil employees and the local community about the benefits of recycling. CompuCycle helped us accomplish this, while also giving people an easy way to responsibly dispose of their electronic waste from home."

David Willis

ExxonMobil Houston campus sustainability team recycling lead



The ExxonMobil campus near Houston, Texas.

6 Corporate governance

Governance practices

Good corporate governance creates a business environment conducive to long-term investments and sustainable economic growth. ExxonMobil implements a variety of corporate governance practices, underpinned by a board comprised predominantly of independent directors. Our *Standards* of *Business Conduct*, adopted and administered by the board of directors, cover a range of topics including labor, diversity, the environment and anti-corruption.

Ethics and integrity

We observe the highest standards of integrity and ethics to develop, approve and implement projects around the world. ExxonMobil requires that employees, officers, directors and those working on our behalf comply with all applicable laws, including the U.S. anti-corruption, anti-trust, anti-boycott, trade sanctions and export controls laws, as well as laws in other countries applicable to our business. In 2016, nearly 47,000 employees and contractors participated in anti-corruption



training and business practice reviews. For additional information on how ExxonMobil works to uphold the highest ethical standards, see the *Standards of Business Conduct*.

Standards of Business Conduct

Transparency

ExxonMobil supports multi-stakeholder engagement for the purpose of increasing transparency of government revenues from the extractive industries. Our long-standing efforts to promote revenue transparency have helped reduce corruption, improve government accountability and promote greater economic stability worldwide. In order to be successful, a transparency initiative should:

- Apply to all companies;
- · Protect commercially sensitive and proprietary information; and
- · Not violate host government laws or contractual obligations.

The Extractive Industries Transparency Initiative (EITI) is a global program dedicated to strengthening governance by improving transparency and accountability in the extractives sector. Companies and governments participating in EITI separately report payments and revenues, respectively, allowing EITI to reconcile any differences between the totals and publish validated total government revenues. ExxonMobil has held an active role at both the secretariat and country levels since EITI's inception more than a decade ago. An ExxonMobil representative has served on the EITI board as either a primary or alternate member since it began.

ExxonMobil supports the EITI application, validation and implementation processes wherever we operate. We are also currently working with governments in several countries, including Guyana and Mexico, which are considering joining EITI. There are currently about 51 countries that are compliant members or have been accepted as candidates to begin reporting under the *EITI Standard*.

Board leadership

ExxonMobil's affairs are managed independently under the direction of our board of directors. All directors are required to stand for election each year at our annual meeting of shareholders. At year-end 2016, 11 of 13 directors, including the presiding director and all members of the audit, compensation, public issues and contributions, and board affairs committees, were independent as defined by New York Stock Exchange guidelines. In 2016, the board met 12 times. Independent leadership is also supported by the presiding director, a non-employee director who, in consultation with the chairman, reviews board agendas and materials to be distributed to directors before board meetings, among other responsibilities. For more information about our board structure, visit the corporate governance section of our website.



Up Close: Board PICC trip to Baytown, Texas

Each year, members of the public issues and contributions committee (PICC) visit a company site to gain a deeper understanding of ExxonMobil operations and to view first-hand the execution of ExxonMobil standards, principles and capabilities. In 2016, the PICC visited our Baytown and Mont Belvieu facilities in Texas to view progress on the North American Growth Project. The project is part of a larger Gulf Coast investment program, called Growing the Gulf, that will create or support 45,000 construction and full-time jobs. For more information, see the case study on page 36.

Founded in 1919, the Baytown refinery and petrochemical complex is located about 25 miles outside of Houston, along the Houston Ship Channel. The refinery consists of manufacturing sites, chemical plants and a global technology center. These sites employ more than 7,000 workers, and the refinery has a potential capacity of 561,000 barrels of crude oil per day. Within the Baytown area, our Mont Belvieu plant manufactures the film that bundles water bottles and heavy-duty sacks used to store food, and the Baytown olefins plant is one of the largest ethylene-producing plants in the world.

The trip included a reception and dinner at Lee College, a community college that is part of ExxonMobil's Petrochemical Initiative, to engage with local community and civic leaders, including the Baytown mayor and the chair of the Houston Port Authority. Additionally, the PICC attended a lunch with employees from Mont Belvieu and the Baytown olefins plants.



ExxonMobil directors (bottom row) attending the PICC trip to Baytown and Mont Belvieu, along with ExxonMobil executives. From left: (Top row) Woody Paul, Paul Fritsch, Mike Dolan, Jeff Woodbury, Paul Guilfoyle, Cindy Shulman, (Bottom row) Peter Brabeck-Letmathe, Henrietta Fore, Kenneth Frazier, Steven Reinemund, Angela Braly and Douglas Oberhelman.

Percent vote for¹

	Item	2016
1.	Election of directors (average) ²	95.9
2.	Ratification of independent auditors ²	98.9
3.	Advisory vote on executive compensation ²	89.3
4.	Independent chairman	38.7
5.	Climate expert on board	20.9
6.	Hire an investment bank ³	2.0
7.	Proxy access bylaw ⁴	61.9
8.	Report on compensation for women	8.4
9.	Report on lobbying	25.7
10	. Increase capital distributions	4.1
11	. Policy to limit global warming to $2^{\circ}C^{3}$	18.5
12	. Report on impacts of climate change policies ³	38.1
13	. Report reserve replacements in BTUs ³	5.6
14	. Report on hydraulic fracturing	24.5

2016 proxy vote summary

Abstentions count for quorum purposes, but not toward voting on these proposals. ²Proposals submitted by the board. ³First-year proposal

⁴ExxonMobil adopted a proxy access bylaw on November 1, 2016.

other interested parties to communicate with them, which further underpins the importance that the board places on shareholder input. At the corporation's 2016 annual meeting, shareholders owning approximately 3.5 billion – or more than 85 percent — of outstanding shares were represented. In 2016, shareholders voted on directors, independent auditors, executive compensation and 11 shareholder proposals. The summary table above shows the 2016 proxy vote results.

Good corporate governance is an essential element of corporate social responsibility. Corporate citizenship topics typically fall under the purview of the public issues and contributions committee, the board affairs committee and the compensation committee, and are routinely reviewed at board meetings. While risk oversight is the responsibility of the entire board, committees help the board focus on risk aspects relevant to each committee. For example, the PICC is charged with reviewing the effectiveness of the company's policies, programs and practices with respect to the environment, among other duties. The committee hears reports from operating units on environmental activities and also visits operating sites to observe and comment on current practices. The entire board receives briefings by internal experts on environmental stewardship and climate change.

Board selection process

We value the diversity of the board in regard to gender, race, geography, experience and fields of expertise. We believe maintaining this diversity is critical to our success in a globalized market. In 2016, 45 percent of the board's independent directors were female, African-American or from outside the United States. Four of the seven most recent additions to the board demonstrate this cultural and intellectual diversity.

Below we introduce our most recent board member additions: Angela Braly and Susan Avery.



Angela Braly was elected to the ExxonMobil board in 2016. Ms. Braly served as president and chief executive officer of WellPoint from 2007 to 2012 and chairman from 2010 to 2012. Her current company directorships include Brookfield Asset Management, Lowe's and Procter & Gamble.

Susan Avery was elected to the board in early 2017. Dr. Avery, an atmospheric scientist, is the former president and director of the Woods Hole Oceanographic Institution. In 2013, she was named to the Scientific Advisory Board of the United Nations Secretary-General, which provides advice on science, technology and innovation for sustainable development.

With our most recent board additions, the ExxonMobil board stands at 13 directors, 12 of whom are non-employee directors. We describe current director qualifications in our proxy statement, and the guidelines the board employs in selecting board candidates are published on our company website and regularly reviewed.

2017 proxy statement

Board committees overview

Executive compensation and strategic advantage

ExxonMobil's business model is reflective of a capital-intensive industry, requiring long investment lead times and a significant focus on risk management. Our executive compensation program supports this business model and focuses our executives on continuous improvement, effective risk management, operations integrity and sustainable growth in shareholder value.

Our compensation committee carefully considers the feedback on executive compensation we receive from our shareholders, some of whom have held ExxonMobil stock for more than a decade. During the 2016 proxy season, the advisory vote on executive compensation received 89 percent of votes "For" the company's program. For more details on our executive compensation program, see our board leadership webpage.

Board leadership ★⊕

Shareholder relations

We value the dialogue we have with our shareholders on a variety of governance, social and environmental topics throughout the year. Our direct engagement with shareholders provides an effective forum to address issues, share relevant information and viewpoints, and align on the facts.

In 2016, we held 51 shareholder engagements on environmental, social and governance issues with institutional investors, pension funds, and labor, religious and nongovernmental organizations, representing almost 40 percent of outstanding stock held by institutional investors. These engagements have frequently allowed us to reach common ground with our shareholders, in some cases avoiding the need for more formal shareholder proposals at the annual shareholders meeting. The board has established procedures for shareholders and

Political advocacy and contributions

Because public policy decisions made at all levels of government can have significant effects on our current and future operations, ExxonMobil communicates its positions to the U.S. Congress, state legislatures and governments around the world.

In the United States, lobbying activities include direct communication with members of Congress, state legislators, administration and regulatory officials, as well as support for trade associations and other groups that engage in lobbying activities. We fully comply with registration and reporting regulations related to our lobbying activities. In 2016, we reported total federal lobbying expenses of about \$12 million in our disclosure reports to Congress.

We make political contributions to candidate committees and political organizations as permitted by applicable laws. We refrain from making political contributions in any countries other than the United States and Canada. In 2016, we contributed almost \$222,000 to state candidates and caucuses in 12 U.S. states.* ExxonMobil's political action committee (PAC) disbursed more than \$957,000 to federal and state candidates.* Corporate political contributions are subject to an internal review process that requires approval from the chairman. The political contributions of the corporation, as well as the contributions from the company-sponsored PAC, are reviewed by the board of directors annually and are routinely verified during internal audits of the corporation's public affairs activities. As shown on the right, ExxonMobil engaged last year on a variety of issues in support of responsible economic, energy and environmental policies. For additional information on political contributions, the issues ExxonMobil engaged on in 2016 and our associated positions, visit our political advocacy and contributions webpage.



Political advocacy and contributions

ExxonMobil Energy Factor

Торіс	ExxonMobil's position							
Climate change	ExxonMobil supports the Paris Agreement, which addresses climate change as a global challenge for all nations.							
Education	ExxonMobil supports science, technology, engineering and mathematics (STEM) education initiatives as part of a path to global competitiveness and advocates for efforts to raise academic standards.							
Energy infrastructure	ExxonMobil supports the continued development of necessary energy infrastructure							
Hydraulic fracturing and horizontal drilling	ExxonMobil supports the global use of horizontal drilling and hydraulic fracturing.							
International trade	ExxonMobil supports lifting restrictions on exports of energy products because expanding markets can benefit all consumers.							
Regulatory improvement	ExxonMobil supports common-sense reforms to improve transparency, accountabilit and objectivity of regulations that would enable effective enforcement, improve public safety and minimize economic costs.							
Renewable fuel standard	ExxonMobil opposes fuel mandates such as the renewable fuel standard because they distort free markets, do not provide claimed environmental benefits and increase costs to consumers.							
Tax policy	ExxonMobil supports stable tax policies that enable the energy industry to remain competitive in the global marketplace.							
Toxic Substances Control Act	ExxonMobil supported the Toxic Substances Control Act reauthorization and modernization to strengthen safety standards.							

Up Close:

Engaging on TSCA modernization

The primary law overseeing the safety of chemical products in the United States — the Toxic Substances Control Act (TSCA) — provides the U.S. Environmental Protection Agency authority to review and regulate chemicals in commerce. TSCA was designed to ensure that products are safe for intended use. In 2016, ExxonMobil and the American Chemistry Council strongly advocated in support of the bipartisan legislation to enhance the TSCA process and provide for a uniform national system of chemical regulation. In June 2016, the president signed into law the Frank R. Lautenberg Chemical Safety for the 21st Century Act, which reauthorized and modernized TSCA to strengthen safety standards.

*Totals may not reflect some candidates' failure to deposit, or returned contributions not yet posted.

Performance data

We assess our performance at many levels of the organization, from individual operational sites to the business lines, to support continual improvement in all areas of corporate citizenship. Starting in 2011, performance data include XTO Energy information. As part of our commitment to transparently communicate our performance, in 2014 we started reporting our data over a 10-year period to demonstrate performance trends over time. For data that is discussed in more detail in this report, we reference the corresponding page number in the table. Data included in the performance table is guided by the reporting guidelines and indicators of IPIECA's *Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (2015)*. For additional information on our corporate citizenship reporting, please see the IPIECA/GRI/SDG index.



IPIECA/GRI/SDG index

Performance data table*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Page #
Safety, health and the workplace											
Fatalities – employees	0	0	4	0	0	1	0	0	0	0	12
Fatalities – contractors	8	5	4	3	9	4	6	3	2	3	12
¹ Fatal accident rate — total workforce (per 1,000,000 work hours)	0.018	0.011	0.017	0.006	0.017	0.010	0.011	0.006	0.004	0.008	N/A
¹ Fatal incident rate — total workforce (per 1,000,000 work hours)	0.013	0.011	0.012	0.006	0.017	0.010	0.009	0.006	0.004	0.008	N/A
² Lost-time incident rate — employees (per 200,000 work hours)	0.031	0.054	0.043	0.048	0.064	0.042	0.051	0.032	0.043	0.027	N/A
² Lost-time incident rate — contractors (per 200,000 work hours)	0.065	0.049	0.040	0.031	0.086	0.049	0.041	0.030	0.029	0.030	N/A
² Lost-time incident rate — total workforce (per 200,000 work hours)	0.048	0.051	0.041	0.038	0.077	0.046	0.044	0.031	0.034	0.029	12
² Total recordable incident rate — employees (per 200,000 work hours)	0.33	0.37	0.32	0.25	0.30	0.25	0.22	0.19	0.21	0.16	N/A
² Total recordable incident rate — contractors (per 200,000 work hours)	0.43	0.49	0.39	0.34	0.41	0.37	0.32	0.29	0.26	0.23	N/A
² Total recordable incident rate — total workforce (per 200,000 work hours)	0.38	0.43	0.36	0.30	0.37	0.33	0.29	0.25	0.24	0.20	12
Process Safety Tier 1 Events (API RP 754 guidance)	N/A	N/A	69	62	70	63	62	65	74	64	N/A
^{3,4} Number of regular employees at year end, thousands	81	80	81	84	82	77	75	75	73	71	15
⁴ Percent of workforce – outside the United States	63	63	63	60	61	59	59	58	59	59	15
⁴ Percent women — global workforce	25	25	26	26	26	28	28	28	28	28	N/A
Percent management and professional new hires — women	38	39	38	40	44	39	39	40	41	44	N/A
Percent management and professional new hires — outside the United States	71	69	63	70	79	68	66	61	61	74	N/A
Number of non-unique employee participants in corporate and technical training, thousands	35	48	52	61	65	76	87	79	85	83	N/A
Total corporate and technical training expenditures, millions of dollars	61	69	71	77	80	88	96	117	124	108	14
Managing climate change risks											
5 Greenhouse gas emissions, absolute (net equity, CO $_{2}^{-}$ equivalent emissions), millions of metric tons	135	126	123	126	128	126	127	123	122	125	20
⁶ Direct (excluding emissions from exported power and heat)	125	117	114	117	119	118	119	115	114	117	N/A
⁷ Emissions associated with imported power	10	9	9	9	9	8	8	8	8	8	N/A
Greenhouse gas emission consituents (excludes emissions from exported power and heat), millions of metric tons											
CO_2 (excluding emissions from exported power and heat)	131	122	119	122	124	120	119	116	115	118	N/A
Methane (CO ₂ -equivalent)	3	3	3	3	3	5	7	6	6	7	N/A
Other gases (CO ₂ -equivalent)	1	1	1	1	1	1	1	1	1	<1	N/A
Emissions from exported power and heat	14	13	14	13	15	15	16	7	4	3	N/A
By-region greenhouse gas emissions (net equity, CO ₂ -equivalent emissions), millions of metric tons											
Africa/Europe/Middle East	50	45	43	45	45	44	44	43	44	44	N/A
Americas	65	62	62	64	66	68	70	66	65	65	N/A
Asia Pacific	20	19	18	17	17	14	13	14	13	16	N/A

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Page #
Managing climate change risks (continued)											
By-division greenhouse gas emissions (net equity, CO ₂ -equivalent emissions), millions of metric tons											
Upstream	53	49	47	50	54	56	58	56	56	59	N/A
Downstream	59	57	56	55	54	51	49	47	45	45	N/A
Chemical	23	20	20	21	20	19	20	20	21	21	N/A
Carbon dioxide – captured for storage, millions of metric tons	N/A	N/A	N/A	N/A	5.0	4.8	5.9	6.9	6.9	6.3	18
⁵ Greenhouse gas emissions, normalized (net equity, CO ₂ -equivalent emissions), metric tons per 100 metric tons of throughput or production											
Upstream	21.7	21.0	20.1	20.5	20.7	22.3	23.2	23.9	23.9	24.6	20
Downstream	21.5	21.0	21.0	20.8	20.0	19.6	19.7	19.2	18.9	19.5	20
Chemical	62.1	59.8	60.7	57.9	57.2	56.3	57.0	53.4	53.6	52.2	20
Energy use (billion gigajoules)	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.5	1.5	20
Energy intensity, normalized versus Global Energy Management System (GEMS) base year (2002) — refining	94.2	93.7	92.8	91.8	90.9	90.0	90.5	90.3	91.2	90.7	N/A
Energy intensity, normalized versus GEMS base year (2002) $-$ chemical steam cracking	89.6	90.4	88.6	87.6	87.3	88.2	88.8	86.4	86.6	84.2	N/A
Hydrocarbon flaring (worldwide activities), millions of metric tons	8.0	5.7	4.4	3.6	4.1	3.6	3.7	4.5	5.3	5.0	21
⁸ Cogeneration capacity in which we have interest, gigawatts	4.5	4.6	4.9	4.9	5.0	5.2	5.3	5.5	5.5	5.3	21
⁸ Number of acres of managed wildlife habitat	370	370	380	6,400	6,900	7,000	7,000	7,200	7,100	7,200	N/A
Freshwater withdrawn, millions of cubic meters	N/A	N/A	N/A	N/A	540	520	420	420	450	440	N/A
Freshwater consumption, millions of cubic meters	320	350	340	330	370	330	280	270	300	290	27
Freshwater intensity, metric tons of water consumed per metric tons of throughput or production											
Upstream	0.07	0.08	0.09	0.10	0.26	0.26	0.24	0.19	0.35	0.30	N/A
Downstream	0.81	0.90	0.85	0.87	0.88	0.82	0.74	0.74	0.73	0.76	N/A
Chemical	2.36	2.56	2.46	2.41	2.64	2.41	1.98	1.79	1.83	1.75	N/A
Marine vessel spills (owned and long-term leased), number of hydrocarbon spills > 1 barrel	0	0	0	0	0	0	0	0	0	0	N/A
⁹ Significant spills to the environment	N/A	N/A	N/A	N/A	N/A	20	17	19	11	9	N/A
Spills (not from marine vessels), number of oil, chemical and drilling fluid spills > 1 barrel	253	211	242	210	484	356	330	334	319	220	N/A
Oil spills, number of oil spills > 1 barrel	224	185	208	186	387	294	280	288	280	188	N/A
Other spills, number of chemical and drilling fluid spills > 1 barrel	29	26	34	24	97	62	50	46	39	32	N/A
Hydrocarbons spilled (oil spilled), thousands of barrels	7.5	20.3	17.4	7.7	17.8	8.5	9.3	9.1	10.8	4.7	28
Other spills, thousands of barrels	0.5	0.4	0.5	40.4	2.0	1.6	0.9	4.1	0.4	3.7	N/A
Controlled hydrocarbon discharges to water, thousands of metric tons	1.7	1.8	1.4	1.3	1.3	1.2	1.1	1.3	1.1	1.1	N/A
Upstream	1.2	1.3	1.1	1.1	1.1	1.0	1.0	1.2	1.0	1.0	N/A
Refining	0.5	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	N/A
Sulfur dioxide (SO ₂) emitted, millions of metric tons	0.21	0.19	0.16	0.14	0.13	0.13	0.12	0.10	0.11	0.10	N/A
Nitrogen oxides (NOx) emitted, millions of metric tons	0.16	0.15	0.13	0.12	0.15	0.14	0.14	0.14	0.14	0.13	N/A
Volatile organic compounds (VOCs) emitted, millions of metric tons	0.26	0.20	0.18	0.18	0.18	0.15	0.15	0.16	0.16	0.15	N/A

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Page #
Environmental performance (continued)											
VOCs emitted, metric tons per 100 metric tons of throughput or production											
Upstream	0.059	0.044	0.042	0.044	0.049	0.044	0.054	0.059	0.058	0.055	N/A
Refining	0.015	0.012	0.011	0.012	0.011	0.010	0.009	0.008	0.008	0.008	N/A
Chemical	0.039	0.043	0.036	0.036	0.032	0.036	0.034	0.029	0.027	0.027	N/A
Environmental expenditures, billions of dollars	3.8	5.2	5.1	4.5	4.9	5.5	6.0	6.2	5.6	4.9	27
Total dollars spent on environmental penalties and fines, billions of dollars	0.002	0.011	0.002	0.011	0.003	0.004	0.002	0.018	0.015	0.006	N/A
Total hazardous waste disposed from remediation, millions of metric tons	0.1	0.2	1.2	0.6	1.3	1.7	1.1	1.0	1.4	1.4	N/A
¹⁰ Total hazardous waste disposed from operations, millions of metric tons	0.1	0.4	0.8	1.3	1.9	2.0	0.3	0.3	0.2	0.1	N/A
Community engagement, human rights and strategic investments											
¹¹ Community investments, millions of dollars	206.6	252.2	235.0	237.1	278.4	255.6	269.5	279.5	272.3	241.5	35
United States	124.1	144.6	143.0	154.8	161.3	156.5	156.3	150.2	145.5	131.1	35
Rest of world	82.5	80.6	92.0	82.3	117.1	99.1	113.2	129.3	126.8	110.4	35
Local development and supply chain management											
¹² ExxonMobil spending with U.S. diverse suppliers, millions of dollars	582	615	887	841	1,068	1,001	1,024	1,108	1,064	1,442	39
Corporate governance											
¹³ Number of Extractive Industries Transparency Initiative (EITI) participating countries	6	8	8	7	7	7	9	10	11	15	N/A
Percent of shares represented at Corporation's Annual Meeting	84.9	84.8	82.9	80.7	81.9	83.0	82.3	82.9	83.9	85.1	44
Corporate political contributions $-$ U.S. state campaigns and national 527s, millions of dollars	0.27	0.45	0.49	1.10	0.51	1.03	0.70	1.17	0.58	0.52	N/A

Notes on performance table:

¹Workforce includes employees and contractors. Accidents or incidents include both injuries and illnesses. From 2007 through 2016 all fatalities were injury-related.

²Workforce includes employees and contractors. Incidents include both injuries and illnesses. Depending on the reporting year, illness-related incidents range from 2 to 13 percent.

³Reduction from 2011 is primarily due to divestment and restructuring activity in the Downstream business.

⁴Regular employees are defined as active executive, management, professional, technical and wage employees who work full-time or part-time for ExxonMobil and are covered by ExxonMobil's benefit plans and programs. Employees at our company-operated retail stores are not included.

⁵The net equity greenhouse gas emissions metric was introduced in 2011 as a replacement for the direct equity greenhouse gas metric. Information has been restated back to 2005 according to the new metric. The net equity greenhouse gas metric includes direct and imported greenhouse gas emissions and excludes emissions from exports (including Hong Kong Power through mid-2014). ExxonMobil reports greenhouse gas emissions on a net equity basis for all our business operations, reflecting our percent ownership in an asset.

⁶The addition of direct emissions and emissions associated with exported power and heat is equivalent to World Resources Institute (WRI) Scope 1.

⁷These emissions are equivalent to WRI Scope 2.

⁸Cumulative figure.

[°]ExxonMobil began measuring significant spills to the environment, the number of spills of any fluid type that warrant greater focus, in 2012.

¹⁰The value for hazardous waste from ongoing operations includes produced water classified as hazardous waste by one local authority, which is approximately 95 percent of the reported figure in 2008 through 2012.

¹¹Total contributions include ExxonMobil corporate and foundation donations, and employee and retiree giving through ExxonMobil's matching gift, disaster relief and employee giving programs.

¹²Beginning in 2015, our spending encompassed an expanded set of diverse classifications that includes: minority-owned businesses; women-owned businesses, small businesses; lesbian-, gay-, bisexual- and transgender-owned businesses; veteran-owned businesses, service-disabled veteran-owned businesses; and businesses owned by peoples with disabilities. Prior to 2014, spending included minority- and women-owned businesses.

¹³In countries where ExxonMobil has an Upstream business presence.

*Some uncertainty exists in performance data, depending on measurement methods. Data in the report and performance data table represent best available information at the time of publication. Performance data are reported for our affiliates and those operations under direct ExxonMobil management and operational control. Includes XTO Energy performance beginning in 2011. N/A is used to indicate that data are not available, or not detailed in this report outside the performance data table.



LRQA Assurance Statement

Relating to Exxon Mobil Corporation's Corporate Citizenship Report for the calendar year 2016.

This Assurance Statement has been prepared for Exxon Mobil Corporation in accordance with our contract but is intended for the readers of this report.

Terms of engagement

Lloyd's Register Quality Assurance, Inc. (LRQA) was commissioned by Exxon Mobil Corporation (ExxonMobil) to assure its processes for reporting safety, health and environmental IPIECA performance indicators used in the *Corporate Citizenship Report* (CCR) for the calendar year 2016, to a reasonable level of assurance using LRQA's verification approach.

Our assurance engagement covered ExxonMobil's operations and activities worldwide and specifically the following requirements:

- Verifying the integrity of the processes used for determining which material issues to report;
- Evaluating consistency with the following industry guidelines:
 - IPIECA/API, Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (2015),
 - API, Compendium of Greenhouse Gas Emission Estimation Methodologies for the Oil and Gas Industry (2009).

Our assurance engagement did not include verifying the accuracy of data and information reported.

LRQA's responsibility is only to ExxonMobil. LRQA disclaims any liability or responsibility to others as explained in the end footnote. ExxonMobil's management was responsible for preparing the CCR and for maintaining effective internal controls over the reporting processes and CCR. LRQA's responsibility was to carry out an assurance engagement on the reporting processes in accordance with our contract with ExxonMobil. Ultimately, the CCR has been approved by, and remains the responsibility of, ExxonMobil.

LRQA's opinion

Based on LRQA's approach, we believe that ExxonMobil's reporting processes were effective in delivering safety, health and environmental indicators that are useful for assessing corporate performance and reporting information consistent with IPIECA/ API Guidance.

The opinion expressed is formed on the basis of a reasonable level of assurance and at the materiality of the professional judgment of the Verifier.

LRQA's approach

LRQA's assurance engagement was carried out in accordance with our Verification procedure¹; the following tasks were undertaken as part of the evidence gathering process for this assurance engagement:

- Reviewing the reported information to confirm the inclusion of all core safety, health and environmental performance indicators referenced in the IPIECA/API Guidance;
- Reviewing the documented reporting requirements against the applicable industry guidelines to assure consistency of scope, definition and reporting for each of the relevant indicators;
- Reviewing the reporting processes at Headquarters and at each of the functional business levels to evaluate the processes used by ExxonMobil to assure completeness, consistency and conformance to reporting requirements across its global operations;
- Reviewing the stakeholder engagement processes;
- Reviewing the processes used to aggregate the data and information at the corporate level for inclusion in the CCR;
- Reviewing ExxonMobil's data collection tools to assess use in the reporting processes;
- Reviewing the data-reporting processes at a sample of nine operating sites selected by LRQA to assess local understanding and implementation of reporting requirements. Sites selected were SARPOM Trecate Refinery, Italy; Exxon Neftegas, Sakhalin, Russia; Mont Belvieu Plastics Plant, Texas; Beaumont Chemical Plant, Texas; and lubricant facilities in Apapa, Nigeria; Tianjin, China; Port Allen, Louisiana; Edmonton, Canada; and Jurong, Singapore.

Observations

Further observations and findings made during the assurance engagement are:

- Processes were in place to ensure that sites contributing to core safety, health and environmental metrics understood corporate reporting obligations and were included in corporate safety, health, environmental and climate change reporting;
- Methods used for calculating each metric were defined clearly and communicated;
- Processes were in place to ensure that the quantitative indicators were checked for completeness, consistency and accuracy;
- Responsibility for annually reviewing and updating reporting guidelines was clear, with improvement in methodology regularly undertaken;
- Guidelines for greenhouse gas emissions reporting were consistent with, and specifically refer to, the API Compendium

- for Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry (2009);
- Active engagement with external stakeholders provided information for determining material issues.

Observations and areas for potential improvement were provided in a report to ExxonMobil's management. These recommendations do not affect our opinion.

LRQA's competence and independence

LRQA ensures the selection of appropriately qualified individuals based on their qualifications, training and experience. The outcome of all verification and certification assessments is then internally reviewed by senior management to ensure that the approach applied is rigorous and transparent.

LRQA is ExxonMobil's certification body for ISO 9001 and ISO 14001 (lubricants operations) and Responsible Care® (chemical operations) and the California Air Resources Board greenhouse gas verification. The certification and verification assessments are the only work undertaken by LRQA for ExxonMobil and as such do not compromise our independence or impartiality.

Signed

Dated: March 30, 2017

Anne frem

Andrea M. Bockrath LRQA Lead Verifier On behalf of Lloyd's Register Quality Assurance, Inc. LRQA Reference: UQA0110889

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¹ LRQA's Verification procedure is based on current best practice and uses the principles of AA1000AS (2008) – Inclusivity, Materiality, Responsiveness and Reliability of performance data and processes defined in ISAE3000.

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Statements of future events or conditions in this report are forward-looking statements. Actual future results, including future energy supply, demand, and mix; the future effectiveness of safety, health, environmental, and other risk management processes; efficiency gains; and the impact of future technologies could differ materially due to factors including changes in supply and demand for oil and gas and other factors affecting long-term oil and gas prices; political and regulatory factors including the impact of international accords and treaties; changes in consumer preferences; actions of competitors including the development of competing technologies; the outcome of current and future research efforts; technical and operating factors; and other factors discussed under the heading "Factors Affecting Future Results" available through the Investors page of our website at *exxonmobil.com*.

E‰onMobil

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Exhibit 25



The Outlook for Energy: A View to 2040 2014

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The Outlook for Energy: A View to 2040

The Outlook for Energy is ExxonMobil's long-term global view of energy demand and supply. Its findings help guide ExxonMobil's long-term investments, and we share the Outlook to help promote better understanding of the issues shaping the world's energy future. Updated each year, this edition covers the period to 2040.

By 2040, we expect to see ...

2 billion more people

on the planet.

130 percent

larger global economy.

about 35 percent

greater demand for energy – which could have more than doubled without gains in efficiency.

non-OECD countries

like China and India lead the growth in energy demand.

about 60 percent

of demand supplied by oil and natural gas.

natural gas surpass coal

as the second-largest fuel source.

90 percent growth

in demand for electricity.

energy-related CO₂

emissions plateau and gradually decline.

Why energy?

Few of us – especially those of us living in advanced economies – ever pause to reflect on the pervasive importance of energy to our lives. That's only natural given the convenience and reliability of the energy we use. Consider electricity, for example. It flows when we flip a switch and suddenly there's light. We turn on a cell phone and instantly connect with others around the world. It happens so automatically, that only disruptions get our attention.

At the same time, few of us ever get a glimpse of the energy being used miles away to produce this electricity for our benefit. Similarly, we expect our local service station will have fuel when we drive our car or truck in for a fill-up. Do we ever consider the energy it took to get the gasoline to the station, let alone the energy used to build our car?

"Energy is a critical part of boosting prosperity and eradicating poverty."

Jim Yong Kim, President, World Bank Group

The Outlook for Energy: A View to 2040 5

2

Why energy?

Energy is everywhere and it transforms everything

Think about it. Energy is all around us. Vital in virtually every aspect of our lives, it's remarkable that the value of energy doesn't get broader recognition.

How are modern energy supplies paired with today's technologies to improve your own life? You're warmed in the winter and cooled in the summer, thanks to energy. Electricity powers your alarm clock, your television, and your cell phone. A refrigerator uses energy to keep your food safe to consume and your oven uses energy to cook it. And before that, your food was grown by farmers, then processed, packaged and transported to the grocery store from another part of the country or the world, using energy at every step along the way. Essentially every task you perform and every product you use throughout the day is made possible because of energy.

It raises the question: **why energy?** The answer is simple. Energy helps us survive and frees us to pursue fuller lives in thousands of ways.

Today, most people are fortunate to have energy supplies and clean water flowing directly to their homes. Modern appliances can handle tasks like cooking and laundry while we read an e-book, watch television, shop online, hit the treadmill, or challenge the kids to a video game, all in a temperature-controlled room.

We have unparalleled travel options. We can use a motorcycle, car, bus, truck, train, boat or plane.

We can dash to school, to work or to the grocery store in minutes. We can drive hundreds of miles to see family or fly across an ocean in hours. And we can trade goods with others thousands of miles away. Energy not only powers all of this travel, it helps us build the vehicles and infrastructure that it requires.

When our loved ones are sick, energy is integral to getting them to the doctor and restoring their health. From hospitals and urgent-care facilities, to basic pharmaceutical drugs, to materials that keep equipment sterile, to high-tech diagnostic tools such as MRIs, energy has a hand in producing and powering our health system.

2.6 billion

Today, 2.6 billion people still rely on traditional biomass energy for cooking.

Our lives are also affected by electric-powered devices that are transforming communications and computing. Today, we can be in touch with someone else basically anytime, anywhere in a matter of seconds. And with the Internet, we can transform the education of our children, telecommute to work, capture new trade opportunities, see distant friends and family, or attend online classes to improve our education.

These technologies are widely used today only because they provide practical value to people like

you; value that would not exist without convenient access to modern and reliable energy supplies. This combination of technology and energy provides important synergies that improve human life. We can meet basic needs much more efficiently and in turn pursue more valuable activities, whether it's time with family and friends, furthering our education, inventing a new medical treatment, building a business, playing or simply helping a neighbor.

Energy and human progress

The last two centuries have seen remarkable changes across our world. The global population has increased from 1 billion to 7 billion people. At the same time, living standards have advanced dramatically in many parts of the world, supported by modern technologies and access to energy. People with the freedom to innovate and thrive in an environment of investment risk-and-reward led a burst of human progress, the pace and scale of which has been remarkable. As an indicator, energy consumption worldwide is now about 25 times higher than in 1800.

Expanding use of advanced technologies has also correlated with increasing demand for coal, oil, natural gas and electricity. As technologies and needs have evolved, people have naturally sought practical solutions with energy that are reliable, affordable and convenient. An often unrecognized sign of technology's progress over time is dramatic energy efficiency gains. For example, a steam engine in 1800 at 6 percent efficiency pales in comparison to a modern combined-cycle gas turbine with about 60 percent efficiency. It's no coincidence that people's quest to improve the use of their resources also extends to energy.

Together, technology and energy advances have helped bring about an unprecedented improvement in the key indicators of human well-being, including incomes, literacy rates and average life expectancy in many parts of the world.

Still, this dramatic progress has not been seen everywhere. According to the International Energy Agency (IEA), 1.3 billion people live without access to electricity, while 2.6 billion people rely on traditional biomass energy for cooking. "The global energy landscape is changing rapidly. And those changes will recast our expectations about the role of differentcountries, regions and fuels over the coming decades."

Maria van der Hoeven, Executive Director, IEA

As the world's population approaches 9 billion people in 2040, we are challenged to not just meet basic needs, but also to improve living standards throughout the world.

In our view, meeting this challenge will require an increase in energy use worldwide of about 35 percent. The scale of the challenge may seem daunting, but history demonstrates a remarkable ability of people to overcome hurdles to progress. Fortunately, the world not only holds a vast and diverse array of energy resources, but we also possess increasingly advanced technologies that can safely and reliably supply this energy.

Another important aspect to improving standards of living concerns the environment. Perhaps most urgent are needs in many areas of the world for cleaner air and cleaner water. Nations around the world also need to continue to address risks associated with rising greenhouse gas (GHG) emissions. We expect advanced technologies and lower carbon fuels will help energy-related CO₂ emissions plateau around 2030.

In pondering our *Outlook* to 2040, we recognize that people's lives and those of their children are being transformed by access to energy and technology. Going forward, we expect people everywhere will continue to invent, innovate, work and deliver practical solutions to build a brighter future. Now, as always, that path to progress will be powered by human ingenuity and energy.

3 hours

Today, in the United States, it takes less than three hours to produce 100 bushels of wheat, compared to 50 hours a century ago.

Global fundamentals

Energy is about people — individuals and societies using electricity, transportation fuels and other energy to make life better. As economies and populations grow, and as living standards improve for billions of people, the need for energy will continue to rise. Even with significant efficiency gains, global energy demand is projected to rise by about 35 percent from 2010 to 2040.

> "Energy is a necessary input to improving quality of life and economic growth. Access to reliable and affordable energy sources can reduce poverty, improve public health, and improve living standards in myriad ways."

> > Columbia University's Center on Global Energy Policy

The Outlook for Energy: A View to 2040

Population and progress

People and economies need energy to grow and thrive

From 2010 to 2040, the world's population is projected to rise from 7 billion to nearly 9 billion, and the global economy will more than double. Over that same period, global energy demand is likely to rise by about 35 percent.

But our world's energy landscape is always more complex than it seems at first glance.

Even a casual assessment reveals that the world is not one homogenous place, but rather many individual countries and regions, each at a different stage of economic and energy development. For example, economic growth in Organisation for Economic Co-operation and Development (OECD) countries will likely average 2.0 percent annually, while non-OECD countries are expected to average 4.4 percent a year through 2040. This growth in gross domestic product (GDP) means improved quality of life for billions of people.

Global population

Billions of people



Economic output (GDP)

Trillions of 2005 dollars



80 percent

Globally, GDP per capita will grow by about 80 percent from 2010 to 2040.

We can categorize our world in broad groups:

The United States and other OECD member nations.

This group already has relatively high living standards, urbanization levels and per capita energy use reflecting well-advanced economies. As OECD economies continue to expand, improvements to energy efficiency and slower population growth will combine to keep overall energy demand essentially flat in these countries through 2040.

China and India. These two countries are the world's most populated, and each is in the process of making broad gains in living standards. By 2040, nine of the world's 20 most populous cities — and one of every three people on the planet — will be in China or India. Together these nations account for half of the projected growth in global energy demand.

China has been a dominant force in energy trends over the past 20 years as its economy grew and living standards rose. China's energy demand will continue to grow substantially, but by 2040, China will have a much more mature economy, with energy demand growth — as well as economic and population growth — slowing to a more temperate pace. India will continue to experience strong growth, with its large population realizing significant gains in living standards. Since 2005, India has surpassed Japan and Russia to become the third-largest energy consumer behind China and the United States – a position it will likely retain through 2040.

Key growth countries and other non-OECD.

Economic progress will drive demand for energy in other non-OECD countries, where many more people will be able to afford some or all of the hallmarks of a middle-class lifestyle, such as better homes, air conditioning, appliances, personal vehicles and computers. The biggest gains should be seen in 10 key growth countries: Brazil, Indonesia, Saudi Arabia, Iran, South Africa, Nigeria, Thailand, Egypt, Mexico and Turkey. By 2040, these 10 countries will have energy demand approaching the level of China. Although Mexico and Turkey are OECD members, their significant population, economic and energy demand growth closely resemble that of the other countries in this group.

Growing urbanization drives energy demand

As we have seen in developed economies over the previous century, one important fundamental of energy demand is the migration of populations from rural to urban areas. Naturally, the expansion of urban infrastructure creates demand for iron, steel, cement and other industrial goods that are energy intensive.

Urbanization also tends to drive energy demand higher for several other reasons: Average urban income levels are higher than in rural areas; energy-intense manufacturing and other industries cluster around cities; and in developing economies, the number of people per household is usually lower in urban settings, which leads to a higher number of actual households.

Global energy demand

Quadrillion BTUs




Global urbanization and major cities in 2040



Source: United Nations and ExxonMobil estimates

All this, combined with an expanding middle class, leads to a higher penetration of consumer electronics, personal vehicles, and other demands for energy.

By 2040, the proportion of people living in urban settings in non-OECD countries is projected to rise to about 60 percent, up from 45 percent in 2010 and 30 percent in 1980. OECD urbanization rates are likely to rise to 85 percent, from about 75 percent.

Even with all of this progress, the growth in global demand for energy is actually slowing down.

While the projected rise in energy demand from 2010 to 2040 is substantial, it is only about 80 percent of the growth seen from 1980 to 2010. This is all the more remarkable because the growth in economic output from 2010 to 2040 will be more than double the growth from 1980 to 2010. This means that the world is continuing to become more efficient as prosperity advances.

This shift is due in part to advances in technology; for example, fuel demand for light-duty vehicles is expected to be relatively flat through 2040 as advanced cars with better fuel economy enter the market.

Energy efficiency works in every aspect of the world's economy to offset demand growth.

Its importance is illustrated by recognizing that the projected rise in population and GDP through 2040 could have caused global energy demand to rise by more than 100 percent. But much of that demand increase will be avoided because of advances in energy efficiency across all sectors.

Another reason for the slowdown in global energy demand growth is the fact that over time, an increasing percentage of the world's population — including OECD countries and China — will already have achieved a relatively high standard of living, with relatively stable energy needs.

While our economies become more efficient, commercial activities and consumer preferences will still drive global energy needs higher. While worldwide demand for energy that people use directly (in cars and homes) will grow through 2040, there will be even larger increases in demand for energy that serves people indirectly through the broader economy. These needs include fuels for manufacturing, trucking and shipping, as well as energy for power generation to support industrial customers, computers and telecommunications.

All energy sources should be pursued to meet global demand through 2040. New technologies will continue to expand the world's energy options. One prominent example is the rapid growth in the production of tight oil and shale gas that has revitalized North American energy production.

While oil will remain the fuel of choice for transportation, natural gas is emerging strongly as a growing fuel of choice for other sectors. Utilities and other consumers are turning to this abundant, affordable and clean-burning fuel. Half of the growth in demand for natural gas is being driven by the need for electricity around the world, which is expected to increase by 90 percent from 2010 to 2040. Nuclear and renewable energy will also grow to support electricity needs.

500 quadrillion

People around the world will help generate energy savings of about 500 quadrillion BTUs in 2040.

Energy demand

People use energy for home, work and travel. People also use energy indirectly in ways they may not think about — by purchasing goods that took energy to manufacture, package and ship; by making use of hospitals, schools and public safety services; or simply by using the Internet. Through 2040, the largest source of energy demand will be for fuels used to make electricity.

"The great energy challenge of the future, which will test all sources, is meeting the demand growth of a growing world."

Daniel Yergin, Vice Chairman, IHS

Residential/Commercial

Energy use rises with improved living standards

Three significant drivers of global energy trends increasing population, urbanization and rising living standards — are clearly evident in the residential and commercial sectors.

The majority of the growth in energy demand used in buildings is expected to come from the residential sector, although energy for commercial and other public facilities will actually grow at a faster pace. These energy needs reflect rising populations as well as an ongoing shift of people from rural to urban settings. This shift generally leads to greater energy use in homes and other buildings for cooking, indoor

Res/Comm demand by region

Quadrillion BTUs



temperature control, lighting, appliances and other equipment (e.g., computer/information systems).

Demand in the residential sector is driven by two factors: the number of households and the amount of energy used per household (energy intensity). The total number of households in the world will rise significantly in coming decades; we expect an increase of close to 50 percent, from **1.9 billion households in 2010 to 2.8 billion by 2040,** due to increasing population and urbanization.

At the same time, urbanization and rising incomes particularly in China, India and the other 10 key growth countries — are driving demand for energy not just for basic needs but also modern uses such as

Households by region

Millions



The United States and other highly urbanized economies have reached a point where growth in energy use in homes is flattening. Improvements to efficiency better windows, for example — are actually beginning to produce a net decline in residential energy demand. But many other countries are in earlier stages of urbanization.

China. In 1990, only about 25 percent of the people in China lived in urban areas; by 2010, that number had grown close to 50 percent. Over that time, residential electricity use per capita had grown about 20 times. By 2040, China's urbanization rate is projected to reach about 75 percent, but its growth in residential energy demand is expected to begin leveling off.

India and Africa. In India, the proportion of people living in urban areas is expected to rise from 30 percent in 2010 to 45 percent in 2040. Africa's urbanization rate is expected to rise from about 40 percent to 50 percent. Demand for energy for residential purposes is expected to grow by about 35 percent in India and 70 percent in Africa over the *Outlook* period.



Urbanization brings a shift away from

traditional fuels. In India and Africa, millions of people still get a significant amount of energy from biomass fuels like wood. Growth in the use of these fuels is slowing in favor of modern energy such as natural gas, liquefied petroleum gas (LPG) and electricity. Modern fuels burn much cleaner, and are far more efficient. When used for cooking, modern fuels such as natural gas and LPG are about four times more efficient than wood. The IEA estimates that 2.6 billion people, mostly in Africa and developing Asia, lack access to modern cooking fuels.

air conditioning, appliances and electronics. In rural China, there are only 16 air conditioners for every 100 households; in urban areas, that ratio is 112 per 100.

Much of the underlying growth in residential energy demand, however, will be offset by the fact that **household energy use continues to reflect efficiency gains**. For example, according to the Energy Information Administration (EIA), U.S. homes built after 2000 consume about the same amount of energy as older homes despite being, on average, 30 percent larger. Globally, residential energy intensity is projected to fall by about 15 percent over the *Outlook* period as homes become better insulated and make greater use of energy-saving lighting and appliances.

Accounting for all of these factors, **energy demand in the residential sector is expected to rise by about 20 percent** from 2010 to 2040, with growth tapering after around 2030 as China's urbanization begins to slow and residential energy demand in mature OECD economies actually declines. "The 'energy-poor' suffer the health consequences of inefficient combustion of solid fuels in inadequately ventilated buildings, as well as the economic consequences of insufficient power for productive income-generating activities and for other basic services such as health and education. In particular, women and girls in the developing world are disproportionately affected in this regard."

United Nations, Energy for a Sustainable Future

Rising living standards and urbanization will also enable many people to change the types of fuel they use in their homes. The world will see a **continued shift toward electricity and natural gas and away from biomass fuels,** like wood, which today still account for approximately 40 percent of global residential energy needs.

By 2040, electricity will likely account for around one-third of residential energy demand, compared to 20 percent in 2010. Another fuel source that should see large growth is natural gas.

The shift away from less-efficient fuels like wood in the residential sector will help people in developing countries improve their quality of life without necessarily increasing their overall energy use.

Res/Comm demand by fuel

Quadrillion BTUs



Significant trends are also seen in the commercial sector, which includes energy used in offices, retail stores, hospitals and schools. Globally, commercial demand for energy is rising, with growth projected to gradually slow toward 2040. In addition, a greater share of commercial energy use is likely to come from electricity rather than the direct use of fuels such as oil or coal. Commercial demand should rise by about 50 percent from 2010 to 2040.

Combined, total residential and commercial energy demand is projected to rise by around 30 percent from 2010 to 2040.

The residential/commercial sector is a growing contributor to electricity demand, ultimately leading to greater demand for the fuels used by utilities and other power generators.



90 percent

Residential/commercial electricity demand will increase by close to 90 percent over the *Outlook* period.

Transportation

The "fleet" expands as many more people can afford cars

Light-duty vehicles — the cars, pickup trucks and sport utility vehicles (SUVs) that people use in their daily lives — represent one of the most visible demand sectors.

Demand for fuel for these personal vehicles, which is met nearly exclusively from oil, is expected to rise slowly over the next decade before gradually trending downward over the remainder of the *Outlook* period.

This shift in demand won't be because of fewer vehicles in the world. In fact, from 2010 to 2040, the number of light-duty vehicles — the global "fleet" is expected to more than double from about 800 million to about 1.7 billion, as the world's population grows and more people in developing economies are able to afford cars.

In 2010, about 75 percent of the world's vehicles were in OECD countries. However, looking ahead, about 80 percent of the growth in the global fleet will come from non-OECD countries.

For example, it is estimated that in 2010 China had only about five light-duty vehicles per 100 people, while India had fewer than two per 100 people; this compares to about 75 vehicles for every 100 people in the United States. However, by 2040, China and India are expected to increase their levels by more than 500 percent. In fact, by 2030, we expect China will have surpassed the United States as the country with the largest number of personal vehicles, even though China's vehicles per capita will be about one-third the level of the United States at that time.

Transportation demand by sector

Millions of oil-equivalent barrels per day



Significant growth will also come from countries in Latin America, Africa and the Middle East, which together will account for about 15 percent of the growth in the global fleet. Collectively, these countries are likely to increase their vehicle ownership by about 80 percent as their total number of cars nearly triples.

Importantly, the increase in the number of light-duty vehicles in the world through 2040 will likely be nearly offset by the fact that **the vehicles themselves will be far more fuel efficient**. As a result, the average efficiency of the world's vehicle fleet is projected to reach about 46 mpg (about 5.1 liters per 100 km) compared to 24 mpg (9.8 liters per 100 km) in 2010.

This unprecedented improvement in global fuel economy is expected to reflect a surge in hybrid vehicle sales. Hybrids, which combine an internal combustion engine and an electric motor, are expected to account for about half of global new-car sales by 2040, as they become increasingly cost competitive compared to conventional vehicles.

By 2040, hybrids are expected to account for about 35 percent of the global light-duty vehicle fleet, up from less than 1 percent in 2010. Over the same period, electric and plug-in vehicles are expected to grow to about 70 million cars, or less than 5 percent of the total fleet. This slower growth is attributed to the relatively higher cost of the vehicles, driven by the cost of batteries.

Vehicle penetration 2000 to 2040

Cars per 100 people



2030

2035

2040

Electric/plug-in

Full hybrid

CNG and LPG

Conventional diesel

Conventional gasoline

Range of average vehicle efficiency

On-road miles per gallon



Light-duty f I eet by type

Million cars

Demand climbing for commercial transportation fuels

While global energy demand for personal transportation is expected to be relatively flat over the next few decades, demand for energy for commercial transportation — trucks, planes, ships and trains — will continue to grow significantly as economies expand and evolve.

Global demand for energy for commercial transportation is expected to rise by 70 percent from 2010 to 2040, driven by the projected increase in economic activity and the associated increase in movement of goods and freight.

Nearly every country will see an increase in commercial transportation energy demand through 2040, but China will see the largest increase — more than 4 million oil-equivalent barrels per day. In 2010, China trailed Europe, the United States and the Middle East in terms of energy demand for commercial transportation. By 2040, China is expected to be in the No. 1 spot. India and Brazil will also see large increases, with India having the highest growth rate globally.

75 percent

Demand for diesel and jet fuel is expected to increase by 75 percent from 2010 to 2040.

The increase in energy demand in the commercial transportation sector is likely to be partially offset by significant improvements to fuel efficiency. For example, more efficient truck, aviation, marine and train fleets, along with logistical system improvements such as intermodal shipping, will help slow the growth in transportation energy demand in many countries.

The largest driver in commercial transportation energy demand will come from heavy-duty vehicles such as trucks and buses. Demand for fuel for heavy-duty vehicles is projected to rise by about 70 percent, and account for about 60 percent of the total increase. In fact, by 2040, the world will be using about the same amount of energy in heavy-duty vehicles as the total energy demand in all of Africa today.

Commercial transportation demand by region



Millions of oil-equivalent barrels per day

Over the next few decades, we expect the mix of fuels used for transportation to continue to evolve

Liquid fuels — gasoline, diesel, jet fuel and fuel oil — will remain the energy of choice for most types of transportation, because they offer a unique combination of affordability, availability, portability and high energy density.

We expect global demand for gasoline (including ethanol) to be relatively flat from 2010 to 2040, largely because cars and other light-duty vehicles will become much more efficient. On the other hand, demand for diesel (including biodiesel) will grow sharply — by about 75 percent — to power the rise in activity in trucks and other commercial transportation. Diesel will also play a more significant role in the marine sector in the latter half of the *Outlook* period, in response to stricter marine emissions standards. Demand for jet fuel will also grow close to 75 percent.

Natural gas is likely to grow in use as a transportation fuel, with its attractiveness enhanced by its relatively low emissions and its affordability relative to oil in many parts of the world.

We expect that growth in natural gas as a transportation fuel will be seen mainly in commercial vehicles — mostly fleet trucks that can run on compressed natural gas (CNG) and long-haul trucks that can use liquefied natural gas (LNG). (See next page.) Lower-sulphur fuel regulations for marine vessels expected over the next decade may attract some shipping companies to invest in LNG capability.

In 2010, natural gas accounted for about 1 percent of all transportation fuels, with about 45 percent of that demand concentrated in Asia Pacific. By 2040, the share of natural gas will likely rise to 5 percent, with growth driven by Asia Pacific and North America.

Transportation fuel mix by region

Millions of oil-equivalent barrels per day





The rise in production of abundant natural gas in North America and other regions has led to heightened interest in natural gas as a transportation fuel. The outlook for growth in natural gas in the transportation sector differs widely by mode of transportation and by region.

Around the world, the biggest interest in natural gas as a transportation fuel is coming from owners of heavy-duty commercial vehicles. Globally, and particularly in the Asia Pacific region, compressed natural gas (CNG) is already a popular fuel choice for transit buses and delivery and refuse truck fleets. In the United States, equipping a truck to run on CNG costs about \$30,000 more than a diesel truck, but potential fuel cost savings could enable a five-year payback time.

Long-haul trucks may favor liquefied natural gas (LNG) because of its higher energy density than CNG and the ability to travel up to 750 miles between fill-ups while pulling heavy loads. Fuel cost savings could recoup the higher investment costs for an LNG truck (\$70,000 to \$90,000 compared to diesel) within about three years.

In terms of light-duty passenger vehicles like cars and SUVs, several countries currently have conditions that favor CNG vehicles, such as air pollution concerns in large urban areas or an ample supply of natural gas relative to refined oil products. These include Argentina, Brazil, Iran, Pakistan and India, which together account for around 80 percent of the global CNG passenger fleet.

However, ExxonMobil expects that outside of these countries, growth in natural gas as a transportation fuel for light-duty vehicles will be limited. While natural gas prices may be lower than gasoline prices, fuel cost is just one dimension of a consumer's decision about which vehicle to purchase. Other dimensions include the fact that natural gas vehicles are more expensive.

In the United States today, CNG cars can cost about \$8,000 more than comparable gasoline-powered cars. CNG vehicles have fuel economy similar to conventional gasoline engines, so a typical driver would take more than five years to recoup the extra purchase cost.

Consumers looking to save fuel costs are more likely to choose hybrid vehicles, which are slightly more expensive than conventional vehicles but have far higher fuel economy. CNG vehicles also have a shorter driving range — up to 40 percent less than comparable vehicles using liquid fuels — due to CNG's lower energy density and the fact that an adequately sized fuel tank is sometimes challenging to fit into a car.

In all sectors and regions, development of a fueling infrastructure is one of the largest hurdles to natural gas vehicle (NGV) penetration. Fleets of vehicles that return to base each day can economically benefit from a single, highly utilized CNG fueling station. Trucks that travel on established long-haul corridors also have the potential for highly utilized, and therefore economic, LNG fueling stations.

Most challenging is building the fueling infrastructure for passenger vehicles, including a large network of easily accessible refueling stations, particularly because of the shorter driving range of NGVs. In the United States, only about 1 percent of fueling stations are equipped for natural gas. Home refueling is an option, but the equipment cost can be as high as \$4,000.

Ultimately, consumers — individuals and businesses — will assess their needs and the costs of various options when deciding if natural gas as a transportation fuel is right for them. Markets will determine which transportation sectors can benefit most from natural gas and a fueling infrastructure will develop around those markets.

Industrial

Urbanization helps fuel industrial demand

The industrial sector is a major consumer of energy, accounting for about half of all the electricity consumed around the world — and about 30 percent of primary energy use.

Urbanization and rising living standards continue to drive industrial demand for energy. The expansion of urban infrastructure creates new demand for steel, cement and other energy-intensive industrial goods. Growing middle-class populations will also increase demand for consumer goods – appliances, apparel and electronics – that require energy to manufacture.

Industrial energy demand by region Quadrillion BTUs



Urbanization is one reason why **global industrial energy demand is projected to rise by one-third** through 2030, with almost all of the growth concentrated in non-OECD countries. Global demand then flattens, however, as rising demand in India and other leading growth countries is offset by a major development in the industrial sector: **declining industrial demand in China post 2030**.

China is the world's largest industrial energy user and is projected to remain so over the *Outlook* period. But China's industrial energy demand will likely peak around 2030, reflecting efficiency improvements and the natural maturing of its economy after decades of rapid growth. In 2010, China produced almost 50 percent of the world's iron, steel and cement; after 2020, we expect China's market share of these heavy industries to decline as its economy shifts toward higher-value manufacturing and services that have lower energy intensity.

By 2040, China's industrial demand is expected to be just 25 percent higher than in 2010; in contrast, Brazil's will be nearly double and India's about 2 1/2 times the 2010 level.

⁷Around the world, more than 300 million people are employed in manufacturing, accounting for some 14 percent of global employment."

> World Economic Forum, Global Agenda Council on Advanced Manufacturing, 2013

Global industrial energy use also is driven by the chemicals sector, where demand for energy is rising about 50 percent faster than overall energy demand. Chemical companies use energy in two ways: as a fuel and as a feedstock to make plastics and other products essential to manufactured goods (see page 27). Demand for these goods — from consumer electronics to medical equipment — goes hand-in-hand with rising living standards. The global production of petrochemicals is expected to more than double from 2010 to 2040. At the same time, fertilizer production will grow by about 25 percent, keeping pace with population growth.

The energy industry itself accounted for about 20 percent of industrial energy demand in 2010, but its share is declining as the industry continues to improve efficiency. More efficient energy extraction and processing, along with reductions in natural gas flaring, are likely to limit the growth in the energy industry's demand to only 30 percent of the total fossil-fuel growth rate.

Industrial energy demand by sector



Efficiency offsets production growth

Quadrillion BTUs



Industrial demand for energy is a function of production activity – such as the manufacturing of steel, automobiles and chemicals – and energy intensity, or the amount of energy needed to produce each unit of output.

Production activity (yellow bars) is expected to rise with increased urbanization and expanded global prosperity. At the same time, continued improvements in energy efficiency (green bars) are expected to reduce energy intensity. Because of this improved efficiency, growth in industrial energy demand will be well below the growth in global production activity.

For chemicals, energy demand includes both fuel and feedstock. Improvements to energy efficiency can reduce only the fuel portion – about 40 percent of the chemicals sector's energy demand. This is why chemicals' efficiency improvements appear modest relative to the improvements in heavy industry and the energy industry.

[']By significant investments in new steelmaking technologies, and through the innovation of the women and men working on the plant floor, America's steel industry has reduced energy intensity per ton of steel shipped by 30 percent since 1990."

American Iron and Steel Institute

Two other elements of the industrial sector are the demand for fuel for agriculture, which will rise to support a growing population, and growth in asphalt demand for road construction.

Increased industrial activity is one reason for the projected strong growth in demand for energy for trucks and other forms of commercial transportation through 2040 (see page 21). This is especially true for China, India and other leading growth countries, where rising domestic consumption and exports drive robust industrial growth.

Through 2040, there are likely to be significant changes in the types of energy used in the industrial sector. Growth in unconventional sources of oil and natural gas is **helping the industrial sector shift away from coal** and curb direct CO₂ emissions. By 2040, the industrial sector is projected to get only about 15 percent of its direct energy from coal, compared to over 20 percent in 2010. At the same time, natural gas and electricity are likely to increase their shares of industrial energy.

In the chemicals sector, rising demand for chemical products will drive increased demand for the liquids that are used as chemical feedstocks: oil-based feedstocks like naphtha and natural gas liquids (NGLs) such as ethane.

Industrial energy demand by fuel Percent



50 percent

Globally, demand for energy from the chemicals sector is rising about 50 percent faster than overall energy demand.

"The transition from agriculture to manufacturing is still the route to higher productivity and rising living standards for developing countries. In advanced economies, manufactured goods stand as the tangible expression of innovation and competitiveness."

> McKinsey Global Institute, Manufacturing the future: The next era of global growth and innovation. November 2012

Chemicals demand - more than just fuel

One aspect of global oil and natural gas demand that is not always obvious is the link to the plastics and other petrochemicals that are integral to many of today's manufactured products.

The chemicals industry is unique among energy consumers because it uses energy in two ways. Only about 40 percent of the industry's energy consumption is used for typical purposes like heat and power. The remainder is the oil and natural gas liquids (NGLs) that chemical companies use as raw materials to make the building blocks for a wide range of essential products. NGLs such as ethane, propane and butane are the valuable byproducts of production from natural gas wells.

The products of oil and NGL feedstocks include consumer goods such as plastics, rubber, paint, ink, electronics, pharmaceuticals, packaging and personal care products. They also include industrial products like solvents, resins and coatings. And they include manufactured products such as auto parts, furniture, flooring, appliances, medical equipment and surgical supplies. Natural gas itself can also be a feedstock for products such as fertilizers. At a chemical plant, steam cracking is one of the main processes used to turn feedstocks into intermediate chemical products such as ethylene and propylene, which are further processed to form plastics and other end-use products. About 70 to 80 percent of the energy consumed in steam cracking is due to the raw materials that are not combusted as fuels but rather transformed into other materials.

Rising natural gas production, particularly in North America, has reshaped the chemicals industry by shifting the economics of chemical production in favor of North American manufacturers. Aside from the Middle East, North America is the only region of the world where most steam cracking facilities are designed to use NGLs rather than the more expensive oil-based feedstocks used in Europe and Asia Pacific.

The twofold advantage of access to an abundant supply of affordable natural gas (for fuel) and NGLs (for feedstocks) is leading to a resurgence in the North American chemicals industry and positioning the region to help meet rising global demand for chemicals. Energy demand from the chemicals industry is projected to grow faster than the overall growth in energy demand as rising standards of living, particularly by the middle class in developing parts of the world, drive growth for goods made from chemical products.

Global chemicals energy demand is expected to rise by about 55 percent from 2010 to 2040, and will account for 35 percent of the growth in the industrial sector. Most of the growth in energy demand in the chemicals sector will be for the feedstocks to make manufactured goods; fuel demand will grow more slowly as improvements to efficiency reduce demand growth.

Today, natural gas and electricity already account for more than half of the energy used for fuel purposes in chemical plants. That percentage will continue to grow over the *Outlook* period, as solid fuels like coal decline over time.

Power generation

Power generation is the fastest-growing major demand sector

Only a century ago, electricity was just emerging for general use. It's remarkable, then, that power generation today is the world's single-largest source of energy demand. Worldwide electricity use is projected to increase by 90 percent from 2010 to 2040, with developing countries accounting for the overwhelming majority of that increase.

Improved living standards are one reason for this projected growth in electricity demand. Urbanization

Global electricity demand by sector

Thousands of terawatt hours



and rising incomes lead to increases in household and industrial electricity consumption, including wider penetration of electronics, appliances and other modern conveniences. Other contributors to the growth in electricity demand include expanding use of the Internet, wireless communications and other information technologies.

As a result, electricity is expected to capture a significant share of the overall growth in final energy needs in the residential/commercial and industrial sectors, continuing a trend of the last 20 years.

In the residential/commercial sector, electricity is expected to account for about 85 percent of the

Global electricity supply by fuel

Thousands of terawatt hours



Electricity use by region

Megawatt hours per capita



growth in energy needs and help displace biomass fuels like wood, which are far more labor intensive, much less efficient and potentially harmful to human health.

In the industrial sector, electricity usage will likely increase about 90 percent and account for approximately 40 percent of the growth in energy needs.

Electricity use for transportation is also an area of significant interest. However, while this demand is likely to more than double by 2040, transportation's share of global electricity demand will remain small – at about 2 percent in 2040.

The same fundamentals that have contributed to higher electricity usage in OECD countries are increasingly driving higher electicity demand in other parts of the world.

For example, the Asia Pacific region's electricity usage per capita is expected to double over the *Outlook* period, after already having risen about 1.5 times over the past 20 years in conjunction with urbanization and rising living standards. China and India are expected to play an important role in this growth, with China's per capita electricity consumption more than doubling, and India's nearly quadrupling.

Even by 2040, the Asia Pacific region's per capita electricity usage will likely only be about one-third of North America's level. Electricity use per capita in China is expected to be about half that of the United States, while India is expected to be about 15 percent that of the United States in 2040.

1.3 billion

About 1.3 billion people lack access to electricity. Africa accounts for about half of this total, with roughly 55 percent of its population lacking access.

Natural gas to overtake coal as largest source of electricity

Utilities and other power producers around the world can choose from a variety of fuels to make electricity. They typically seek to use energy sources and technologies that enable reliable and relatively low-cost power generation while meeting environmental standards. Over the *Outlook* period, we anticipate that public policies will continue to evolve to place tighter standards and/or higher costs on emissions – including CO₂ – while also promoting renewables. As a result, we expect the power sector to adopt combinations of fuels and technologies that reduce emissions but also raise the cost of electricity.

At the same time, the sector will also need to manage reliability challenges associated with increasing penetration of intermittent renewables, like wind and solar. These renewables have a cost, which is often overlooked, related to reliablility for times when the wind is not blowing and the sun is not shining.

Fuel input to power generation is projected to rise by more than 50 percent, faster than any other sector, over the *Outlook* period. In 2010, coal was the world's No. 1 fuel for power generation, accounting for about 45 percent of fuel demand. Though coal use will likely increase by about 55 percent in developing countries by 2040, it continues to lose ground in developed countries – primarily to natural gas and renewables such as wind and solar.

By 2040, demand for natural gas in the power generation sector is expected to rise by close to 80 percent. At that time, natural gas will be approaching coal as the world's largest energy source for power generation, and coal's share will have dropped to about 30 percent. Natural gas will actually produce more electricity than coal, reflecting efficiency advantages of gas-fired versus coal-fired power plants.

Increased local natural gas production in North America and elsewhere, along with expanded international trade, is expected to supply the gas for power generation.

By 2040, we expect that the use of nuclear power will approximately double and renewables will increase by about 150 percent, led by wind and hydroelectric power.

Fuel input to power generation



Growth in fuel for power generation

2010-2040 in quadrillion BTUs



The shift away from coal and toward natural gas, nuclear and renewables in the power generation sector is an important contributor to the projected slowdown in global energy-related CO₂ emissions over the *Outlook* period (see page 32).

Trends vary by region. In China, the world's largest consumer of fuels for power generation, demand for coal will likely continue to climb through 2025, but then begin to decline as the country advances its efforts to improve air quality and diversify its energy sources. By 2040, coal is likely to account for only about 45 percent of energy used for power generation in China, compared to about 85 percent in 2010.

The use of coal for power generation will likely continue to rise in many developing countries, such as India and much of Southeast Asia.

As with any decision about energy usage, economics play an important role. In the power generation sector, cost-benefit analyses are influenced by policies that seek to reduce CO₂ emissions by effectively imposing a "cost of carbon." Natural gas and coal are, in general, the lowest-cost options for power generation. But when a significant cost of carbon is

85 percent

About 85 percent of the growth in electricity generation is expected in developing countries.

imposed, coal-fired plants become less competitive with lower-emission alternatives like natural gas, nuclear and renewables.

To reduce CO₂ emissions associated with power generation using natural gas and coal, one technology often discussed is carbon capture and storage (CCS). Since new gas-fired power plants are likely to generate about 50 percent fewer CO₂ emissions than new coal-fired plants, we expect gas-fired CCS plants will provide lower-cost electricity than coal-fired CCS plants. However, CCS technology in any case faces substantial economic and practical hurdles, which are expected to continue to limit its significant deployment over the *Outlook* period.

Average U.S. cost of electricity generation in 2030

Cost per kilowatt hour in 2013 cents



*Reliability cost includes integration, backup capacity and additional transmission costs.

Emissions

Markets, technology and public policies affect energy choices and emissions

In recent years, many nations have begun to identify and address climate risks associated with rising GHG emissions. Since energy use is a significant contributor to GHG emissions, climate policies that target these emissions are likely to play a significant role in the world's energy future by directly and indirectly affecting people's energy choices.

Since energy use is pervasive in every aspect of life around the world, and since policies to address

Energy-related CO₂ emissions Billion tonnes



GHG – and more specifically CO₂ – emissions will tend to raise the cost of energy and related activities, many countries are taking care in structuring both the nature and the pace of GHG policy initiatives. This approach is understandable as a way to manage climate risks associated with GHG emissions while also minimizing related policy impacts on local economies, industrial competitiveness, energy security and the people's ability to pay higher costs.

Although climate policies remain uncertain today, for purposes of the *Outlook* to 2040, we assume that governments will continue to gradually adopt a wide variety of more stringent policies to help stem GHG emissions.

Over time, as these policies advance and people respond to rising energy costs, we anticipate greater adoption of energy-saving technologies and practices, as well as lower CO₂ emissions per unit of energy consumed. For example, **in the power generation sector, policies to stem GHG emissions** will likely raise electricity costs for consumers, slowing demand growth. Power producers will also seek to utilize more efficient electricity-generating technologies, and shift from coal toward lower-emission fuel sources like natural gas, nuclear and renewables.

To help model the potential impacts of a broad mosaic of future GHG policies, we use a simple cost of carbon as a proxy mechanism. For example, in most OECD nations, we assume an implied cost of CO₂ emissions that will reach about \$80 per tonne in 2040. OECD nations are likely to continue to lead the way in adopting these policies, with developing nations gradually following, led by China.

Greenhouse gas emissions related to energy use are projected to plateau by 2030

Market forces as well as emerging public policies are already having an impact on energy-related CO₂ emissions in many parts of the world. After decades of growth, we expect worldwide energy-related CO₂ emissions will plateau around 2030 before gradually declining toward 2040, despite a steady rise in overall energy use.

Regionally, we see a variety of emission patterns through 2040, reflecting the different stages of economic development and varying degrees and types of energy used at a national level. Increasingly, the world's CO₂ emissions will be driven by developing nations. Overall, non-OECD emissions are likely to rise about 50 percent, as energy demand rises by about two-thirds. Over the same period, OECD emissions are likely to decline approximately 25 percent and approach a 25 percent share of global emissions – down from about 40 percent in 2010.

While emissions in non-OECD nations will play a more significant role going forward, some historical perspective is appropriate. First, in 1980, the OECD accounted for about 60 percent of global emissions. Since then, both OECD and non-OECD nations have made progress in slowing the growth of CO₂ emissions by improving the energy efficiency of their economies. In addition, OECD nations have gradually reduced the carbon intensity of their energy use by switching to lower-carbon fuels, namely natural gas and renewables. Together, these factors have helped enable the decline in CO₂ emissions that has already begun in the OECD.

Non-OECD emissions surpassed OECD emissions in 2004, largely due to significant economic progress and a carbon-intensive energy mix heavily dependent on coal. Looking ahead to 2040, we anticipate non-OECD nations will continue to improve the energy-efficiency of their economies, but also shift toward less carbon-intensive energy sources. Together, these factors will help global CO₂ emissions peak around 2030. Even then, emissions on a per capita basis in non-OECD nations will remain about half the level of OECD nations.

CO₂ emissions relative to energy efficiency and fuel mix changes

Thousands of BTUs per dollar of GDP (2005\$)



Energy-related CO₂ emissions

Tonnes per capita



Energy supply

Advances in technology continue to make a wide range of energy supplies available to consumers. At the same time, the fuels that people and businesses choose to meet their needs continue to evolve. These choices are based not just on price, but also on attributes like convenience, performance and environmental effects. Natural gas is expected to be the fastest-growing major fuel through 2040.

"Instead of asking if the world will run out of oil and gas, many people are starting to wonder what other frontier energy sources we will be able to access as technology progresses."

Center for Strategic and International Studies, The Shifting Geopolitics of Natural Gas, July 2013



Oil and other liquid supplies

Oil resource base continues to expand

Over the coming decades, energy sources will continue to evolve and diversify, driven by changes in technology, consumer needs, and public policies. But liquid supplies — primarily crude oil — are projected to remain the single biggest source of energy and vital to transportation.

Ongoing advances in exploration and production technology continue to expand the size of the world's recoverable crude and condensate resources. Despite rising liquids production, we estimate that by 2040, about 65 percent of the world's recoverable crude and condensate resource base will have yet to be produced.

Even as global oil production rises, the estimated size of the global recoverable resource base continues to increase as a result of advancements in science and technology that have enabled the production of new sources of liquid fuels. In the early 1980s, the U.S. Geological Survey estimated that there were 55 years of crude and condensate supply given the demand at that time. In 2012, that estimate had risen to 125 years with current increased production.

Globally, while conventional crude production will likely decline slightly over the *Outlook* period, this decline will be more than offset by rising production from supply sources enabled by new technologies — including tight oil, deepwater and oil sands.

North American liquids production is expected to rise by more than 40 percent from 2010 to 2040, boosted by gains in oil sands, tight oil and NGLs. With production rising and demand falling,

65 percent

By 2040, about 65 percent of the world's recoverable crude and condensate resource will have yet to be produced.

Crude and condensate resource

Trillion barrels of oil



North America is expected to shift from a significant crude oil importer to a fairly balanced position by 2030.

Latin American liquids production will nearly double through 2040 with the development of the Venezuelan oil sands, Brazilian deepwater and biofuels.

The Middle East is expected to have the largest absolute growth in liquids production over the *Outlook* period — an increase of more than 35 percent. This increase will be due to conventional oil developments in Iraq, as well as growth in NGLs and rising production of tight oil toward the latter half of the *Outlook* period.

In Africa, large deepwater developments are expected to result in the continent seeing about a 10 percent rise in liquids production from 2010 to 2040.

Rise in tight oil, NGLs and other emerging sources

For decades, the vast majority of the world's oil came from conventional sources — wells drilled on land or not far offshore. But that will change significantly over the next few decades. As conventional production declines, more of the world's oil demand will be met by emerging sources that only recently became available in significant quantities — oil sands, tight oil, deepwater, NGLs and biofuels.

Growth in these emerging sources is largely due to advancements in science and technology; the exception is biofuels, which in most countries is linked to government policies that mandate the use of these fuels derived from agricultural products like corn, sugar, seeds or palm oil.

By 2040, emerging supplies will account for more than 40 percent of global liquids supply, as technology enables increased development of these resources (see page 39).

45 percent

By 2040, about 45 percent of liquids supply will be from sources other than conventional crude and condensate production.

The largest contribution comes from NGLs, which should grow by 80 percent from 2010 to 2040. NGLs — such as ethane, propane and butane are extracted from natural gas. NGLs are expected to approach 15 percent of global liquids supply in 2040 amid rising production in North America and the Middle East. The projected strong growth in natural gas production, driven in part by unconventional drilling activity, means rising output of NGLs too. Like some oil-based liquids, NGLs can be used as feedstocks to manufacture plastics and other chemical products, as heating fuels or as additives to engine fuels.

Change in liquids production

2010-2040 in millions of oil-equivalent barrels per day



10 times

Tight oil supply grows more rapidly than any other liquid supply source, more than 10 times the 2010 level.

Deepwater supplies will grow by more than 150 percent from 2010 to 2040. Deepwater production, which refers to wells drilled in more than 400 meters (1,312 feet) of water, is concentrated in Angola, Nigeria, the Gulf of Mexico and Brazil. Globally, deepwater drilling is expected to plateau near the end of the *Outlook*.

Another rapidly emerging source is tight oil. These are liquids extracted from low permeability rock formations, which until recently were not economic to produce. Tight oil production is projected to rise by more than 1,000 percent from 2010 to 2040, when it will account for 5 percent of global liquids production. Tight oil production will be led by North America, followed by Russia and then other areas. To put this in perspective with OPEC producers, North American tight oil supply in 2015 will likely surpass any other OPEC nation's current oil production — with the exception of Saudi Arabia.

Oil derived from oil sands will rise by almost 300 percent over the *Outlook* period. These liquid supplies are concentrated in Canada and Venezuela.

North America will see a dramatic rise in technologyenabled supplies. Canada, for example, is expected to see more than 200 percent growth in oil sands production from 2010 through 2040. In North America, tight oil and NGLs will account for almost 35 percent of liquids production by 2040.

Liquids production from recently emerging sources is expected to grow fastest in non-OPEC countries, where conventional production is declining fastest. But OPEC member nations will also expand their production of liquids. By 2040, about 45 percent of the world's liquids supply will come from OPEC countries, compared to about 40 percent in 2010.

North America liquids supply by type



Global liquids supply by type

Millions of oil-equivalent barrels per day Millions of oil-equivalent barrels per day



Advances in technologies used for well drilling and completion have enabled the energy industry to reach new sources of oil and natural gas to meet rising demand around the world. New technologies have also helped reduce the environmental impact of energy production by allowing more oil and gas to be produced with fewer wells.

For example, the Gorgon Jansz development offshore northwest Australia will include wells that deliver natural gas at rates in excess of 300 million cubic feet per day. Just one of these wells could meet the residential gas demand of more than 40 million households in China every day.

Advances in technologies will play a critical role in meeting global energy demand because they enable the discovery of new resources, access to harsh or remote locations and the development of challenged reservoirs that previously were not economic to produce.

The Arctic is the world's largest remaining frontier of undiscovered oil and gas resources. With its remote location, harsh weather and dynamic ice cover, the Arctic presents extraordinary challenges. Technology solutions include ice-resistant and iceberg-resistant platforms, iceberg surveillance research to characterize the hazards associated with icebergs and simulation capabilities to predict the potential magnitude of ice impacts.

For example, at the Sakhalin-1 project offshore eastern Russia, advances in drilling technologies have enabled several fields far offshore to be reached by a land-based drilling rig, improving production rates and reducing environmental risk. These fields have been developed with the Yastreb rig, one of the world's largest and most sophisticated land-based drilling rigs. Since 2007, ExxonMobil has drilled 19 of the world's 30 longest extended-reach wells, including the Z-44 well drilled at the Chayvo field. This well extended for a total length of 12,376 meters (40,604 feet) — more than 7 miles. Because of the application of other proprietary technologies, these Sakhalin-1 wells were also the fastest-drilled extendedreach wells in the world.

Well completion is the final step of the drilling process, where the connection to hydrocarbon-bearing rock is established. Here again, advances in technology have enabled more oil and natural gas to be recovered from the length of each well, improving production and reducing the environmental footprint of energy production. For example, by combining extended-reach drilling capability with advanced stimulation technology, operators can optimize how and where stimulation fluid interacts with rock, allowing sustained production rates along the length of the wellbore. Companies are pushing completions in excess of 3,000 meters (9,842 feet) in length, compared to a typical completion of 30 meters a couple of decades ago.

These types of drilling and completion technologies have also enabled the recent growth in production from shale and other unconventional oil and gas reservoirs in North America, using a combination of hydraulic fracturing and horizontal, extended-reach drilling. ExxonMobil's Piceance project in Colorado pioneered the capability to place multiple hydraulic fractures in a single well, and was first to use efficient pad drilling operations that now characterize all unconventional oil and gas production.

An illustration of land-based extended reach technology

State-of-the-art proven technology safely reaches and develops offshore oil resources.

Marine habitats are undisturbed, as there s no drilling through the ocean or oreaching of the ocean floor.



Natural gas

The world has about 200 years of natural gas at current production levels

Natural gas will continue to play an increasingly important role in meeting global energy needs. Utilities, industries and other consumers are choosing this fuel because it is versatile, affordable and produces relatively low emissions.

Natural gas will be the world's fastest-growing major energy source through 2040. Global demand is projected to rise by close to 65 percent from 2010 to 2040 — and account for about 40 percent of the growth in global energy needs. By roughly 2025, natural gas is expected to overtake coal as the second-largest energy source, behind oil.

Non-OECD countries drive 80 percent of the projected global growth in natural gas demand. **About 50 percent of the growth is expected to come from Asia Pacific, with China accounting for half that increase.** In OECD countries, demand for natural gas is expected to rise through 2035, then plateau. About two-thirds of the increase in OECD demand will likely occur in North America, supported by abundant domestic resources.

Natural gas resources are plentiful. The IEA estimates the remaining recoverable natural gas resource worldwide to be about 28,600 trillion cubic feet (TCF) — about 200 times the natural gas the world currently consumes in a year. Estimates of recoverable gas have doubled in the last 10 to 15 years as hydraulic fracturing and horizontal drilling technologies have unlocked the prospect of recovering unconventional gas — the natural gas found in shale and other dense rock formations that only recently became economic to produce.

Gas resources also are geographically diverse; six of seven regions each hold 10 percent or more of the world's remaining recoverable resource. Conventional gas constitutes approximately 60 percent of the world's remaining recoverable gas resource, of which about 55 percent is in the Middle East and Russia/Caspian.

Remaining recoverable natural gas resource

Thousand trillion cubic feet



Natural gas production will expand and diversify over the coming decades. While North America and Russia/Caspian will continue to be the two leading natural gas-producing regions, other regions will also see strong growth. Asia Pacific, Africa and Latin America are each expected to more than double their gas production over the Outlook period. This growth will be spurred by both strong regional demand and export projects.

Shale, LNG continue to reshape natural gas market

Two significant developments in natural gas — shale gas production in North America and the growth of the global LNG market — are likely to play a major role in expanding and reshaping natural gas supplies over the coming decades.

Unconventional gas — including shale gas, tight gas and coalbed methane — accounts for about 40 percent of the world's remaining recoverable gas resource, according to IEA estimates. Unconventional development is expected to play an increasing role in the global gas supply.

215 billion

Global demand for natural gas will rise by 215 billion cubic feet per day over the *Outlook* period. That is equal to adding more than three times the natural gas consumed in the United States in 2010.

Advances in technology and favorable market conditions have unlocked North America's vast resources of shale gas and other unconventional sources such as tight gas and tight oil. From 2010 to 2040, unconventional gas production in North America is expected to grow by around 65 billion cubic feet per day, which is about the size of total U.S. gas production today. This abundant supply is expected to enable **North America to shift from a net importer to a net exporter of natural gas by 2020** as production outpaces demand.

Natural gas production by region

Billion cubic feet per day



Natural gas production by type

Billion cubic feet per day



There is also large potential for unconventional gas production in other parts of the world, notably Asia Pacific. Australia, China and Indonesia, along with Argentina and other nations, are actively promoting exploration and development of their unconventional gas resources, aspiring to replicate North America's success. In each country, the pace of development will depend on geology, appropriate technology adaptations, governing policies and development economics.

About 65 percent of the growth in natural gas supplies through 2040 is expected to be from unconventional sources, which will account for one-third of global production by 2040. North America will lead unconventional gas production, accounting for more than half the growth through most of the *Outlook* period.

Like oil, natural gas is often found in remote areas, far from large, urban energy demand centers. LNG, or liquefied natural gas, can be transported by ship, enabling gas to be delivered economically to more distant markets than can be reached by pipeline.

All around the world — from the highlands of Papua New Guinea, to the deep water off east Africa, to frigid far east Russia, to the U.S. Gulf Coast — LNG projects are in various stages of planning and development to produce gas destined for faraway ports. These projects will bring jobs and economic opportunity to gas-rich regions, while supplying much-needed cleaner energy to burgeoning cities. An increasing share of global natural gas demand through 2040 is expected to be met by gas imported as LNG.

LNG volume is expected to triple over the Outlook period to meet approximately 15 percent of global gas demand. The growth of the LNG market will facilitate trade between regions, helping to balance global supply and demand of natural gas.

Overall, international trade of natural gas in 2040 is expected to be 2.5 times the 2010 level, growing from about 15 percent of gas demand in 2010 to 25 percent by 2040. Most of this traded volume will be LNG, particularly in Asia Pacific. **By 2040, about 40 percent of Asia Pacific's natural gas demand will be satisfied by LNG,** with another 10 percent supplied by pipeline imports. Europe's regional gas imports are also likely to increase from about 45 to 60 percent as local production declines.

LNG in 2040

Billion cubic feet per day



"Natural gas is poised to enter a golden age, but this future hinges critically on the successful development of the world's vast unconventional gas resources. North American experience shows unconventional gas notably shale gas — can be exploited economically. Many countries are lining up to emulate this success."

International Energy Agency

Global energy supplies

Over the Outlook period, we see several major trends in energy supplies

Oil remains the top global energy source and the fuel of choice for transportation. Demand for oil is projected to rise by approximately 25 percent through 2040, led by increased commercial transportation activity. A growing share of this demand will be met by sources such as deepwater, oil sands and tight oil, which are increasing as a result of advances in technology.

Natural gas will contribute the biggest growth in energy supplies. Natural gas is affordable, widely available, extremely versatile, and emits up to 60 percent less CO₂ than coal when used for power generation. With abundant resources unlocked by continuing technology advances, natural gas is expected to become more important in the global energy mix, accounting for more than 25 percent of global energy needs by 2040, as natural gas demand rises by about 65 percent.

Coal is currently the top fuel for power generation and accounts for the second-largest share of energy supplies today. We expect demand will continue to rise until around 2025 and then decline – despite the existence of a huge resource base. Driving this decline will be demand reductions in OECD countries as well as in China, which today consumes approximately half of the world's coal production. By 2040, we anticipate that coal's share of the global energy mix will fall from approximately 25 percent in 2010 to below 20 percent.

Nuclear energy will see solid growth. While some countries scaled back their nuclear expansion plans in the wake of the 2011 Fukushima incident in Japan, many other countries are expected to expand the use of this energy source to meet electricity needs while reducing emissions. Growth will be led by the Asia Pacific region, where nuclear output is projected to rise from 3 percent of total energy in 2010 to close to 9 percent by 2040.

Energy mix continues to evolve

Quadrillion BTUs



Renewable energy supplies — including traditional biomass, hydro and geothermal as well as wind, solar and biofuels — will grow by close to 60 percent, led by increases in hydro, wind and solar. Wind, solar and biofuels are likely to make up about 4 percent of energy supplies in 2040, up from 1 percent in 2010. We foresee wind and solar providing about 10 percent of electricity generated in 2040, up from about 2 percent in 2010.

Expanding energy will require trillions of

dollars in investment. The IEA estimates that meeting the world's energy needs will require expenditures on the energy-supply infrastructure of approximately \$1.6 trillion per year on average through 2035. About half of the investments relate to projected oil and natural gas needs, while approximately 45 percent relate to expected power generation requirements.

Global marketplace

What does a family in Shanghai preparing their dinner have in common with a taxi driver in New York City? How is a computer service company in Mumbai similar to an automobile manufacturer in Germany?

They each are connected to the global energy marketplace. Every consumer, every economy is linked in some way to the worldwide energy network and the global growth and international trade it enables. Maintaining a robust energy marketplace is critical to meeting world energy demand now and in the future.

"Energy powers the movement of goods and people across borders. Without energy, there is no international trade."

Pascal Lamy, former Director-General, World Trade Organization



Energy and trade

Free trade benefits producers and consumers

Today's global economy is made possible by free trade. Trade is not a simple one-dimensional link between producers and consumers. It's an extensive web of buyers and sellers, all at various stages of the global value chain. At the micro level, producers/ sellers are also consumers/buyers, because they exchange what they produce for all other goods and services they need. At the macro level, worldwide imports and exports balance each other out. As global citizens, we consume what we produce.

Now more than ever, producers utilize whichever resources are most abundant and suitable, and specialize in providing products and services that offer the best opportunities to add value and meet the needs of customers worldwide. Meanwhile, consumers enjoy unprecedented access to a wide range of products and services from around the world at affordable prices — from raw materials and intermediate goods to capital equipment, technology devices and final consumer goods. Trade improves both the quantity and quality of products and services. And the entire global trade network relies on energy.

The link between energy and trade

Traditionally, the goods and services that a country or company provides to the global marketplace are considered either labor intensive (such as textiles and shoes) or capital intensive (such as automobiles and machinery). In recent decades, knowledge-intensive "The most important single central fact about a free market is that no exchange takes place unless both parties benefit."

Milton Friedman, Nobel Laureate in Economics

goods and services (such as computer software and financial services) have grown in prominence. But no matter how a product or service is classified, it always has an essential component: energy.

This is the first major link between energy and trade: All goods and services traded on the global market embody energy in their production or creation. Whether used as a direct input or as an ingredient embedded in capital, labor and technology, energy plays a vital role in the global "production function," even as continued advances in technology enable all segments of society to use energy more efficiently.

In addition, delivering goods and services across national borders and vast distances requires efficient transportation and communication, which both rely on energy. Since the first ancient trading routes, advances in transportation and communication technologies have helped people overcome natural barriers to trade, such as distance and geography.

32 percent

In 2012, global goods and services exports were valued at 32 percent of world GDP, up from 22 percent in 1980.

Throughout history, advances in transportation have aligned with the changing ways in which the world harnesses energy: from horse power and sailboats; to coal-fired steam-engine trains and ocean liners; to tractor-trailers, mega ships and airplanes that use the latest engine and fuel technologies.

The same is true of advances in communication, which not only support the trading of goods, but also the increasingly important service trade. Today, services are exchanged at all times of day around the world – from information systems to call centers, from cross-border banking to foreign tourism. Whether transacted via cell phones, fax or the Internet, all of these services fundamentally rely on electricity and other forms of energy.

The last and perhaps most visible link between energy and trade is the trading of various energy forms themselves. Every economy relies on energy, but energy resources are unevenly distributed around the world. As a result, trading of energy is essential to global economic development. It enables both energy exporters and energy importers to realize economic benefits that would otherwise be impossible to attain.

Unobstructed energy trade helps countries improve economic security by offering diverse supplies to supplement their indigenous resources. Over time, energy trade minimizes the impact of market disruptions and encourages investment in energy exploration and production. More generally, a healthy world energy market makes a crucial contribution to fostering global political, social and economic progress.

Exports and imports of energy

Maintaining a robust global energy marketplace is critical to meeting rising global energy demand. The backbone of the global energy marketplace is

free trade, which enables energy to move across various boundaries by pipeline, ship, railway – or in the case of electricity, by transmission lines. Oil and natural gas are the most widely traded energy sources, but other forms of energy – including coal, electricity and some renewable fuels – are also actively traded on the international market.

Trade has always been an important aspect of world energy markets. It will be even more important in the future.

"We have seen that when governments allow access to resources ... promote international cooperation ... and support strong partnerships, nations benefit through expanded trade that creates economic value and enhances energy diversity."

Rex W. Tillerson, Chairman and CEO, ExxonMobil
In terms of oil, the world's single biggest energy source, we expect that about half of global liquid fuels demand will continue to be met via international trade by 2040. However, on the regional level, there will be some important changes in trends over that time period:

- In the Americas, North America is expected to shift from a significant importer of petroleum supplies to a fairly balanced position by about 2030 as its domestic production rises substantially. Latin America, already a net exporter, will see strong growth in exports by 2040 even as local demand increases.
- Europe is expected to remain a significant importer of liquid fuels. The Russia/Caspian region will remain a net exporter, even as its production gradually declines after 2030.
- The Middle East is expected to expand oil exports as its production increases through 2040. Africa, another significant exporter today, is expected to see its exports decline over the coming decades as local demand rises but production remains steady.
- The Asia Pacific region already relies on imports for about 70 percent of its liquid fuels demand; this proportion is expected to grow even higher through 2040 as local demand grows by about 50 percent. Net imports are likely to rise by roughly 75 percent.

International trading will play an increasingly important role in meeting global demand for natural gas. Traded volumes of natural gas in 2040 are expected to be 2 1/2 times the 2010 level, with most of this growth coming from LNG.

- North America is expected to shift from a net importer of natural gas to a net exporter by 2020, as production growth from shale and other unconventional sources outpaces demand. Latin America is expected to remain fairly well balanced through 2040 as local demand absorbs local production.
- Europe, which imports about 45 percent of its gas requirements today, is likely to see that percentage rise to about 60 percent by 2025 as local production continues to decline.

Liquids and natural gas net exports by region



The Russia/Caspian region will continue to be a significant exporter of natural gas, with flows likely to grow by 170 percent as production rises by about 40 percent through 2040.

- The Middle East and Africa will continue to be natural gas exporters. Middle East gas exports are likely to change only marginally through 2040, as production grows by roughly 70 percent while demand grows by about 85 percent. On the other hand, Africa is likely to see its exports grow from 2025 as production increases exceed growth in local demand.
- The largest shift in net imports is likely to be seen in the Asia Pacific region, where the percentage of natural gas demand met by imports from outside the region is expected to rise from 15 percent today to 35 percent by 2040. Net gas imports into Asia Pacific are expected to rise by about 300 percent through 2025 and by about 500 percent by 2040.



It is interesting to note that for both oil and natural gas, Europe and Asia Pacific will remain the two key importing regions, while the Middle East and the Russia/Caspian region remain the two largest exporters to world markets.

Ensuring reliable energy trading

Modern technology and infrastructure — from transmission lines to LNG tankers — have overcome many of the natural obstacles to energy trading. However, trading can still be hindered by less-recognized artificial barriers such as excessive regulations and government restrictions. By impeding trade, such barriers also impede the ability of people around the world to jointly create and share the value from new economic opportunities. Because energy is so integral to the global marketplace and to every modern economic activity, what impacts energy trade also impacts trade of any other commodity, good or service. As people have learned over time, limiting trade leads to scarcities, fewer choices and lower overall value for the entire global economy. On the other hand, more opportunities to trade mean more value, wealth and jobs for everyone.

All regions benefit from access to the global market and expanded trade opportunities. These benefits can be enhanced by trade rules and policies that facilitate open markets, support infrastructure development and promote international cooperation. Nations — like people — do not prosper in isolation. And when a country engages in international trade, it will generally be a net exporter or a net importer of particular goods and services, including those related to energy. A trade occurs because it adds value to both the buyer and the seller. Taking all of a nation's trades into account results in what is commonly referred to as its trade balance, reflecting the difference in value between its exports and its imports.

In principle, a country's trade balance is no different from a household's or a business' budget balance. If we buy more from others than we sell, we run a deficit and need to borrow money or sell assets to cover it. On the contrary, if we sell more than we buy, we run a surplus, which we can save and invest. However, the story doesn't just stop there.

Imagine a two-country world where the United States runs a trade deficit and China a surplus. In this case, the U.S. is buying more than it sells, meaning more dollars are going out than coming in. So what happens to those "extra" dollars that China receives? It turns out to be in China's interest to "recycle" its surplus dollars by investing in U.S. stocks and bonds, as well as physical assets. From a U.S. perspective, this means that any "extra" dollars leaving the country due to trade will return as a positive source of investment funds. Essentially, this completes the entire cycle of dollar circulation in the world economy.

Of course, in reality, the world consists of multiple countries and the relationships among them are more complicated than this simple U.S.-China example. However, the same principle still applies: the flow of funds related to a country's trade and cross-border investment always offset each other in any given year. This relationship is called the "balance of payments."

Balance of payments example



Why is it important to recognize this relationship? In practical terms, a nation needs constant investments to support stronger economic growth. The investments by both private and public sectors (including financing related to government deficit spending) have to be supported first by savings (households, businesses and government) within a country. When national savings are not enough to cover national investments, and if a country is not willing to either reduce investments or boost savings, it has to seek investments from other nations. This, as illustrated earlier, means it will simultaneously run a trade deficit. Again, this situation is similar to budget challenges that individuals and husinesses face every day.

Just as business results can vary from year to year, a country's exports and imports will fluctuate over time, affected by sometimes transient factors. But fundamentally, it is important to keep in mind that a nation's trade balance is ultimately determined by the differences between its national savings and investment, which in turn reflect more deeply rooted dynamics in demography. industrial composition, market structure, fiscal liabilities and general economic development.

The links between trade, investment and savings hold for every country in every year. Artificial barriers to trade not only threaten the obvious value created by free trade, but also endanger the free flow of investment funds that are important to economic prosperity.

Over time, achieving a more balanced trade position is synonymous with narrowing the gap between national savings and investments. In the end, only nations that promote free trade while also maintaining a sound savings-investment balance, including a solid fiscal foundation, can naturally strengthen their economic well-being and sustain long-term prosperity.

Practical energy choices

This year's *Outlook* highlights the ubiquitous nature of energy. Like no other commodity, energy touches every aspect of modern life, providing tremendous benefits to individuals and businesses around the world.

The convenience and reliability of modern energy are often taken for granted. But providing energy wherever and whenever people need it is not easy or automatic. The benefits we get from every flip of a light switch — or turn of an engine key or push of an "on" button – reflect decades of scientific advancement and enormous levels of investment.

Over the past century, advances in technologies have fundamentally changed our world. There has also been a dramatic evolution of energy needs and energy supplies. In recent decades, even as global energy needs reached unprecedented levels of scale and complexity, technology enabled consumers to choose from an increasingly diverse set of energy sources.

In this lies a simple fact: good, practical options to meet people's energy needs continue to expand.

The need for energy will continue to grow as economies expand, living standards rise and the world's population grows by more than 25 percent through 2040. Global demand for energy is projected to rise by about 35 percent from 2010 to 2040.

To meet this demand in the most effective and economic way, none of our energy options should be arbitrarily denied, dismissed, penalized or promoted. And free trade opportunities should be facilitated – not curtailed.

Governments must continue to foster the innovation and free markets that have always been the source of benefits for individuals and societies. Both public and private institutions can assist this process by promoting information sharing, sound cost/benefit analysis, and transparent legislative and regulatory processes. These elements are important for promoting economic growth, competitiveness, energy security and environmental protection. Free markets supported by reliable public policies remain essential to creating economic opportunities and encouraging the private-sector investments that are critical to meeting people's energy needs. According to the IEA, energy investments worldwide will need to total about \$37 trillion over 2012 to 2035.

Individuals will also continue to play a major role in shaping the energy future as they make choices in pursuing their personal needs and ambitions.

One of the significant choices being made by energy consumers is their continued adoption of energysaving behaviors and technologies. Whether that choice is a more advanced wood-burning stove, LED lighting, a next-generation laptop computer, lightweight materials or a hybrid vehicle, gains in efficiency are one of the most effective ways to ensure the continued flow of reliable and affordable energy as our population grows and prosperity expands.

Since everyone needs energy, it is important that everyone understands the challenges related to these energy needs. Deepening public understanding of energy issues is our goal in publishing the *Outlook* for Energy each year. Ensuring that people have access to the energy they need to improve their lives motivates our work.

Meeting the world's energy challenges means helping billions of people raise their living standards, while also reducing the impact of energy use on the environment.

The scale of our world's energy challenges is enormous, but so is human capacity for innovation and the will to succeed. By expanding technology and energy options – and by creating the political and fiscal environments that allow innovation and market solutions to thrive – we are optimistic that the world will be able to safely and responsibly expand prosperity and security.

2014 Outlook data

Energy Demand (quadrillio	n BTUs)					Averag	e Annual (Change	2010	% Change	2010	C	Share of Total		
Regions	1990	2000	2010	2025	2040	2010	2025	2010	2010	2025	2010	2010	2025	ai 2040	
World	361	418	523	654	710	1.5%	0.5%	1.0%	25%	9%	36%	100%	100%	100%	
OECD	190	226	230	232	222	0.1%	-0.3%	-0.1%	1%	-5%	-4%	44%	36%	31%	
Non OECD	170	193	292	421	488	2.5%	1.0%	1.7%	44%	16%	67%	56%	64%	69%	
Africa Asia Dacific	01	120	29	43	60	2.7%	2.2%	2.4%	48%	38%	105%	6%	1%	8%	
China	34	48	200	148	147	2.5%	-0.0%	1.0%	43%	-1%	52%	18%	23%	21%	
India	13	19	28	49	68	3.8%	2.3%	3.0%	76%	40%	146%	5%	7%	10%	
Europe	74	78	81	79	74	-0.2%	-0.4%	-0.3%	-3%	-6%	-9%	16%	12%	10%	
European Union	68	72	73	69	63	-0.4%	-0.6%	-0.5%	-6%	-8%	-13%	14%	11%	9%	
Latin America Middle East	15	20	27	37	46	2.1%	1.5%	1.8%	37%	25%	72%	5%	6%	6% 7%	
North America	95	114	113	117	112	0.2%	-0.3%	-0.0%	3%	-4%	-1%	22%	18%	16%	
United States	81	96	94	93	88	-0.1%	-0.3%	-0.2%	-1%	-5%	-6%	18%	14%	12%	
Russia/Caspian	58	38	42	47	45	0.7%	-0.2%	0.2%	10%	-3%	7%	8%	7%	6%	
Energy by Type — World															
Primary	361	418	523	654	710	1.5%	0.5%	1.0%	25%	9%	36%	100%	100%	100%	
Oil	137	158	178	206	221	1.0%	0.5%	0.7%	15%	7%	24%	34%	31%	31%	
Gas	72	89	115	159	190	2.2%	1.2%	1.7%	38%	19%	64%	22%	24%	27%	
Coal	86	93	133	158	133	1.1%	-1.1%	0.0%	19%	-16%	0%	26%	24%	19%	
Riomass/Waste	35	40	29 48	40	55	2.3%	-0.1%	2.5%	41%	-2%	13%	5% 9%	0% 9%	8%	
Hydro	7	9	12	17	21	2.4%	1.5%	2.0%	43%	26%	80%	2%	3%	3%	
Other Renewables	1	3	7	18	30	6.3%	3.5%	4.9%	151%	68%	322%	1%	3%	4%	
End-Use Sectors - World															
Residential/Commercial															
Total	87	98	115	137	148	1.2%	0.5%	0.8%	19%	8%	28%	100%	100%	100%	
Oil	13	16	15	16	16	0.4%	-0.0%	0.2%	6%	-1%	6%	13%	12%	11%	
Gas	17	21	24	30	33	1.4%	0.6%	1.0%	23%	9%	35%	21%	22%	22%	
Biomass/Waste	26	29	33	34	28	0.1%	-1.1%	-0.5%	2%	-15%	-14%	29%	25%	19%	
Other	15	10	52 11	40	11	2.5%	-0.4%	-0.0%	44% 5%	-6%	-1%	20%	54% 8%	41%	
	15	10				0.570	0.170	0.070	570	070	170	770	0,0	770	
Transportation															
Total	65	81	99	121	140	1.4%	1.0%	1.2%	23%	15%	42%	100%	100%	100%	
Oil Biofuels	64	/9	94 2	5	122	1.1%	2.5%	2.9%	18%	10%	30%	95%	92%	8/%	
Gas	0	Ő	1	3	7	8.9%	5.3%	7.1%	260%	117%	681%	1%	3%	5%	
Other	1	1	1	1	2	1.8%	2.7%	2.3%	31%	49%	95%	1%	1%	1%	
Industrial															
Total	139	151	193	245	260	1.6%	0.4%	1.0%	27%	6%	35%	100%	100%	100%	
Oil	46	50	58	69	76	1.1%	0.7%	0.9%	18%	10%	31%	30%	28%	29%	
Gas	31	37	44	59	68	1.9%	1.0%	1.4%	33%	15%	54%	23%	24%	26%	
Coal	29	28	42	48	36	1.0%	-1.9%	-0.5%	16%	-26%	-14%	22%	20%	14%	
Electricity	18	22	30	48	58	3.0%	1.3%	2.2%	5/%	22%	91%	16%	19%	22%	
Other	IJ	14	17	21	21	1.170	0.076	0.5%	1770	076	1070	7 /0	070	070	
Power Generation – World	ł														
Primary	118	144	192	258	294	2.0%	0.9%	1.4%	34%	14%	53%	100%	100%	100%	
Gas	24	21	11	9 67	21 21	-0.9%	-2.3%	-1.0%	-13%	-29%	-39%	0% 24%	4%	2%	
Coal	48	62	87	106	95	1.3%	-0.7%	0.3%	22%	-10%	9%	45%	41%	32%	
Nuclear	21	27	29	40	59	2.3%	2.6%	2.5%	41%	47%	109%	15%	16%	20%	
Hydro	7	9	12	17	21	2.4%	1.5%	2.0%	43%	26%	80%	6%	7%	7%	
Wind Other Repowerblar	2	0	1	5	10	10.6%	4.3%	7.4%	351%	8/%	100%	1%	2%	3%	
	3	4	/	14	20	4.3%	2.0%	5.0%	7 3 70	4070	10070	470	570	/ /0	
Electricity Demand (Terawa	att Hours)								-						
World	10135	13212	18548	27854	35242	2.7%	1.6%	2.2%	50%	27%	90%	100%	100%	100%	
Non OECD	3/78	4608	9678	16749	23361	0.9%	0.5%	2.2%	15%	7%	23%	52% 48%	40%	34%	
NOTOLED	5470	4000	0070	10/4/	23301	4.370	2.270	J.J /0	0770	5770	10570	4070	0070	0070	
Energy-Related CO ₂ Emissi	ions (Billio	n Tonnes)													
World	21.4	23.9	30.6	36.8	36.3	1.2%	-0.1%	0.6%	20%	-1%	19%	100%	100%	100%	
Non OFCD	10.1	12.8	17.8	25.0	9.7	-0.6%	-1.2%	-0.9%	-8% 41%	-1/%	-24%	42%	32% 68%	27%	
	10.1	11.1	17.0	25.0	20.0	2.370	0.470	1.4/0	-+1/0	070	5070	50%	0070	13/0	
GDP (2005\$, Trillion)															
World	30	40	51	79	117	2.9%	2.7%	2.8%	54%	48%	128%	100%	100%	100%	
Non OECD	25	32	38 12	51	68	2.0%	1.9%	2.0%	35%	33%	80%	74%	65% 35%	58%	
Africa	1	1	1	20	4	4.1%	3.8%	3.9%	83%	74%	219%	2%	3%	3%	
Asia Pacific	6	9	14	26	43	4.2%	3.4%	3.8%	86%	66%	209%	27%	33%	37%	
China	1	1	4	10	19	6.8%	4.3%	5.5%	167%	88%	403%	7%	13%	16%	
India	0	1	1	3	6	5.9%	4.9%	5.4%	136%	106%	386%	2%	4%	5%	
European Union	10	14	16	20	20	1.0%	1.7%	1.7%	28%	27%	00% 59%	28%	20%	22%	
Latin America	1	2	2	4	6	3.5%	2.9%	3.2%	68%	54%	158%	5%	5%	5%	
Middle East	1	1	1	2	4	3.8%	3.1%	3.5%	76%	58%	178%	3%	3%	3%	
North America	9	13	15	22	31	2.5%	2.3%	2.4%	45%	40%	103%	30%	28%	26%	
United States Russia/Caspian	8	1	13	19	26 3	2.4%	2.2%	2.3%	43% 71%	39% 52%	99% 160%	26%	24%	22%	
		* ~ ~ ~ `		~	5	3.770	2.070	5.270	, 170	5270	10070	270	570	570	
Energy Intensity (Thousand	BTU per	\$ GDP)	10.5			4	0.45	4 70 1		0.70					
World	11.9	10.5	10.2	8.3	6.1	-1.4%	-2.1%	-1.7%	-19%	-27%	-41%				
Non OECD	31.3	26.2	21.8	4.0	10.0	-2.4%	-2.2%	-2.1%	-30%	-34%	-54%				
	35	20.2	20			2.170		2.570	5070	5170	5 170				

Rounding of data in the Outlook may result in slight differences between totals and the sum of individual components.

Energy Demand (quadrillio	n BTUs)					Averag	Average Annual Change			% Change			Share of Total		
OECD Energy by Type	1990	2000	2010	2025	2040	2010	2025	2010	2010	2025 2040	2010	2010	nare of lot 2025	ai 2040	
Primary	190	226	230	232	222	0.1%	-0.3%	-0.1%	1%	-5%	-4%	100%	100%	100%	
Oil	85	98	94	87	79	-0.5%	-0.6%	-0.6%	-7%	-9%	-15%	41%	37%	36%	
Gas	35	4/	42	65	69 15	1.3%	0.4%	0.8%	21%	6%	28%	23%	28%	31%	
Nuclear	18	23	24	26	29	-2.3%	-4.3%	0.7%	12%	10%	23%	10%	11%	13%	
Biomass/Waste	6	7	9	10	9	1.0%	-0.6%	0.2%	16%	-9%	6%	4%	4%	4%	
Hydro	4	5	5	5	5	0.7%	0.3%	0.5%	11%	4%	15%	2%	2%	2%	
Other Renewables	1	2	4	10	15	5.4%	3.0%	4.2%	121%	55%	242%	2%	4%	7%	
End-Use Sectors															
Residential/Commercial															
Total	39	46	50	51	50	0.1%	-0.1%	-0.0%	1%	-2%	-0%	100%	100%	100%	
Gas	9 12	9	17	5 17	4	-2.3%	-2.3%	-2.3%	-29%	-30%	-50%	34%	34%	7%	
Biomass/Waste	2	2	3	2	2	-0.4%	-1.7%	-1.1%	-6%	-23%	-27%	5%	5%	4%	
Electricity	12	17	21	23	25	0.7%	0.6%	0.6%	11%	9%	20%	42%	45%	50%	
Other	4	2	3	3	3	0.4%	0.2%	0.3%	6%	3%	9%	5%	5%	6%	
Transportation															
Total	45	55	58	56	55	-0.2%	-0.2%	-0.2%	-3%	-2%	-5%	100%	100%	100%	
Oil	44	54	55	52	49	-0.4%	-0.5%	-0.4%	-6%	-7%	-12%	96%	93%	89%	
Biotuels	0	0	2	3	4	3.1%	2.0%	2.5%	58%	34%	111%	3%	5%	7%	
Gas Other	0	0	0	0	2	0.6%	0.3% 3.3%	9.0%	440% 9%	62%	76%	0% 1%	1%	3% 1%	
	Ū	5	5	5		0.070	5.570	1.770	, /0	0270	, 070	170	170	170	
Industrial	4.4	70	40	70	70	0.20/	0.20/	0.10/	E0/	20/	20/	1000/	1000/	1000/	
Oil	64 26	72	69 28	72	70	-0.2%	-0.2%	-0.2%	5% _3%	-3% -4%	2% -7%	100% 41%	38%	37%	
Gas	15	18	17	21	22	1.4%	0.1%	0.7%	23%	1%	25%	25%	29%	31%	
Coal	10	8	7	5	3	-2.9%	-3.0%	-3.0%	-36%	-37%	-59%	10%	6%	4%	
Electricity	10	12	12	14	15	1.3%	0.2%	0.8%	22%	3%	25%	17%	20%	21%	
Other	3	4	4	5	5	0.7%	-0.4%	0.2%	11%	-5%	6%	6%	7%	7%	
Power Generation															
Primary	67	84	90	94	90	0.3%	-0.3%	-0.0%	4%	-4%	-0%	100%	100%	100%	
Oil	6	5	3	2	20	-1.4%	-6.4%	-3.9%	-19%	-63%	-70%	3%	3%	1%	
Coal	30	35	34	25	12	-2.2%	-4.7%	-3.4%	-28%	-51%	-65%	38%	27%	13%	
Nuclear	18	23	24	26	29	0.8%	0.6%	0.7%	12%	10%	23%	26%	28%	32%	
Hydro	4	5	5	5	5	0.7%	0.3%	0.5%	11%	4%	15%	5%	5%	6%	
Wind	0	0	1	3	6	8.7%	4.1%	6.4%	250%	83%	540%	1%	3%	7%	
Other Renewables	2	3	4	/	8	2.9%	0.9%	1.9%	54%	14%	/6%	5%	1%	9%	
Non OECD															
Energy by Type	170	102	202	401	400	2 5 0/	1.00/	1 70/	4.40/	140/	470/	1000/	1000/	100%	
Oil	53	59	85	119	400	2.3%	1.0%	1.7%	44%	10%	68%	29%	28%	29%	
Gas	37	42	62	94	121	2.9%	1.7%	2.3%	53%	28%	96%	21%	22%	25%	
Coal	44	50	91	128	118	2.3%	-0.6%	0.9%	40%	-8%	29%	31%	30%	24%	
Nuclear	3	4	5	14	30	7.2%	5.4%	6.3%	183%	119%	519%	2%	3%	6%	
Biomass/ Waste	30	33 4	40	45	45	3.3%	-0.0%	0.5%	15% 64%	-0%	122%	2%	3%	9% 3%	
Other Renewables	0	1	3	9	16	7.5%	4.1%	5.8%	196%	83%	441%	1%	2%	3%	
			-		-										
End-Use Sectors Residential/Commercial															
Total	48	52	65	86	98	1.9%	0.8%	1.4%	33%	13%	50%	100%	100%	100%	
Oil	5	6	8	11	12	2.3%	0.8%	1.5%	40%	13%	58%	12%	13%	13%	
Gas	4	5	8	13	16	3.5%	1.7%	2.6%	67%	28%	115%	12%	15%	17%	
Biomass/ waste	24	6	30	31	27	5.0%	-1.1%	-0.4%	3%	-15%	213%	4/%	36%	27%	
Other	12	8	8	9	8	0.3%	-0.6%	-0.2%	5%	-9%	-5%	13%	10%	8%	
T															į
Transportation	20	24	/1	65	85	3 10/	1.9%	2 50/	5.00/	210/	107%	100%	100%	100%	
Oil	19	25	39	59	74	2.9%	1.5%	2.2%	53%	24%	90%	94%	91%	87%	
Biofuels	0	0	1	2	5	6.2%	4.6%	5.4%	148%	96%	386%	2%	4%	5%	
Gas	0	0	1	3	5	8.3%	5.0%	6.6%	230%	109%	588%	2%	4%	6%	
Other	1	0	1	1	1	2.5%	2.4%	2.4%	45%	43%	106%	2%	1%	2%	
Industrial															
Total	76	79	124	173	190	2.2%	0.6%	1.4%	39%	10%	53%	100%	100%	100%	
Oil	20	21	30	42	50	2.2%	1.2%	1.7%	39%	20%	66%	24%	24%	2/%	
Coal	10	19	27	38 44	4/	2.2%	-1.8%	-0.1%	40%	-24%	-4%	22%	22%	25%	
Electricity	8	9	19	33	43	4.0%	1.8%	2.9%	79%	31%	134%	15%	19%	23%	
Other	12	10	13	16	16	1.2%	0.1%	0.7%	19%	2%	21%	11%	9%	8%	
Power Generation															ļ
Primary	51	60	102	164	204	3.2%	1.5%	2.3%	61%	24%	100%	100%	100%	100%	
Qil	9	7	8	7	6	-0.7%	-1.3%	-1.0%	-11%	-18%	-27%	8%	4%	3%	
Gas	17	17	26	41	53	3.1%	1.6%	2.3%	57%	28%	100%	26%	25%	26%	
Nuclear	3	4	53	14	30	2.9%	5.4%	63%	183%	2%	519%	5%	8%	15%	
Hydro	3	4	7	12	16	3.3%	2.0%	2.7%	64%	35%	122%	7%	7%	8%	
Wind	0	0	0	2	4	15.1%	4.5%	9.7%	723%	94%	1499%	0%	1%	2%	
Other Renewables	1	1	3	7	12	6.7%	4.1%	5.4%	165%	82%	381%	3%	4%	6%	

2014 Outlook data

Energy Demand (quadrillio	n BTUs) u	inless othe	erwise indic	ated		A verag	e Annual (Change		% Change					
Regions	1000	2000	2010	2025	2040	2010	2025	2010	2010	2025	2010	2010 SI	hare of Tota	al 2040	
Primary	17	2000	2010	43	60	2025	2040	2040	48%	38%	105%	100%	100%	100%	
Oil	4	5	7	12	18	3.7%	2.6%	3.1%	73%	47%	153%	24%	28%	30%	
Gas	2	4	5	8	12	3.6%	2.6%	3.1%	69%	47%	149%	16%	18%	20%	
Coal	3	3	4	6	9	2.3%	3.4%	2.9%	41%	66%	135%	14%	13%	16%	
Nuclear Biomass/Waste	0	10	13	16	17	4.5%	0.5%	1.0%	93% 23%	386%	23%	0%	37%	2%	
Hydro	0	0	0	1	2	7.6%	3.3%	5.4%	200%	63%	387%	1%	2%	3%	
Other Renewables	0	0	0	0	1	12.9%	5.8%	9.3%	517%	134%	1347%	0%	1%	1%	
End Lice Domand (includin	a alactrici	ι 													
Total End-Use	16	20	25	37	48	2.4%	1.9%	2.2%	43%	33%	90%	100%	100%	100%	
Residential/Commercial	7	9	13	18	22	2.2%	1.5%	1.9%	40%	25%	74%	49%	48%	45%	
Transportation	2	3	4	7	10	3.7%	2.7%	3.2%	73%	49%	157%	15%	18%	20%	
Industrial	7	8	9	12	17	2.1%	2.0%	2.1%	36%	35%	84%	36%	34%	34%	
Memo: Electricity Demand	I	1	Z	4	9	5.5%	4.0%	5.1%	124%	90%	339%	8%	12%	18%	
Power Generation Fuel	3	4	6	11	20	4.6%	4.0%	4.3%	97%	79%	253%	19%	26%	33%	
CO Emissions P.Tonnes	0.7	0.0	11	10	20	2 20/	2 00/	2.00/	E 00/	E 20/	1400/				
CO ₂ Emissions, B Tonnes	0.7	0.9	1.1	1.0	2.0	5.270	Z.070	5.0%	37%	5270	14270				
ASIA PACIFIC															
Primary	91	128	200	289	321	2.5%	0.7%	1.6%	45%	11%	60%	100%	100%	100%	
Oil	29	43	5/	/5	85	1.8%	0.8%	1.3%	31%	13%	48%	28%	26%	26%	
Coal	32	45	88	120	107	4.0%	-0.8%	0.7%	37%	-11%	22%	44%	41%	33%	
Nuclear	3	5	6	15	28	6.3%	4.3%	5.3%	151%	88%	371%	3%	5%	9%	
Biomass/Waste	19	20	22	25	23	0.8%	-0.5%	0.1%	12%	-8%	3%	11%	9%	7%	
Hydro	1	2	4	7	9	3.8%	2.3%	3.0%	75%	40%	145%	2%	2%	3%	
Other Renewables	0	I	2	/	12	7.8%	3.7%	5.7%	209%	72%	429%	1%	2%	4%	
End-Use Demand (includin	g electrici	ity)													
Total End-Use	76	101	151	212	231	2.3%	0.6%	1.4%	40%	9%	53%	100%	100%	100%	
Residential/Commercial	28	33	41	54	59	1.8%	0.6%	1.2%	30%	9%	42%	27%	25%	25%	
Industrial	36	50	83	118	120	2.0%	0.2%	1.3%	42%	27/0	45%	55%	56%	52%	
Memo: Electricity Demand	7	12	24	44	58	4.0%	1.9%	2.9%	81%	32%	139%	16%	21%	25%	
	22	41	77	105	1 - 1	2 20/	1 20/	2 20/	(20/	210/	000/	200/	420/	470/	
Power Generation Fuel	23	41	//	125	151	3.3%	1.3%	2.3%	63%	21%	98%	38%	43%	47%	
CO ₂ Emissions, B Tonnes	5.3	7.7	13.1	18.3	18.3	2.2%	0.0%	1.1%	39%	0%	40%				
FUROPE															
Primary	74	78	81	79	74	-0.2%	-0.4%	-0.3%	-3%	-6%	-9%	100%	100%	100%	
Oil	30	32	31	27	25	-0.8%	-0.5%	-0.7%	-12%	-7%	-19%	38%	34%	34%	
Gas	13	17	20	21	21	0.3%	0.1%	0.2%	5%	1%	6%	24%	26%	28%	
Coal	0	14	13	10	5	-1.3%	-4.2%	-2.8%	-18%	-48%	-5/%	15%	13%	/% 12%	
Biomass/Waste	2	3	5	6	5	11%	-0.5%	0.1%	17%	-8%	2%	6%	7%	7%	
Hydro	2	2	2	2	2	-0.1%	0.2%	0.0%	-2%	2%	1%	3%	3%	3%	
Other Renewables	0	0	2	4	6	5.6%	2.4%	4.0%	126%	43%	222%	2%	5%	7%	
End-Use Demand (includin	a electrici	itv)													
Total End-Use	57	61	64	62	60	-0.2%	-0.2%	-0.2%	-3%	-4%	-6%	100%	100%	100%	
Residential/Commercial	17	18	21	21	20	0.1%	-0.3%	-0.1%	1%	-4%	-3%	33%	34%	34%	
Transportation	14	17	19	18	18	-0.2%	-0.0%	-0.1%	-3%	-0%	-4%	29%	29%	30%	
Memo: Electricity Demand	20	25	24 12	23	13	-0.4%	-0.4%	-0.4%	-5%	-5%	13%	38% 18%	37% 21%	22%	
Memo: Electricity Demond	,	10	12	15	15	0.070	0.270	0.170	770	570	1370	10/0	2170	2270	
Power Generation Fuel	27	29	32	32	30	0.1%	-0.6%	-0.3%	1%	-8%	-7%	39%	41%	40%	
CO ₂ Emissions, B Tonnes	4.5	4.3	4.3	3.9	3.2	-0.7%	-1.3%	-1.0%	-10%	-18%	-26%				
	15	20	27	27	16	2.1%	1 5%	1.8%	37%	25%	72%	100%	100%	100%	
Oil	8	10	12	16	18	1.8%	0.7%	1.3%	31%	11%	45%	46%	44%	39%	
Gas	3	4	6	9	13	2.9%	2.7%	2.8%	53%	49%	127%	22%	24%	29%	
Coal	1	1	1	1	1	1.6%	0.5%	1.0%	27%	7%	36%	3%	3%	3%	
Nuclear Dia ang (M/anta	0	0	0	0	0	3.5%	1.6%	2.5%	68%	26%	112%	1%	1%	1%	
Hydro	1	3	2	3	5	2.7%	1.3%	1.8%	41%	21%	71%	9%	9%	9%	
Other Renewables	Ö	õ	1	2	4	5.4%	4.5%	5.0%	120%	94%	326%	4%	6%	9%	
Fed Has Decred (Sector)		ч. Л													
Total End-Lise	14	18	24	32	⊿1	21%	1 5%	1.8%	37%	26%	72%	100%	100%	100%	
Residential/Commercial	3	4	4	6	6	1.7%	1.0%	1.4%	29%	17%	51%	18%	17%	16%	
Transportation	4	5	7	11	13	2.6%	1.3%	2.0%	48%	21%	79%	31%	33%	32%	
Industrial	7	9	12	16	21	1.9%	1.8%	1.9%	33%	32%	75%	51%	50%	52%	
iviemo: Electricity Demand	I	2	3	5	/	3.1%	2.3%	2.1%	58%	41%	123%	13%	15%	17%	
Power Generation Fuel	3	4	6	9	12	2.6%	1.9%	2.3%	48%	33%	97%	23%	25%	27%	
CO ₂ Emissions B Tonnes	07	0.9	12	17	2.0	2.0%	1 3%	1.6%	35%	21%	63%				

Energy Demand (quadrillio Regions	on BTUs)					Averag 2010	e Annual (2025	Change 2010	2010	% Change 2025	2010	SI	nare of Tot	al
MIDDLE EAST	1990	2000	2010	2025	2040	2025	2040	2040	2025	2040	2040	2010	2025	2040
Primary	11	18	30	42	52	2.3%	1.4%	1.9%	42%	23%	74%	100%	100%	100%
Oil	7	11	16	20	24	1.7%	1.0%	1.4%	29%	16%	50%	53%	48%	46%
Gas	4	7	13	21	25	2.9%	1.2%	2.1%	54%	20%	84%	45%	49%	48%
Coal	0	0	0	0	0	-10.1%	-6.3%	-8.2%	-80%	-62%	-92%	1%	0%	0%
Nuclear	0	0	0	0	2	-	10.8%	-	-	366%	-	0%	1%	4%
Biomass/Waste	0	0	0	0	0	7.4%	6.8%	7.1%	193%	168%	686%	0%	0%	0%
Hvdro	Ó	Ō	Ó	Ó	Ó	4.8%	3.2%	4.0%	103%	60%	226%	0%	0%	0%
Other Renewables	0	0	0	0	1	12.3%	6.4%	9.3%	469%	152%	1334%	0%	1%	1%
End-Use Demand (includin	a electrici	tv)												
Total End-Use	9	14	23	33	42	2.5%	1.5%	2.0%	44%	26%	81%	100%	100%	100%
Residential/Commercial	1	3	4	7	9	2.8%	1.6%	2.2%	51%	28%	93%	19%	20%	20%
Transportation	3	4	7	9	11	2.0%	1.4%	1.7%	35%	23%	66%	28%	26%	26%
Industrial	5	8	12	18	22	2.6%	1.6%	21%	46%	26%	84%	53%	54%	54%
Memo: Electricity Demand	1	1	2	5	7	4.8%	2.2%	3.5%	102%	38%	178%	11%	15%	17%
mento. Electricity Defiliand			2	5	,	1.070	2.270	5.570	102/0	5070	17070	1170	1370	. , ,0
Power Generation Fuel	3	5	9	14	17	2.8%	1.3%	2.1%	52%	22%	85%	31%	33%	33%
	5	5	,		.,	2.070	1.370	2.170	5270	2270	03/0	5170	5570	5570
CO ₂ Emissions, B Tonnes	07	11	18	23	26	17%	0.7%	1.2%	29%	11%	43%			
	0.7	1.1	1.0	2.5	2.0	1.770	0.770	1.270	2770	1170	4370			
NORTH AMERICA														
Primary	95	114	113	117	112	0.2%	-0.3%	-0.0%	3%	-4%	-1%	100%	100%	100%
Oil	12	49	47	46	43	-0.2%	-0.5%	-0.3%	-3%	-7%	-10%	12%	39%	38%
Gas	21	26	28	35	37	1.6%	0.5%	1.0%	26%	7%	36%	24%	30%	33%
Coal	20	20	20	14	6	-2.6%	-5.4%	-4.0%	-32%	-56%	-70%	19%	12%	6%
Nuclear	7	9	10	11	13	0.8%	1.1%	0.9%	12%	18%	33%	9%	9%	11%
Biomass /Waste	2	Á	3	1	3	0.0%	_1.1%	-0.4%	7%	-16%	_10%	3%	3%	3%
Hydro	2	2	2	2	3	1 2%	0.3%	0.4%	21%	-10%	26%	2%	2%	3%
Other Penewahler	1	1	2	5	7	5.0%	3.2%	1 1%	107%	4/0	20/0	2%	270	7%
Other Renewables			2	5	,	5.070	J.270	4.170	10770	0070	23170	270	470	770
End-Use Demand (includin	a electrici	tv)												
Total End-Use	72	86	86	01	80	0.3%	_0.1%	0.1%	5%	-2%	1%	100%	100%	100%
Peridential/Commercial	18	22	23	23	23	0.3%	0.0%	0.1%	3%	1%	3%	26%	26%	26%
Transportation	25	22	22	20	23	_0.0%	_0.0%	_0.1%	_1%	-2%	_3%	37%	20%	25%
Industrial	30	34	32	36	35	0.0%	_0.2%	0.1%	13%	_3%	10%	37%	30%	30%
Memo: Electricity Demand	11	15	16	10	20	1 1%	0.2%	0.3%	10%	9%	30%	1.8%	21%	22%
Merrio. Electricity Demand		15	10	17	20	1.170	0.070	0.770	1770	770	3070	1070	2170	2370
Power Constation Fuel	22	12	13	45	13	0.3%	_0.2%	0.0%	1%	_2%	1%	38%	28%	20%
Fower Generation 1 der	55	42	45	45	45	0.570	-0.270	0.070	470	-370	170	50%	50%	J770
CO ₂ Emissions B Tonnes	5.6	66	65	61	5.0	-0.4%	-1 3%	-0.8%	-6%	-18%	-22%			
	5.0	0.0	0.5	0.1	5.0	0.470	1.370	0.070	070	1070	2270			
RUSSIA/CASPIAN														
Primary	58	38	42	47	45	0.7%	-0.2%	0.2%	10%	-3%	7%	100%	100%	100%
Oil	18	8	9	10	10	0.9%	0.1%	0.5%	14%	1%	14%	20%	21%	22%
Gas	23	20	23	25	25	0.5%	-0.1%	0.3%	8%	-2%	7%	54%	53%	54%
Coal	13	7	7	7	4	0.5%	-2.7%	-1.3%	1%	-34%	-33%	16%	15%	10%
Nuclear	2	2	2	,	5	2.7%	1 3%	1 7%	38%	21%	67%	6%	8%	10%
Biomass /Waste	1	0	0	-	1	0.0%	0.3%	0.6%	15%	5%	21%	1%	1%	1%
Hydro	1	1	1	1	1	0.7%	0.3%	0.0%	1%	6%	10%	2%	2%	2%
Other Penewahler	0	0	0	0	0	10.0%	6.0%	8.4%	372%	1/1%	1036%	0%	0%	1%
	U	U	0	0	0	10.770	0.070	0.470	57270	14170	105070	070	070	170
End-Use Demand (includin	a electrici	tv)												
Total End-Lise	46	29	34	37	36	0.6%	-0.1%	0.2%	10%	-2%	8%	100%	100%	100%
Residential/Commercial	12	9	9	9	9	0.3%	-0.5%	-0.1%	1%	-8%	-1%	27%	26%	24%
Transportation	6	2	4	5	5	1 3%	0.5%	0.8%	22%	3%	26%	12%	13%	14%
Industrial	29	17	20	22	22	0.6%	-0.0%	0.3%	10%	-1%	9%	61%	61%	62%
Memo: Electricity/Demand	5	3	20	5	6	2.0%	0.8%	1.4%	34%	13%	51%	12%	15%	17%
Mento. Lieculicity Dellialiu	5	J	4	5	0	2.070	0.070	1.470	5470	1570	5170	1270	1370	1770
Power Generation Fuel	27	19	19	21	20	0.6%	-0.4%	0.1%	9%	-6%	3%	46%	45%	44%
		.,	.,	- '	20	0.070	0.170	070	. /0	0,0	370	.070	.370	
CO ₂ Emissions, B Tonnes	3.9	2.3	2.5	2.7	2.4	0.4%	-0.7%	-0.1%	7%	-10%	-4%			

Glossary

Billions of cubic feet per day (BCFD): This is used to define volumes of natural gas. One billion cubic feet per day of natural gas is enough to meet about 2 percent of the natural gas used in homes around the world. Six billion cubic feet per day of natural gas is equivalent to about 1 million oil-equivalent barrels per day.

BTU: British thermal unit. A BTU is a standard unit of energy that can be used to measure any type of energy source. The energy content of one gallon of gasoline is about 125,000 BTUs. "Quad" refers to a quadrillion BTUs.

Millions of oil-equivalent barrels per day (MBDOE): This term provides a standardized unit of measure for different types of energy sources (oil, gas, coal, etc.) based on energy content relative to a typical barrel of oil. One million oil-equivalent barrels per day is enough energy to fuel about 5 percent of the light duty vehicles on the world's roads today. **Primary energy:** Includes energy in the form of oil, natural gas, coal, nuclear, hydro, geothermal, wind, solar and bioenergy sources (biofuels, municipal solid waste, traditional biomass). Does not include electricity and market heat, which are secondary energy types reflecting conversion/production from primary energy sources.

Watt: A unit of electrical power, equal to one joule per second. A 1-gigawatt power plant can meet the electricity demand of more than 500,000 homes in the U.S. (Kilowatt (KW) = 1,000 watts; Gigawatt (GW) = 1,000,000,000 watts; Terawatt (TW) = 10¹² watts). 300 terawatt hours is equivalent to about 1 quadrillion BTUs (Quad).

The Outlook for Energy includes Exxon Mobil Corporation's internal estimates and forecasts of energy demand, supply, and trends through 2040 based upon internal data and analyses as well as publicly available information from external sources including the International Energy Agency. This report includes forward looking statements. Actual future conditions and results (including energy demand, energy supply, the relative mix of energy across sources, economic sectors and geographic regions, imports and exports of energy) could differ materially due to changes in economic conditions, technology, the development of new supply sources, political events, demographic changes, and other factors discussed herein and under the heading "Factors Affecting Future Results" in the Investors section of our website at www.exxonmobil.com. This material is not to be used or reproduced without the permission of Exxon Mobil Corporation. All rights reserved.



Exxon Mobil Corporation

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Exhibit 26

Energy and Carbon -- Managing the Risks

ExxonMobil¹ engages in constructive and informed dialogue with a wide variety of stakeholders on a number of energy-related topics. This report seeks to address important questions raised recently by several stakeholder organizations on the topics of global energy demand and supply, climate change policy, and carbon asset risk.

As detailed below, ExxonMobil makes long-term investment decisions based in part on our rigorous, comprehensive annual analysis of the global outlook for energy, an analysis that has repeatedly proven to be consistent with the International Energy Agency *World Energy Outlook*, the U.S. Energy Information Administration *Annual Energy Outlook*, and other reputable, independent sources. For several years, our *Outlook for Energy* has explicitly accounted for the prospect of policies regulating greenhouse gas emissions (GHG). This factor, among many others, has informed investments decisions that have led ExxonMobil to become the leading producer of cleaner-burning natural gas in the United States, for example.

Based on this analysis, we are confident that none of our hydrocarbon reserves are now or will become "stranded." We believe producing these assets is essential to meeting growing energy demand worldwide, and in preventing consumers – especially those in the least developed and most vulnerable economies – from themselves becoming stranded in the global pursuit of higher living standards and greater economic opportunity.

¹ As used in this document, "ExxonMobil" means Exxon Mobil Corporation and/or one or more of its affiliated companies. Statements of future events or conditions in this report are forward-looking statements. Actual future results, including economic conditions and growth rates; energy demand and supply sources; efficiency gains; and capital expenditures, could differ materially due to factors including technological developments; changes in law or regulation; the development of new supply sources; demographic changes; and other factors discussed herein and under the heading "Factors Affecting Future Results" in the Investors section of our website at: www.exxonmobil.com. The information provided includes ExxonMobil's internal estimates and forecasts based upon internal data and analyses, as well as publicly available information from external sources including the International Energy Agency. Citations in this document are used for purposes of illustration and reference only and any citation to outside sources does not necessarily mean that ExxonMobil endorses all views or opinions expressed in or by those sources.

1. Strong Correlation between Economic Growth and Energy Use

The universal importance of accessible and affordable energy for modern life is undeniable. Energy powers economies and enables progress throughout the world. It provides heat for homes and businesses to protect against the elements; power for hospitals and clinics to run advanced, life-saving equipment; fuel for cooking and transportation; and light for schools and streets. Energy is the great enabler for modern living and it is difficult to imagine life without it. Given the importance of energy, it is little wonder that governments seek to safeguard its accessibility and affordability for their growing populations. It is also understandable that any restrictions on energy production that decrease its accessibility, reliability or affordability are of real concern to consumers who depend upon it.



Improved Living Standards Depend on Energy

2. World Energy Needs Keep Growing

Each year, ExxonMobil analyzes trends in energy and publishes our forecast of global energy requirements in our *Outlook for Energy*. The Outlook provides the foundation for our business and investment planning, and is compiled from the breadth of the company's worldwide experience in and understanding of the energy industry. It is based on rigorous analyses of supply and demand, technological development, economics, and government policies and regulations, and it is consistent with many independent, reputable third-party analyses.

ExxonMobil's current *Outlook for Energy* extends through the year 2040, and contains several conclusions that are relevant to questions raised by stakeholder organizations. Understanding this factual and analytical foundation is crucial to understanding ExxonMobil's investment decisions and approach to the prospect of further constraints on carbon.

<u>World population increases</u>. Ultimately, the focus of ExxonMobil's *Outlook for Energy* – indeed, the focus of our business – is upon people, their economic aspirations and their energy requirements. Accordingly, our analysis begins with demographics. Like many independent analyses, ExxonMobil anticipates the world's population will add two billion people to its current total of seven billion by the end of the Outlook period. The majority of this growth will occur in developing countries.

<u>World GDP grows</u>. The global economy will grow as the world's population increases, and it is our belief that GDP gains will outpace population gains over the Outlook period, resulting in higher living standards. Assuming sufficient, reliable and affordable energy is available, we see world GDP growing at a rate that exceeds population growth through the Outlook period, almost tripling in size from what it was globally in 2000.² It is

² We see global GDP approaching \$120 trillion, as compared to \$40 trillion of global GDP in 2000 (all in constant 2005 USA\$'s). GDP per capita will also grow by about 80 percent between 2010 and 2040, despite the increase in population.

largely the poorest and least developed of the world's countries that benefit most from this anticipated growth. However, this level of GDP growth requires more accessible, reliable and affordable energy to fuel growth, and it is vulnerable populations who would suffer most should that growth be artificially constrained.



<u>Energy demand grows with population and GDP</u>. As the world becomes more populous and living standards improve over the Outlook period, energy demand will increase as well. We see the world requiring 35 percent more energy in 2040 than it did in 2010. The pace of this energy demand increase is higher than the population growth rate, but less than global GDP growth rate. Greater energy efficiency is a key reason why energy demand growth trails economic growth. We see society implementing policy changes that will promote energy efficiency, which will serve to limit energy demand growth. We also see many governments adopting policies that promote the switch to less carbonintensive fuels, such as natural gas. As noted in the chart above, energy demand in 2040 could be almost double what it would be without the anticipated efficiency gains. ExxonMobil believes that efficiency is one of the most effective tools available to manage greenhouse gas emissions, and accordingly our company is making significant contributions to energy efficiency, both in our own operations and in our products.

<u>Energy-related CO2 emissions stabilize and start decreasing</u>. As the world's population grows and living standards increase, we believe GHG emissions will plateau and start decreasing during the Outlook period. In the OECD countries, energy-based GHG emissions have already peaked and are declining. Our views in this regard are similar to other leading, independent forecasts.³



As part of our Outlook process, we do not project overall atmospheric GHG concentration, nor do we model global average temperature impacts.⁴ However, we do project an energy-related CO2 emissions profile through 2040, and this can be compared

³ For example, the IEA predicts that energy-related emissions will grow by 20%, on trend but slightly higher than our Outlook. See <u>www.worldenergyOutlook.org</u>.

⁴ These would require data inputs that are well beyond our company's ability to reasonably measure or verify.

to the energy-related CO2 emissions profiles from various scenarios outlined by the Intergovernmental Panel on Climate Change (IPCC). When we do this, our Outlook emissions profile through 2040 would closely approximate the IPCC's intermediate RCP 4.5 emissions profile pathway in shape, but is slightly under it in magnitude.⁵

<u>All economic energy sources are needed to meet growing global demand.</u> In analyzing the evolution of the world's energy mix, we anticipate renewables growing at the fastest pace among all sources through the Outlook period. However, because they make a relatively small contribution compared to other energy sources, renewables will continue to comprise about 5 percent of the total energy mix by 2040. Factors limiting further penetration of renewables include scalability, geographic dispersion, intermittency (in the case of solar and wind), and cost relative to other sources.



⁵ The IPCC RCP 4.5 scenario extends 60 years beyond our Outlook period to the year 2100, and incorporates a full carbon cycle analysis. The relevant time horizons differ and we do not forecast potential climate impacts as part of our Outlook, and therefore cannot attest to their accuracy.





3. Climate Change Risk

ExxonMobil takes the risk of climate change seriously, and continues to take meaningful steps to help address the risk and to ensure our facilities, operations and investments are managed with this risk in mind.

Many governments are also taking these risks seriously, and are considering steps they can take to address them. These steps may vary in timing and approach, but regardless, it is our belief they will be most effective if they are informed by global energy demand and supply realities, and balance the economic aspirations of consumers.

4. Carbon Budget and Carbon Asset Risk Implications

One focus area of stakeholder organizations relates to what they consider the potential for a so-called carbon budget. Some are advocating for this mandated carbon budget in order to achieve global carbon-based emission reductions in the range of 80 percent through the year 2040, with the intent of stabilizing world temperature increases not to exceed 2 degrees Celsius by 2100 (i.e., the "low carbon scenario"). A concern expressed by some of our stakeholders is whether such a "low carbon scenario" could impact ExxonMobil's reserves and operations – i.e., whether this would result in unburnable proved reserves of oil and natural gas.

The "low carbon scenario" would require CO2 prices significantly above current price levels. In 2007, the U.S. Climate Change Science Program published a study that examined, among other things, the global CO2 cost needed to drive investments and transform the global energy system, in order to achieve various atmospheric CO2 stabilization pathways. The three pathways shown in the chart below are from the MIT IGSM model used in the study, and are representative of scenarios with assumed climate policies that stabilize GHGs in the atmosphere at various levels, from 650 ppm CO2 down to 450 ppm CO2, a level approximating the level asserted to have a reasonable chance at meeting the "low carbon scenario." Meeting the 450 ppm pathway requires large, immediate reductions in emissions with overall net emissions becoming negative in the second half of the century. Non-fossil energy sources, like nuclear and renewables, along with carbon capture and sequestration, are deployed in order to transform the energy system. Costs for CO2 required to drive this transformation are modeled. In general, CO2 costs rise with more stringent stabilization targets and with time. Stabilization at 450 ppm would require CO2 prices significantly above current price levels, rising to over \$200 per ton by 2050. By comparison, current EU Emissions Trading System prices are approximately \$8 to \$10 per ton of CO2.

In the right section of the chart below, different levels of added CO2 are converted to estimated added annual energy costs for an average American family earning the median

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income. For example, by 2030 for the 450ppm CO2 stabilization pathway, the average American household would face an added CO2 cost of almost \$2,350 per year for energy, amounting to about 5 percent of total before-tax median income. These costs would need to escalate steeply over time, and be more than double the 2030 level by mid-century. Further, in order to stabilize atmospheric GHG concentrations, these CO2 costs would have to be applied across both developed and developing countries.



In 2008, the International Energy Agency estimated that reducing greenhouse gas emissions to just 50 percent below 2005 levels by 2050 would require \$45 trillion in added energy supply and infrastructure investments.⁶ In this scenario, the IEA estimated that *each year* between 2005 and 2050 the world would need to construct 24 to 32 one-thousand-megawatt nuclear plants, build 30 to 35 coal plants with carbon capture and

⁶ See IEA Energy Technology Perspectives 2008, Scenarios & Strategies to 2050.

sequestration capabilities, and install 3,700 to 17,800 wind turbines of four megawatt capacity.

<u>Transforming the energy system will take time</u>. Energy use and mix evolve slowly due to the vast size of the global energy system. As shown in the chart below, biomass like wood was the primary fuel for much of humanity's existence. Coal supplanted biomass as the primary energy source around 1900; it was not until the middle of the 20th century before oil overtook coal as the primary source of energy. We believe the transition to lower carbon energy sources will also take time, despite rapid growth rates for such sources. Traditional energy sources have had many decades to scale up to meet the enormous energy needs of the world. As discussed above, renewable sources, such as solar and wind, despite very rapid growth rates, cannot scale up quickly enough to meet global demand growth while at the same time displacing more traditional sources of energy.



<u>A "low carbon scenario" will impact economic development.</u> Another consideration related to the "low carbon scenario" is that capping of carbon-based fuels would likely harm those least economically developed populations who are most in need of affordable, reliable and accessible energy.⁷ Artificially restricting supplies can also increase costs, and increasing costs would not only impact the affordability and accessibility of energy, especially to those least able to pay, it could impact the rate of economic development and living standards for all. Increasing energy costs leads to a scarcity of affordable, reliable and accessible energy and can additionally lead to social instability. While the risk of regulation where GHG emissions are capped to the extent contemplated in the "low carbon scenario" during the Outlook period is always possible, it is difficult to envision governments choosing this path in light of the negative implications for economic growth and prosperity that such a course poses, especially when other avenues may be available, as discussed further below.



All Scenarios Require Ongoing Development

⁷ According to the International Energy Agency, 2.6 billion people still rely on biomass for cooking and over 15% of the world's population lacks access to electricity (<u>http://www.iea.org/topics/energypoverty/</u>).

Even in a "low carbon scenario," hydrocarbon energy sources are still needed. The IEA in its World Energy Outlook 2013 examined production of liquids from currently-producing fields, in the absence of additional investment, versus liquids demand, for both their lead "*New Policies Scenario*" and for a "450 Scenario." As shown in the chart above, in both scenarios, there remains significant liquids demand through 2035, and there is a need for ongoing development and investment. Without ongoing investment, liquids demand will not be met, leaving the world short of oil.

ExxonMobil believes that although there is always the possibility that government action may impact the company, the scenario where governments restrict hydrocarbon production in a way to reduce GHG emissions 80 percent during the Outlook period is highly unlikely. The Outlook demonstrates that the world will require all the carbon-based energy that ExxonMobil plans to produce during the Outlook period.⁸ Also, as discussed above, we do not anticipate society being able to supplant traditional carbon-based forms of energy with other energy forms, such as renewables, to the extent needed to meet this carbon budget during the Outlook period.

5. Managing the Risk

<u>ExxonMobil's actions</u>. ExxonMobil addresses the risk of climate change in several concrete and meaningful ways. We do so by improving energy efficiency and reducing emissions at our operations, and by enabling consumers to use energy more efficiently through the advanced products we manufacture. In addition, we conduct and support extensive research and development in new technologies that promote efficiency and reduce emissions.

⁸ ExxonMobil's proved reserves at year-end 2013 are estimated to be produced on average within sixteen years, well within the Outlook period. See Exxon Mobil Corporation 2013 Financial & Operating Review, p. 22. It is important to note that this sixteen year average reserves-to-production ratio does not mean that the company will run out of hydrocarbons in sixteen years, since it continues to add proved reserves from its resource base and has successfully replaced more than 100% of production for many years. See Item 2 Financial Section of ExxonMobil's 2013 Form 10-K for ExxonMobil's proved reserves, which are determined in accordance with current SEC definitions.

In our operations, we apply a constant focus on efficiency that enables us to produce energy to meet society's needs using fewer resources and at a lower cost.

For example, ExxonMobil is a leader in cogeneration at our facilities, with equity ownership in more than 100 cogeneration units at more than 30 sites with over 5200 megawatts of capacity. This capacity, which is equivalent to the electricity needs of approximately 2.5 million U.S. households, reduces the burden on outside power and grid suppliers and can reduce the resulting emissions by powering ExxonMobil's operations in a more efficient and effective manner.

We also constantly strive to reduce the emission intensity of our operations. Cumulative savings, for example, between 2009 and 2012 amounted to 8.4 million metric tons of greenhouse gases.

Many of ExxonMobil's products also enable consumers to be more energy efficient and therefore reduce greenhouse gas emissions. Advancements in tire liner technology developed by ExxonMobil allow drivers to save fuel. Our synthetic lubricants also improve vehicle engine efficiency. And lighter weight plastics developed by ExxonMobil reduce vehicle weights, further contributing to better fuel efficiency. ⁹

ExxonMobil is also the largest producer of natural gas in the United States, a fuel with a variety of consumer uses, including heating, cooking and electricity generation. Natural gas emits up to 60 percent less CO2 than coal when used as the source for power generation.

Research is another area in which ExxonMobil is contributing to energy efficiency and reduced emissions. We are on the forefront of technologies to lower greenhouse gas emissions. For example, ExxonMobil operates one of the world's largest carbon capture

⁹ Using ExxonMobil fuel-saving technologies in one-third of U.S. vehicles, for example, could translate into a saving of about 5 billion gallons of gasoline, with associated greenhouse gas emissions savings equivalent to taking about 8 million cars off the road.

and sequestration (CCS) operations at our LaBarge plant in Wyoming. It is a co-venturer in another project, the Gorgon natural gas development in Australia, which when operational will have the largest saline reservoir CO2 injection facility in the world. The company is leveraging its experience with CCS in developing new methods for capturing CO2, which can reduce costs and increase the application of carbon capture for society. ExxonMobil also is actively engaged, both internally and in partnership with renowned universities and institutions, in research on new break-through technologies for energy.

The company also engineers its facilities and operations robustly with extreme weather considerations in mind. Fortification to existing facilities and operations are addressed, where warranted due to climate or weather events, as part of ExxonMobil's Operations Integrity Management System.

ExxonMobil routinely conducts life cycle assessments (LCAs), which are useful to understand whether a technology can result in environmental improvements across a broad range of factors. For example, in 2011 we conducted a LCA in concert with Massachusetts Institute of Technology and Synthetic Genomics Inc. to assess the impact of algal biofuel production on GHG emissions, land use, and water use. The study demonstrated the potential that algae fuels can be produced with freshwater consumption equivalent to petroleum refining, and enable lower GHG emissions. A more recent LCA demonstrated that "well-to-wire" GHG emissions from shale gas are about half that of coal, and not significantly different than emissions of conventional gas.

In addition, ExxonMobil is involved in researching emerging technologies that can help mitigate the risk of climate change. For example, the company has conducted research into combustion fundamentals with automotive partners in order to devise concepts to improve the efficiency and reduce emissions of internal combustion engines.

ExxonMobil has also developed technology for an on-board hydrogen-powered fuel cell that converts other fuels into hydrogen directly under a vehicle's hood, thereby eliminating the need for separate facilities for producing and distributing hydrogen. This

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technology can be up to 80 percent more fuel efficient and emit 45 percent less CO2 than conventional internal combustion engines. The company is also a founding member of the Global Climate and Energy Project at Stanford University, a program that seeks to develop fundamental, game-changing scientific breakthroughs that could lower GHG emissions.

<u>Government policy</u>. Addressing climate risks is one of many important challenges that governments face on an ongoing basis, along with ensuring that energy supplies are affordable and accessible to meet societal needs.

Energy companies like ExxonMobil can play a constructive role in this decision-making process by sharing our insights on the most effective means of achieving society's goals given the workings of the global energy system and the realities that govern it.

The introduction of rising CO2 costs will have a variety of impacts on the economy and energy use in every sector and region within any given country. Therefore, the exact nature and pace of GHG policy initiatives will likely be affected by their impact on the economy, economic competitiveness, energy security and the ability of individuals to pay the related costs.

Governments' constraints on use of carbon-based energy sources and limits on greenhouse gas emissions are expected to increase throughout the Outlook period. However, the impact of these rising costs of regulations on the economy we expect will vary regionally throughout the world and will not rise to the level required for the "low carbon scenario." These reasonable constraints translate into costs, and these costs will help drive the efficiency gains that we anticipate will serve to curb energy growth requirements for society as forecasted over the Outlook period.

We also see these reasonable constraints leading to a lower carbon energy mix over the Outlook period, which can serve to further reduce greenhouse gas emissions. For example, fuel switching to cleaner burning fuels such as natural gas has significantly

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contributed to the United States reducing greenhouse gas emissions last year to levels not seen since 1994. Furthermore, the impact of efficiency is expected to help stabilize and eventually to reduce GHG emissions over the Outlook period, as discussed previously. These constraints will also likely result in dramatic global growth in natural gas consumption at the expense of other forms of energy, such as coal.

We see the continued focus on efficiency, conservation and fuel switching as some of the most effective and balanced ways society can address climate change within the Outlook period in a manner that avoids the potentially harmful and destabilizing consequences that the artificial capping of needed carbon-based energy sources implied within the "low carbon scenario" can cause.¹⁰

6. Planning Bases and Investments

ExxonMobil is committed to disciplined investing in attractive opportunities through the normal fluctuations in business cycles. Projects are evaluated under a wide range of possible economic conditions and commodity prices that are reasonably likely to occur, and we expect them to deliver competitive returns through the cycles. We do not publish the economic bases upon which we evaluate investments due to competitive considerations. However, we apply prudent and substantial safety margins in our planning assumptions to help ensure robust returns. In assessing the economic viability of proved reserves, we do not believe a scenario consistent with reducing GHG emissions by 80 percent by 2050, as suggested by the "low carbon scenario," lies within the "reasonably likely to occur" range of planning assumptions, since we consider the scenario highly unlikely.

The company also stress tests its oil and natural gas capital investment opportunities, which provides an added margin of safety against uncertainties, such as those related to technology, costs, geopolitics, availability of required materials, services, and labor, etc.

¹⁰ Permitting the freer trade and export of natural gas is but one way, for example, where countries that rely on more carbon-intense forms of energy can increase their use of cleaner-burning fuels.

Such stress testing differs from alternative scenario planning, such as alternate Outlooks, which we do not develop, but stress testing provides us an opportunity to fully consider different economic scenarios in our planning and investment process. The Outlook is reviewed at least annually, and updated as needed to reflect changes in views and circumstances, including advances in technology.



We also address the potential for future climate-related controls, including the potential for restriction on emissions, through the use of a proxy cost of carbon. This proxy cost of carbon is embedded in our current *Outlook for Energy*, and has been a feature of the report for several years. The proxy cost seeks to reflect all types of actions and policies that governments may take over the Outlook period relating to the exploration, development, production, transportation or use of carbon-based fuels. Our proxy cost,

which in some areas may approach \$80/ton over the Outlook period¹¹, is not a suggestion that governments should apply specific taxes. It is also not the same as a "social cost of carbon," which we believe involves countless more assumptions and subjective speculation on future climate impacts. It is simply our effort to quantify what we believe government policies over the Outlook period could cost to our investment opportunities. Perhaps most importantly, we require that all our business segments include, where appropriate, GHG costs in their economics when seeking funding for capital investments. We require that investment proposals reflect the climate-related policy decisions we anticipate governments making during the Outlook period and therefore incorporate them as a factor in our specific investment decisions.

When governments are considering policy options, ExxonMobil advocates an approach that ensures a uniform and predictable cost of carbon; allows market prices to drive solutions; maximizes transparency to stakeholders; reduces administrative complexity; promotes global participation; and is easily adjusted to future developments in climate science and policy impacts. We continue to believe a revenue-neutral carbon tax is better able to accommodate these key criteria than alternatives such as cap-and-trade.

Our views are based on our many years of successful energy experience worldwide and are similar to long-term energy demand forecasts of the International Energy Agency. As discussed previously, we see population, GDP and energy needs increasing for the world over the Outlook period, and that *all* economically viable energy sources will be required to meet these growing needs. We believe that governments will carefully balance the risk of climate change against other pressing social needs over the Outlook period, including the need for accessible, reliable and affordable energy, and that an artificial capping of carbon-based fuels to levels in the "low carbon scenario" is highly unlikely.

¹¹ As noted in our Outlook, this amount varies from country to country, with that amount generally equating to OECD countries, and lower amounts applying to non-OECD countries.

7. Capital Allocation

ExxonMobil maintains capital allocation discipline with rigorous project evaluation and investment selectivity, while consistently returning cash to our shareholders. Our capital allocation approach is as follows:

- I. Invest in resilient, attractive business opportunities
- II. Pay a reliable and growing dividend
- III. Return excess cash to shareholders through the purchase of shares.

Although the company does not incorporate the "low carbon scenario" in its capital allocation plans, a key strategy to ensure investment selectivity under a wide range of economic assumptions is to maintain a very diverse portfolio of oil and gas investment opportunities. This diversity – in terms of resource type and corresponding development options (oil, gas, NGLs, onshore, offshore, deepwater, conventional, unconventional, LNG, etc.) and geographic dispersion is unparalleled in the industry. Further, the company does not believe current investments in new reserves are exposed to the risk of stranded assets, given the rising global need for energy as discussed earlier.

8. Optional Reserves Disclosure under SEC Rules

Some have suggested that ExxonMobil consider availing itself of an optional disclosure available to securities issuers under Item 1202 of SEC Regulation S-K.¹² That SEC item provides, among other things, that "the registrant may, but is not required to, disclose, in the aggregate, an estimate of reserves estimated for each product type based on different price and cost criteria, such as a range of prices and costs that may reasonably be

¹² The rules were subject to comment at the time that they were proposed. See Modernization of Oil and Gas Reporting, Securities and Exchange Commission, 17 CFR Parts 210, 211, 229, and 249 [Release Nos. 33-8995; 34-59192; FR-78; File Nos. S7-15-08] at p. 66. (*www.sec.gov/rules/final/2008/33-8995.pdf*) ExxonMobil also provided comments to the proposed provision. See Letter of Exxon Mobil Corporation to Ms. Florence Harmon, Acting Secretary, Securities and Exchange Commission, September 5, 2008, File Number S7-15-08 – Modernization of the Oil and Gas Reporting Requirements at p. 24.

achieved, including standardized futures prices or management's own forecasts." Proponents ask the company to use this option to identify the price sensitivity of its reserves, with special reference to long-lived unconventional reserves such as oil sands.

We believe the public reporting of reserves is best done using the historical price basis as required under Item 1202(a) of Regulation S-K, rather than the optional sensitivity analysis under Item 1202(b), for several reasons. First and most importantly, historical prices are a known quantity and reporting on this basis provides information that can be readily compared between different companies and over multiple years.¹³ Proved reserve reporting using historical prices is a conservative approach that gives investors confidence in the numbers being reported.

Using speculative future prices, on the other hand, would introduce uncertainty and potential volatility into the reporting, which we do not believe would be helpful for investors. In fact, we believe such disclosure could be misleading. Price forecasts are subject to considerable uncertainty. While ExxonMobil tests its project economics to ensure they will be robust under a wide variety of possible future circumstances, we do not make predictions or forecasts of future oil and gas prices. If reserves determined on a speculative price were included in our SEC filings, we believe such disclosure could potentially mislead investors, or give such prices greater weight in making investment decisions than would be warranted.

We are also concerned that providing the optional sensitivity disclosure could enable our competitors to infer commercial information about our projects, resulting in commercial harm to ExxonMobil and our shareholders. We note that none of our key competitors to our knowledge provide the Item 1202(b) sensitivity disclosure.

¹³ We note the rules under 1202(a) use an average of monthly prices over the year rather than a single "spot" price, thus helping to reduce the effects of short-term volatility that often characterize oil and gas prices.

Lastly, we note that even when sensitivity disclosure under Item 1202(b) is included in a filing, the price and cost assumptions must be ones the company believes are reasonable. This disclosure item is therefore not intended or permitted to be a vehicle for exploring extreme scenarios.

For all the above reasons, we do not believe including the sensitivity disclosure under Item 1202(b) in our SEC filings would be prudent or in the best interest of our shareholders.

9. Summary

In summary, ExxonMobil's *Outlook for Energy* continues to provide the basis for our long-term investment decisions. Similar to the forecasts of other independent analysts, our Outlook envisions a world in which populations are growing, economies are expanding, living standards are rising, and, as a result, energy needs are increasing. Meeting these needs will require all economic energy sources, especially oil and natural gas.

Our *Outlook for Energy* also envisions that governments will enact policies to constrain carbon in an effort to reduce greenhouse gas emissions and manage the risks of climate change. We seek to quantify the cumulative impact of such policies in a proxy cost of carbon, which has been a consistent feature of our *Outlook for Energy* for many years.

We rigorously consider the risk of climate change in our planning bases and investments. Our investments are stress tested against a conservative set of economic bases and a broad spectrum of economic assumptions to help ensure that they will perform adequately, even in circumstances that the company may not foresee, which provides an additional margin of safety. We also require that all significant proposed projects include a cost of carbon – which reflects our best assessment of costs associated with potential GHG regulations over the Outlook period – when being evaluated for investment. Our *Outlook for Energy* does not envision the "low carbon scenario" advocated by some because the costs and the damaging impact to accessible, reliable and affordable energy resulting from the policy changes such a scenario would produce are beyond those that societies, especially the world's poorest and most vulnerable, would be willing to bear, in our estimation.

In the final analysis, we believe ExxonMobil is well positioned to continue to deliver results to our shareholders and deliver energy to the world's consumers far into the future. Meeting the economic needs of people around the world in a safe and environmentally responsible manner not only informs our *Outlook for Energy* and guides our investment decisions, it is also animates our business and inspires our workforce.

10. Additional Information

There were additional information requests raised by some in the course of engagement with the groups with whom we have been dialoguing. These are addressed in the Appendix.

Appendix

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EXXONMOBIL PROVED RESERVES - AT DECEMBER 31, 2013

	United States	Canada/ S. Amer. (2)	Europe	Africa	Asia	Australia/ Oceania	Total	Worldwide	Canada/ S. Amer. (2)	Canada/ S. Amer. (2)	Total
				Crude Oil				Natural Gas Liquids (2)	Bitumen	Synthetic Oil	
Total liquids proved reserves (1) (millions of barrels)	2,338	284	273	1,193	3,308	155	7,551	1,479	3,630	579	13,239
 				Natural Gas							
lotal natural gas proved reserves (1) (billions of cubic feet)	26,301	1,235	11,694	867	24,248	7,515	71,860				71,860
Oil-Equivalent Total All Products (3) (millions of oil-equivalent barrels)	6,722	490	2,222	1,338	7,349	1,407	19,528	1,479	3,630	579	25,216

Proved Reserves Distribution (4)

(percent, oil equivalent barrels)



- (1) Source: ExxonMobil 2013 Form 10-K (pages 103 and 106).
- (2) Includes total proved reserves attributable to Imperial Oil Limited, in which there is a 30.4 percent noncontrolling interest. Refer to ExxonMobil 2013 Form 10-K (pages 103, 104, and 106) for more details.
- (3) Natural gas is converted to oil-equivalent basis at six million cubic feet per one thousand barrels.
- (4) Source: ExxonMobil 2013 Financial and Operating Review (page 22).

EXXONMOBIL RESOURCE BASE – AT DECEMBER 31, 2013 (1)



Billion Oil-Equivalent Barrels (BOEB)

(1) Source: 2013 ExxonMobil Financial & Operating Review (page 21) and 2014 Analyst Meeting (slide 49).

Note: ExxonMobil's resource base includes quantities of oil and gas that are not yet classified as proved reserves under SEC definitions, but that we believe will ultimately be developed. These quantities are also not intended to correspond to "probable" or "possible" reserves under SEC rules.
EXXONMOBIL OIL & GAS PRODUCTION OUTLOOK (1)



- Total production outlook
 - 2014: Flat
 - 2015 2017: up 2-3% per year
- Liquids outlook
 - 2014: up 2%
 - 2015 2017: up 4% per year
- Gas outlook
 - 2014: down 2%
 - 2015 2017: up 1% per year

⁽¹⁾ Source 2014 ExxonMobil Analyst Meeting (slide 32).

^{(2) 2013} production excludes the impact of UAE onshore concession expiry and Iraq West Qurna 1 partial divestment. Production outlook excludes impact from future divestments and OPEC quota effects. Based on 2013 average price (\$109 Brent).

EXXONMOBIL CAPEX OUTLOOK (1)



- Expect to invest \$39.8B in 2014
 - Reduced Upstream spending
 - Selective Downstream and Chemical investments
- Average less than \$37B per year from 2015 to 2017

(1) Source 2014 ExxonMobil Analyst Meeting (slide 33).

EXXONMOBIL OIL & GAS EXPLORATION AND PRODUCTION EARNINGS AND UNIT PROFITABILITY (1)

The revenue, cost, and earnings data are shown both on a total dollar and a unit basis, and are inclusive of non-consolidated and Canadian oil sands operations.

	Total Revenues and Costs, Including Non-Consolidated Interests and Oil Sands					Revenues and Costs per Unit of Sales or Production (2)					
-		Canada/		-					Canada/		
	United	South				Australia/		United	South	Outside	
	States	America	Europe	Africa	Asia	Oceania	Total	States	America	Americas	Worldw ide
2013			(mi	llions of dolla	ars)			(dollars per unit of sales)			
Revenue											
Liquids	13,350	7,558	6,751	18,811	28,440	1,596	76,506	84.87	75.28	101.92	95.25
Natural gas	3,880	360	11,384	6	13,477	539	29,646	3.00	2.80	8.77	6.86
								(dollars per	roduction)		
Total revenue	17,230	7,918	18,135	18,817	41,917	2,135	106,152	46.20	63.93	78.86	69.66
Less costs:											
Production costs											
excluding taxes	4,742	3,965	3,318	2,396	2,423	654	17,498	12.72	32.02	8.56	11.48
Depreciation and depletion	5,133	989	2,050	3,269	2,635	334	14,410	13.76	7.99	8.07	9.46
Exploration expenses	413	386	260	288	997	92	2,436	1.11	3.12	1.59	1.60
Taxes other than income	1,617	94	4,466	1,583	9,146	427	17,333	4.33	0.74	15.21	11.37
Related income tax	1,788	542	4,956	6,841	14,191	202	28,520	4.79	4.38	25.50	18.72
Results of producing activities	3,537	1,942	3,085	4,440	12,525	426	25,955	9.49	15.68	19.93	17.03
Other earnings (3)	662	(495)	302	59	234	(118)	644	1.77	(4.00)	0.47	0.42
Total earnings, excluding											
power and coal	4,199	1,447	3,387	4,499	12,759	308	26,599	11.26	11.68	20.40	17.45
Power and coal	(8)	-	-	-	250	-	242				
Total earnings	4,191	1,447	3,387	4,499	13,009	308	26,841	11.23	11.68	20.64	17.61

Unit Earnings Excluding NCI Volumes (4) 18.03

(1) Source: ExxonMobil 2013 Financial and Operating Review (page 56).

- (2) The per-unit data are divided into two sections: (a) revenue per unit of sales from ExxonMobil's own production; and, (b) operating costs and earnings per unit of net oil-equivalent production. Units for crude oil and natural gas liquids are barrels, while units for natural gas are thousands of cubic feet. The volumes of crude oil and natural gas liquids production and net natural gas production available for sale used in this calculation are shown on pages 48 and 49 of ExxonMobil's 2013 Financial & Operating Review. The volumes of natural gas were converted to oil-equivalent barrels based on a conversion factor of 6 thousand cubic feet per barrel.
- (3) Includes earnings related to transportation operations, LNG liquefaction and transportation operations, sale of third-party purchases, technical services agreements, other nonoperating activities, and adjustments for noncontrolling interests.
- (4) Calculation based on total earnings (net income attributable to ExxonMobil) divided by net oilequivalent production less noncontrolling interest (NCI) volumes.

EXXONMOBIL

PRODUCTION PRICES AND PRODUCTION COSTS (1)

The table below summarizes average production prices and average production costs by geographic area and by product type.

	United	Canada/				Australia/	
	States	S. America	Europe	Africa	Asia	Oceania	Total
During 2013			(dollars per unit)				
Total							
Average production prices (2)							
Crude oil, per barrel	95.11	98.91	106.49	108.73	104.98	107.92	104.01
NGL, per barrel	44.24	44.96	65.36	75.24	61.64	59.55	56.26
Natural gas, per thousand cubic feet	3.00	2.80	9.59	2.79	8.53	4.20	6.86
Bitumen, per barrel	-	59.63	-	-	-	-	59.63
Synthetic oil, per barrel	-	93.96	-	-	-	-	93.96
Average production costs, per oil-equivalent barrel - total (3)	12.72	32.02	12.42	13.95	4.41	16.81	11.48
Average production costs, per barrel - bitumen (3)	-	34.30	-	-	-	-	34.30
Average production costs, per barrel - synthetic oil (3)	-	50.94	-	-	-	-	50.94

(1) Source: ExxonMobil 2013 Form 10-K (page 9)

- (2) Revenue per unit of sales from ExxonMobil's own production. (See ExxonMobil's 2013 Financial & Operating Review, page 56.) Revenue in this calculation is the same as in the Results of Operations disclosure in ExxonMobil's 2013 Form 10-K (page 97) and does not include revenue from other activities that ExxonMobil includes in the Upstream function, such as oil and gas transportation operations, LNG liquefaction and transportation operations, coal and power operations, technical service agreements, other nonoperating activities and adjustments for noncontrolling interests, in accordance with Securities and Exchange Commission and Financial Accounting Standards Board rules.
- (3) Production costs per unit of net oil-equivalent production. (See ExxonMobil's 2013 inancial & Operating Review, page 56.) The volumes of natural gas were converted to oil-equivalent barrels based on a conversion factor of 6 thousand cubic feet per barrel. Production costs in this calculation are the same as in the Results of Operations disclosure in ExxonMobil's 2013 Form 10-K (page 97) and do not include production costs from other activities that ExxonMobil includes in the Upstream function, such as oil and gas transportation operations, LNG liquefaction and transportation operations, coal and power operations, technical service agreements, other nonoperating activities and adjustments for noncontrolling interests, in accordance with Securities and Exchange Commission and Financial Accounting Standards Board rules. Depreciation & depletion, exploration costs, and taxes are not included in production costs.

Seriatim of crudes processed in US in 2012



Exhibit 27



CALIFORNIA

REPORT: NATURAL GAS BANS WILL DISPROPORTIONATELY IMPACT LOW INCOME CALIFORNIANS

BY MENYAE CHRISTOPHER JUL. 13, 2020 Leave a Comment

20 Shares

Natural gas bans will hit California hard, disproportionately impacting the poorest of Californians, according to a new Foundation for Research on Equal Opportunity <u>report</u>.

Despite natural gas rates being at their lowest levels <u>since 1999</u>, several municipalities across California have proposed or implemented bans on the use of the resource in homes and businesses. As report author Robert Bryce explains:

"Restrictions and bans on natural gas are being labeled as essential elements of that climate policy. But those bans are, in fact, regressive taxes that will have an almost undetectable impact on global climate. **If California wants to avoid increasing the number of its people living in poverty, it must strive to keep energy affordable**." (emphasis added) **A Net Price Increase**

Californians pay one of the highest electricity rates in the United States. In 2015, the average resident <u>spent</u> 2.7 percent of their salary on electricity and paid approximately \$1,700 annually to keep their lights on. This percentage has been increasing since 2008 Prices <u>have climbed</u> 30 percent over the last decade as <u>successive governors</u> have mandated that an increasing share of electricity is sourced from renewables.





California's electricity rates are rapidly rising. Over the past decade, California's electricity rates increased at a rate that was six times as fast as the rate seen in the rest of the U.S. over that time frame. (Source: M. Nelson & M. Shellenberger / Environmental Progress, Energy Information Administration; Graphic: FREOPP)

According to Bryce, if California continues this "electrify everything" trend, consumers will be forced to buy electricity, which is more expensive than natural gas on an energy-equivalent basis*:

"Assuming a 100 percent efficient use of electricity, California residents are paying about \$56 per million Btu (MMBtu) for the electricity they consume. In 2019, the average residential price of natural gas in California was \$13.32 per MMBtu. Assuming that fuel is consumed in an appliance or heater that is 95 percent efficient, the cost of natural gas to residential consumers is about \$14 per MMBtu. **Thus, by banning gas-fired appliances, California politicians are forcing homeowners and renters to pay four times as much for their energy as they would if they were consuming natural gas directly."** (emphasis added)

An Undue Burden

The cities that have passed these natural gas bans have the ability to stomach this price increase without much worry because they are some of the wealthiest regions in the nation. <u>Berkley</u>, the first city to ban natural gas hookups, has a median household income of \$80,912 and a per capita income of \$48,229, <u>Encinitas</u> earns \$113,175 and \$62,251, respectively, <u>Los Altos</u> has six figure incomes for both categories, and the list continues.

On average, these cities have an 80 percent higher income than the United States and have a 46 percent higher income than the rest of California.

Meanwhile, 18.1 percent of residents in the sunshine state live in poverty and 33 percent are classified as low income. According to <u>a study by</u> Energy Efficiency For All, any modest electricity rate increase would threaten these vulnerable households with mass shut-offs and economic dislocations.

7/27/2020

Report: Natural Gas Bans Will Disproportionately Impact Low Income Californians

The higher costs to these individuals would only reduce already low levels of disposable incomes and directly threaten their well bring.

The Gas Grid

In 2019, California Gridwords released a <u>report</u> detailing how a declining customer base would cause a negative feedback loop as rates increase for those still on the gas grid. Their payments would go to maintaining a system whose costs remain steady, despite reduced gas connections. As Bryce details:

"The declining customer base will amplify rate increases for the remaining gas customers...Widely dispersed building electrification in response to individual customer economics typically will not result in meaningful system cost reductions, as no new infrastructure or existing maintenance needs can be avoided."

The report estimates that rapid reductions in gas consumption would cause rates to double or triple for those connected to the grid, with a special focus on the lower income and disadvantaged communities who cannot voluntarily leave the grid and accept the higher electricity prices.

"A primary issue affecting low-income and disadvantaged communities discussed in our stakeholder engagement was that the high upfront cost to convert to all-electric service may force low-income and otherwise vulnerable customers to remain on the gas distribution system and, as wealthier customers electrify and leave the gas system, those left behind would face ever-increasing gas rates."

The potential spike in prices has spurred The California Energy Commission to consider <u>imposing an exit fee</u> of \$5 a month on individuals moving into all-electric buildings. This fee would be combined with tax dollars to "<u>cover a</u> <u>share</u> of the gas system revenue requirement" to mitigate the necessary rate increases.

So even if individuals leave the grid, they will still be responsible for its upkeep. They will have to pay the cost of not being on the grid with electricity higher prices, and they will pay the price of leaving the grid through their tax dollars and collected fees.

The Cost To Transition

The goal in the natural gas shut offs is to decarbonize buildings by becoming all electric. But the cost for this switch is extremely high and too often not talked.

Decarbonizing buildings would require retrofitting apartment buildings with electric appliances and upgrading their circuit breakers to handle the additional power requirements. As one <u>ClimateWorks Foundation employee</u>, Californian Justin Guay, that cost is approximately \$13,100 for a heat pump installation and duct work, and \$2,800 for a feeder line and electric panel. The \$15,000 mentioned to upgrade his house does not include the cost of replacing the water heater, stovetop or dryer.

In Guay's switch to all electric, he noted the irony that he was more reliant on the electricity grid. As houses electrify, they become more reliant on the grid to feed electric appliances that were previously gas powered.

Couple this increased draw on the electric grid with a growing population and the increased energy consumption <u>projected by California Energy Commission</u>, and natural gas use is simply shifted upstream to power generation to meet demand. The change in end use from home to power plant results in nearly a 50 percent

decrease in its efficiency. 92 percent of natural gas <u>is delivered</u> as energy after being transmitted, while 62 percent of its energy potential is lost during power generation.



Source

Conclusion

According to Bryce, there are no winners here. As individuals leave the gas grid, the poor will face higher prices on the grid and higher electricity prices when they switch. They will be threatened with a higher cost of living that could force them from their homes. Lower income individuals are priced out of neighborhoods where they could build equity because of higher electric costs. Middle class and wealthy individuals pay four times more for electricity, diminishing disposable income, while still paying for a gas grid they are unable to connect to through municipal law.

The result of California's efforts? A reduction of global emissions by less than half of one percent.

*This statement was updated following clarification from the report author.

Exhibit 28

<u>Mobil</u>

Motorsports

- The heritage
- The inside track
- NASCAR
- Porsche Mobil 1 Supercup
- Grand Prix racing
- <u>Corvette Racing</u>
- Grassroots
- Mobil 1 Racing oils
- Where to buy

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For the fourth straight race season, we're spotlighting environmental and sustainability awareness as an official NASCAR® Race to GreenTM partner, sharing the benefits of new Mobil 1TM Annual Protection motor oil with the motorsports industry and consumers.



Supporting "Race to Green" with Mobil 1 Annual Protection oil

Mobil 1^{TM} , the <u>Official Motor Oil of NASCAR®</u>, is showcasing the breakthrough lubricant technology of its latest product by supplying the newest NASCAR® fleet and service vehicles with Mobil 1 Annual Protection oil, which allows drivers to go one full year – or 20,000 miles, whichever comes first – between oil changes.

By allowing motorists to drive longer between oil changes, Mobil 1 Annual Protection oil helps to safely reduce the amount of used oil generated through regular oil changes. In fact, if every driver in the U.S. extended their oil change interval to one full year by using Mobil 1 Annual Protection, this could reduce up to 587 million gallons of used oil.*

"As the Official Motor Oil of NASCAR, we take pride in supporting its green initiatives and helping make an environmental impact. We are once again thrilled to support Race to Green this year with Mobil 1 Annual Protection, which helps reduce used oil and enables cars to go longer between oil changes."

- Kai Decker, global motorsports manager at ExxonMobil

The sustainability initiatives of the Mobil 1 brand extend beyond NASCAR® Race to Green[™]. Since 2004, we have supported Earth 911 to help consumers with the challenge of properly disposing of used oil. Through its website, <u>www.Earth911.com</u>, consumers can find information about reducing, reusing and recycling their used products, and identify nearby locations specifically for used oil collection. For more tips on responsible used oil recycling, visit our <u>used motor oil recycling page</u>.



Where to buy new Mobil 1 Annual Protection oil

Use our locator tool to find stores that carry Mobil 1 Annual Protection oil.

Find a location

*Calculation based on average U.S. vehicle engine oil sump size, average U.S. oil change interval and average U.S. annual driving distance. Assumes new vehicles under warranty follow OEM-recommended oil change interval. Mobil 1 Annual Protection is guaranteed to protect for one full year or 20,000 miles, whichever comes first.



Mobil 1TM Annual Protection

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Ultimate protection in 1 change

See the engine teardown results for Mobil 1TM Annual Protection, the motor oil that protects engines for one full year or 20,000 miles, whichever comes first.

Energy lives hereTM

Exhibit 29



UNITED STATES SECURITIES AND EXCHANGE COMMISSION FORT WORTH REGIONAL OFFICE 801 CHERRY STREET SUITE 1900 FORT WORTH, TEXAS 76102-6882

August 2, 2018

By Electronic Mail

David R. Woodcock Jones Day 2727 North Harwood Street Dallas, Texas 75201 dwoodcock@jonesday.com

Re: In the Matter of Exxon Mobil Corporation (FW-04042)

Dear Mr. Woodcock:

We have concluded the investigation referenced above as to Exxon Mobil Corporation. Based on the information we have as of this date, we do not intend to recommend an enforcement action by the Commission against Exxon. We are providing this notice pursuant to Securities Act Release No. 5310,¹ which states in part that this notice "must in no way be construed as indicating that the party has been exonerated or that no action may ultimately result from the staff's investigation." We appreciate your assistance with this matter.

Sincerely,

SL_1 5}_1-

Shamoil T. Shipchandler Director | Fort Worth Regional Office U.S. Securities and Exchange Commission

1

The full text of Release No. 5310 can be found at http://www.sec.gov/divisions/enforce/wells-release.pdf.

Exhibit 30

Nancy E. Glowa City Solicitor

Arthur J. Goldberg Deputy City Solicitor

Vali Buland First Assistant City Solicitor



CITY OF CAMBRIDGE

Office of the City Solicitor 795 Massachusetts Avenue Cambridge, Massachusetts 02139

October 17, 2016

Lisa C. Peterson Acting City Manager City Hall Cambridge, MA 02139

RE: City Council Order No. 0-5 dated June 13, 2016 Re: Gas Pump Labels Containing Information About Fossil Fuel Consumption

Dear Ms. Peterson:

In City Council Order No. 0-5 (dated June 13, 2016, a copy of which is attached hereto for reference) (hereinafter, "Council Order"), the City Council requested the City Manager to "confer with the appropriate City departments to determine the feasibility of requiring gas pump labels with information about the environmental impact of burning fossil fuels at all gas stations in the City[.]" The Council Order states that "[r]equiring these labels at [gas pumps] will provide consumers with information about the impact of fossil fuel consumption, which may encourage them to use alternative forms of transportation where appropriate[.]"¹

In order to make a gas pump handle warning label requirement have the force of law and to enforce any violations thereof, the City Council will need to enact an ordinance establishing this requirement. As will be discussed below, if the City of Cambridge ("City") enacts an ordinance requiring the placement of labels on gas pump handles that contain information about the environmental effects of burning fossil fuels, the ordinance could be found to invoke the First Amendment, but arguably will not violate it depending on what information is required to be included in the labels. Also, this type of ordinance likely will not violate the Commerce Clause, and likely will not be preempted by existing federal or state laws.

Assistant City Solicitors

Paul S. Kawai Samuel A. Aylesworth Keplin K. U. Allwaters Anne Sterman Sean M. McKendry

¹ The Council Order also notes that North Vancouver, Berkeley and San Francisco have recently implemented laws requiring such labels on gas pump handles. We have conferred with attorneys from the City of Berkeley and City of San Francisco Law Departments, and to date, neither city has enacted a law requiring the placement of warning labels on gas pumps handles. Rather, each City is currently considering such laws. Additionally, we understand that the City of Seattle has not passed but is also considering such a law.

A. First Amendment Concerns.

i. Requiring the Placement of Warning Labels Concerning the Environmental Effects of Burning Fossil Fuels on Gas Pump Handles Will Likely Constitute Compelled Commercial Speech Under the First Amendment.

The Supreme Court has recognized that laws requiring the disclosure of specific information "may be as violative of the First Amendment as prohibitions on speech." Zauderer v. Office of Discipli. Counsel of Sup. Ct. of Ohio, 471 U.S. 626, 650 (1985). Thus, a City ordinance requiring the placement of labels on gas pump handles containing information about the environmental effects of burning fossil fuels will be subject to the protections of the First Amendment as it will amount to the City compelling speech from gas station operators and franchisors (if applicable).

compelled by this ordinance will The speech likely be considered "commercial speech," as it will be provided to consumers in connection with a proposed commercial transaction (i.e., purchasing gas) with the intent of encouraging consumers not to engage in said transaction (i.e., encouraging consumers to use alternative transportation instead of purchasing gas). See New York Rest Ass'n v. New York City Bd. of Health, 556 F.3d 114, 131-34 (2d Cir. 2009); El Dia, Inc. v. P.R. Dept. of Consumer Affairs, 413 F.3d 110, 115 (1st Cir. 2005); Consol. Cigar Corp. v. Reilly, 218 F.3d 30, 54-55 (1st Cir. 2000) rev'd other holdings, Lorillard Tobacco Co. v. Reilly, 533 U.S. 525, 539 (2001).

ii. The Suggested Ordinance Likely Will not Violate the First Amendment if the Information Required to be Stated in the Gas Pump Warning Labels is "Purely Factual and Uncontroversial."

In analyzing laws that compel commercial speech in the context of the First Amendment, different standards apply depending on the nature of the compelled speech. Here, if the ordinance requires the label to contain "purely factual and uncontroversial information," it likely will not violate the First Amendment as long as: (1) the compelled speech is "reasonably related" to a legitimate governmental interest; and (2) the ordinance is not unjustified or unduly burdensome so that it chills protected commercial speech. Zauderer, 471 U.S. at 650-51; Safelite Group, Inc. v. Jepsen, 764 F.3d 258, 261-62 (2d Cir. 2014); Cook v. Gates, 528 F.3d 42, 55 (1st Cir. 2008); Pharm. Care Mgmt. Ass'n, 429 F.3d at 297-98, 310 n. 8, 316.

Thus, if the ordinance requires the warning labels to contain information identifying what pollutants are emitted from motor vehicles as a result of burning fossil fuels, it will likely pass constitutional muster. This information will be "purely factual and uncontroversial," and "reasonably related" to the legitimate governmental interest in reducing pollution and protecting the environment as it will encourage consumers to use alternative forms of transportation where appropriate. Int'l Paper Co. v. Town of Jay, 928 F.2d 480, 485 (1st Cir. 1991). Further, this type of warning will not be unjustified or unduly burdensome so that it chills protected commercial speech as the warning label (presumably) will not physically limit gas station operators from placing advertisements on other portions of gas pumps. See Dwyer v. Cappell, 762 F.3d 275, 283-84 (3d Cir. 2014); Consol. Cigar Corp., 218 F.3d at 54-55 rev'd other holdings, Lorillard Tobacco Co., 533 U.S. at 539.

iii. It is not Clear Whether the Suggested Ordinance will be found to Violate the First Amendment if the Gas Pump Warning Labels are Required to Display Non-factual and/or Controversial Information.

Neither the Supreme Court nor the First Circuit have established what level of scrutiny applies to a law that compels commercial speech containing non-factual and/or controversial information (*e.g.*, burning fossil fuels contributes to climate change).² In light of how other courts have reviewed such laws, a Massachusetts court will likely analyze this type of ordinance under intermediate scrutiny or strict scrutiny to determine whether it violates the First Amendment.³

a.If the Suggested Ordinance Requires Gas Pump Warning Labels to Display Non-factual and/or Controversial Information, it Arguably may be found not to Violate the First Amendment if the Ordinance is Analyzed Under Intermediate Scrutiny.

If a court determines that intermediate scrutiny is the proper standard of review, the court will need to determine whether the compelled commercial speech is false, deceptive or misleading, or whether it proposes an unlawful activity. <u>Mass. Ass'n of Private Career Schools</u>, 2016 WL 308776 at *7. If the compelled commercial speech is not false, deceptive or misleading, and does not propose an unlawful activity, three (3) additional inquiries need to be made: (1) whether the asserted governmental interest is substantial; (2) whether the regulation directly advances said governmental interest; and (3) whether the regulation is not more extensive than is necessary to serve that interest. <u>Id.</u> at *8.

Under this test, a warning indicating that the burning of fossil fuels contributes to climate change will arguably not be found to be false, deceptive or misleading, and will not encourage unlawful activity. <u>Massachusetts v. E.P.A.</u>, 549 U.S. 497, 521-24 (2007) ("Judged by any standard, U.S. motor-vehicle emissions make a meaningful contribution to greenhouse gas concentrations and hence . . . to global warming."); <u>see generally</u> Endanger. Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66496 (Dec. 15, 2009). Additionally, the City's asserted interest in enacting such an ordinance will be substantial as reducing pollution is a substantial governmental interest. <u>See Grace United Methodist Church v. City of Cheyenne</u>, 451 F.3d 643, 656-58 (10th Cir. 2006); <u>Nat'l Elec. Mfr. Ass'n v. Sorrell</u>, 272 F.3d 104, 115 n.6 (2d Cir. 2001).

² Even if it can be established that burning fossil fuels contributes to climate change, this will likely be considered controversial information given the current national debate over climate change. <u>Compare</u> Chelsea Harvey, <u>Human-caused climate changes has been happening for a lot longer than we thought scientists say</u>, Wash. Post, Aug. 24, 2016, <u>available at https://www.washingtonpost.com/news/energy-environment/wp/2016/08/24/human-caused-climate-change-has-been-happening-for-a-lot-longer-than-we-thought-scientists-say/?utm_term=.1310109408ba, <u>with Matt</u> Ridley & Benny Peiser, <u>Your Complete Guide to the Climate Change Debate</u>, Wall St. Journal, Nov. 27, 2015, <u>available at http://www.wsj.com/articles/your-complete-guide-to-the-climate-debate-1448656890</u>.</u>

³ The few federal courts that have addressed such laws have varied on what level of scrutiny applies. <u>See Safelite Group, Inc.</u>, 764 F.3d at 261-266 (applying intermediate scrutiny); <u>Mass. Ass'n of Private Career Schools v. Healey</u>, 2016 WL 308776, *15-16, 21 (D. Mass. 2016) (same); <u>Entm't Software Ass'n v. Blagojevich</u>, 469 F.3d 641, 651-53 (7th Cir. 2006) (applying strict scrutiny). Although the District of Massachusetts applied intermediate scrutiny to a regulation that compelled potentially non-factual commercial speech in <u>Mass. Ass'n of Private Career Schools</u>, this case is only persuasive authority, rather than binding authority.

Next, the warning label requirement will directly advance the City's interest in reducing pollution as the compelled speech will be delivered to listeners at the point where it is most likely to affect them— at the location where they purchase gas. See Discount Tobacco City & Lottery, Inc. v. United States, 674 F.3d 509, 543 (2012); see also Lorillard Tobacco Co., 533 U.S. at 546. Lastly, this ordinance arguably will not be more extensive than is necessary to serve the City's interest in reducing pollution as the ordinance will not prohibit gas station operators from using the rest of the pump itself to place advertisements from third parties, or their own factual information and/or opinions concerning the information provided in the required warning label. See Greater New Orleans Broadcas. Ass'n v. United States, 527 U.S. 173, 188 (1999).

Accordingly, if the suggested ordinance requires gas pump warning labels to contain information about climate change, it will arguably not violate the First Amendment if a court determines intermediate scrutiny is the proper standard of review.

b.If the Suggested Ordinance Requires the Gas Pump Warning Labels to Display Non-factual and/or Controversial Information, it will Likely be found to Violate the First Amendment if the Ordinance is Analyzed Under Strict Scrutiny.

If a court determines that strict scrutiny is the proper standard of review, the City will have to establish that the suggested ordinance is narrowly tailored to promote a "compelling" governmental interest. <u>Wooley v. Maynard</u>, 430 U.S. 705, 715-16 (1977); <u>Entm't Software Ass'n</u>, 469 F.3d at 646, 653. A law is not narrowly tailored if a less restrictive alternative would serve the government's purpose. <u>Entm't Software Ass'n</u>, 469 F.3d at 646.

Although some courts have recognized that reducing pollution is a compelling governmental interest, it is doubtful that the City will be able to establish that the ordinance is narrowly tailored to serve this interest as requiring the placement of warning labels on gas pump handles containing information about climate change likely is not the "least restrictive" method of advancing this purpose.⁴ Thus, if the suggested ordinance is analyzed under strict scrutiny, it will likely be found to violate the First Amendment.

B. <u>Requiring the Placement of Warnings Concerning the Burning of Fossil Fuels on Gas</u> Pump Handles Likely will not be found to Violate the Commerce Clause.⁵

States and municipalities can violate the Commerce Clause in the Constitution, Art. I, § 8, cl. 3, through the "Dormant Commerce Clause," which "prohibits states from acting in a manner that burdens the flow of interstate commerce." <u>Pharm. Research and Mfrs. of Am. v. Concannon</u>, 249 F.3d 66, 79 (1st Cir. 2000). A state law invokes the Dormant Commerce Clause if it does one of the following: (1) it has an "extraterritorial reach," and "directly controls commerce occurring

⁴ For example, the City could disseminate information about the connection between burning fossil fuels and climate change to residents. This would not affect the commercial speech rights of gas station operators and franchisors (if applicable), and would advance the City's interest in reducing pollution caused by the burning of fossil fuels.

⁵ Many of the First Amendment cases we reviewed also contained Dormant Commerce Clause analyses. Thus, it is prudent to analyze whether the suggested ordinance will violate the Dormant Commerce Clause.

wholly outside the boundaries of a State"; (2) it discriminates against interstate commerce; or (3) it "regulates evenhandedly and has only incidental effects on interstate commerce."⁶ Id. at 79-80.

i. An Ordinance Requiring Gas Station Operators in Cambridge to Place Warning Labels on Gas Pump Handles Likely will not have an Extraterritorial Reach.

"[A] state statute is a per se violation of the Commerce Clause when it has an 'extraterritorial reach," which occurs "[w]hen a state statute regulates commerce wholly outside the state's borders or when the statute has a practical effect of controlling conduct outside of the state." Id. at 79. An ordinance requiring the placement of warning labels on gas pump handles in the City will regulate activity wholly within Cambridge, and thus, will not interfere with commerce outside of Massachusetts. See id. at 82. Thus, the suggested ordinance likely will not have an extraterritorial reach.

ii. It is Unlikely that the Suggested Ordinance will Discriminate Against Interstate Commerce.

"[A] state regulation that discriminates against interstate commerce on **its face**, in purpose, or in effect is highly suspect and will be sustained only when it promotes a legitimate state interest that cannot be achieved through any reasonable nondiscriminatory alternative." <u>Cherry Hill</u> <u>Vineyard, LLC v. Baldacci</u>, 505 F.3d 28, 33 (1st Cir. 2007) (emphasis added).

First, the suggested ordinance will likely be determined to be facially neutral, rather than facially discriminatory, as it will apply to all gas station operators in the City (instead of explicitly discriminating against interstate commerce by distinguishing between in-state and out-of-state commerce). See Am. Beverage Ass'n v. Snyder, 735 F.3d 362, 370-71 (6th Cir. 2013); Rocky Mountain Farmers Union v. Corey, 730 F.3d 1070, 1089 (9th Cir. 2013). Next, the ordinance will not have a discriminatory purpose as the early legislative history of this suggested law (*i.e.*, the Council Order) indicates that the purpose of the law will be to encourage consumers to use alternative transportation where appropriate in order to reduce pollution and protect the environment, as opposed to discriminating against interstate commerce. See Alliance of Auto Mfrs., 430 F.3d at 37.

Lastly, as the City has not yet enacted an ordinance regarding gas pump handle warning labels, it is doubtful that someone challenging said ordinance after its initial enactment will be able to establish that it has a discriminatory effect on interstate commerce as there will be no evidence of a discriminatory effect. See Cherry Hill Vineyard, LLC, 505 F.3d at 36, 37. Further, even after this ordinance is enacted, it is unlikely that one will be able to establish that the law has a discriminatory effect as it will apply to all gas station operators in Cambridge. <u>Cf. Constr. Materials Recycling Ass'n Issues and Educ. Fund, Inc. v. Burack</u>, 686 F. Supp. 2d 162, 170 (D.N.H. 2010).

⁶ The Dormant Commerce Clause can also be invoked by municipal laws. <u>See Houlton Citizens' Coalition v. Town of Houlton</u>, 175 F.3d 178, 188-89 (1st Cir. 1999).

Accordingly, an ordinance requiring the placement of warning labels on gas pump handles containing information about the environmental effects of burning fossil fuels likely will not discriminate against interstate commerce.

iii. The Suggested Ordinance Will Likely Regulate Evenhandedly and Have Only Incidental Effects on Interstate Commerce.

"When a state statute regulates evenhandedly and has only incidental effects on interstate commerce, that statute will be upheld unless the burden on interstate commerce is clearly excessive in relation to the putative local benefits." <u>Pharm. Research and Mfrs. of Am.</u>, 249 F.3d at 83 (internal quotation marks omitted). In analyzing a statute that regulates evenhandedly, courts balance the following factors: (1) the nature of the putative local benefits advanced by the statute; (2) the burden the statute places on interstate commerce; and (3) whether the burden is "clearly excessive" as compared to the putative local benefits. Id. at 83-84.

Here, the suggested ordinance will regulate evenhandedly as it will apply to all gas station operators in the City, and will only have an incidental effect on commerce as the ordinance will not discriminate against interstate commerce. The "putative local benefit" will be reducing pollution and protecting the environment, which, as previously noted, is a substantial governmental interest. The only burden that will arguably be imposed by this law will be its possible effects on the profits of gas station operators and their franchisors (if applicable), which is not enough to support an argument that a law violates the Commerce Clause. See id. at 83. Thus, this burden arguably will not be "clearly excessive" when compared to the benefit advanced by the ordinance.

Accordingly, in balancing these factors, a court will likely determine that the suggested ordinance does not violate the Dormant Commerce Clause.

C. The Suggested Ordinance Likely Will not be Preempted by Federal Law.

The only federal laws and regulations we have found that concern the placement of signs and/or labels on gas pumps are 15 U.S.C. §§ 2801-2841, 16 CFR 306, 40 CFR 80.35, 80 CFR 80.1501 and 26 CFR 48.4082-2. First, 15 U.S.C. §§ 2821-2824 governs petroleum marketing practices. In particular, 15 U.S.C. § 2822(c) requires retailers of "automotive fuel" to display "at the point of sale to ultimate purchasers of automotive fuel, the automotive fuel rating of such fuel" Additionally, pursuant to 15 U.S.C. § 2823(c), the Federal Trade Commission promulgated 16 CFR 306, which includes requirements related to the certification and labeling of fuel ratings. Of note, 16 CFR 306.10 requires the placement of fuel rating labels on gas pumps, and 16 CFR 306.12 establishes the specifications of said labels. Next, 40 CFR 80.35 and 40 CFR 80.1501 were promulgated by the Environmental Protection Agency, and require specific statements to be posted on gas pumps that dispense oxygenated gas and ethanol blended gas, respectively. 26 CFR 48.4082-2 was promulgated by the Internal Revenue Service, and requires fuel retailers, if applicable, to display a notice concerning the use of dyed diesel fuel.

It is unlikely that a City ordinance requiring the placement of labels on fuel pump handles providing information about the effects of burning fossil fuels on the environment will be preempted by any of these federal laws. First, the only one of these laws that contains an express preemption provision is 15 U.S.C. §§ 2801-2841. See Grant's Dairy—Maine, LLC v. Comm'r of Me. Dept. of Agric., Food & Rural Res., 232 F.3d 8, 15 (1st Cir. 2000) (stating express preemption principles). More specifically, 15 U.S.C. § 2824(a) states:

To the extent that any provision of this subchapter applies to any act or omission, no State or any political subdivision thereof may adopt or continue in effect, except as provided in subsection (b) of this section, any provision of law or regulation with respect to such act or omission, unless such provision of such law or regulation is the same as the applicable provision of this subchapter.

The few federal cases that have interpreted this provision in the context of preemption have recognized that 15 U.S.C. § 2824(a) preempts state laws only where a state law imposes requirements related to fuel rating disclosures and labeling. See Alvarez v. Chevron Corp., 656 F.3d 925, 934-35 (9th Cir. 2011); Johnson v. MFA Petroleum Co., 10 F. Supp. 3d 982, 990 (W.D. Mo. 2014); VP Racing Fuels, Inc. v. Gen. Petroleum Corp., 673 F. Supp. 2d 1073, 1082-83 (E.D. Cal. 2009). Here, the suggested City ordinance likely will not be preempted by 15 U.S.C. § 2824(a) as the information to be displayed in the warning labels will not concern fuel grade disclosures and labeling, and will be unrelated to a fuel's grade. Cf. VP Racing Fuels, Inc., 673 F. Supp. 2d at 1083.

Further, there likely will not be a conflict between the proposed City ordinance and any of the above referenced federal laws as it is doubtful that the ordinance will impose obligations on gas station operators that will make compliance with both the ordinance and the federal laws impossible. <u>See Grant's Dairy—Maine, LLC</u>, 232 F.3d at 15 (stating conflict preemption principles). Additionally, the regulatory schemes of each of the above referenced federal laws likely are not pervasive enough to warrant an inference that Congress did not intend states or municipalities to supplement them. Id, (stating field preemption principles).

D. The Suggested Ordinance Likely will not be Preempted by Massachusetts Law.

The only Massachusetts laws we have found that reference the placement of signs and/or labels on gas pumps are G.L. c. 94, §§ 295A-295CC, which governs the sale of gas in Massachusetts, and the regulations promulgated pursuant to these statutory sections, 202 CMR 2.06. In particular, G.L. c. 94, § 295C requires the placement of signs indicating the price of gas on gas "pump[s] or "other dispensing device[s]," and 202 CMR 2.06(1)-(2), (6) and (8)-(15) establish signage requirements related to: (1) the grade of gas; (2) whether cash or credit cards are accepted as payment; (3) whether gas pumps are located on multiple sides of a "dispensing device"; (4) alcohol content in fuel; and (5) pumps that dispense biodiesel and/or biomass diesel.

Nothing in G.L. c. 94, § 295C or 202 CMR 2.06 expressly limits the types of signs and/or labels that can be placed on gas pumps. Rather, G.L. c. 94, § 295C states: "No sign, advertising material or other display or product that is placed upon, above or around a pump or dispenser shall directly or indirectly obscure the [required] posted price sign" Accordingly, there does not appear to be any Massachusetts statute or regulation that will prohibit or preempt the City from enacting an ordinance requiring the placement of warning labels on gas pump handles. See

Yetman v. City of Cambridge, 7 Mass. App. Ct. 700, 702 (1979) (discussing preemption principles); School Comm. of Boston v. City of Boston. 383 Mass. 693, 701 (1981) (same).

CONCLUSION

Under current federal and state laws, it appears that the City would not be prohibited from enacting an ordinance requiring gas station operators to place warning labels on gas pump handles that contain information about the effects the burning of fossil fuels have on the environment. Notably, it appears there are no federal or state laws that will preempt this type of ordinance. Additionally, this type of ordinance likely will not violate the Commerce Clause.

The language mandated by the suggested ordinance will likely be considered compelled commercial speech and therefore, the ordinance will be subject to the protections of the First Amendment. Whether the ordinance will violate the First Amendment will depend on the specific language that is required to be included in the warning label. If the mandated language is "purely factual and uncontroversial," the ordinance likely will not be found to violate the First Amendment.

If the ordinance mandates warning labels that contain non-factual and/or controversial information, the ordinance will be reviewed under a stricter standard. Given the uncertainty of current federal precedent, however, it is not clear whether a court would analyze this type of ordinance under intermediate scrutiny or strict scrutiny. If a court applies intermediate scrutiny, the ordinance will likely pass constitutional muster. If a court applies strict scrutiny, the ordinance will likely be found to violate the First Amendment.

Very truly yours,

NEG/smm

Nancy E. Glowa

Exhibit 31

Kline, Scot

From: Sent: To: Cc:	Michael Meade «Michael.Meade@ag.hy.gov» Tuesday, March 22, 2016 4:51 PM Kline, Scot; Morgan, Wendy Lemuel Scolovic; Peter Washburn; Eric Soufer, Damien LaVera; Daniel Lavoie; Natalia Salgado: Brian Mahaeda
Subject:	RE: Climate Change Coalition

A couple of updates to report back to the group. First, after a follow up conversation with our AG. Al Gore will now be joining us for part of the day on 3/29. This will certainly add a little star power to the announcement!

We will also be joined by MA AG Healey, which will bring our total number of AG's to a grand total of 7. I'm waiting to hear back from New Mexico, which is our possible 8" Attorney General. On the staff side, a total of 26 states (including DC and USVI) will be joining us for the meetings.

From: Kline, Scot [mailto:scot.kline@vermont.gov] Sent: Tuesday, March 22, 2016 11:41 AM To: Michael Meade; Morgan, Wendy Cc: Lemuel Srolovic; Peter Washburn; Eric Soufer; Damien LaVera; Daniel Lavoie; Natalia Salgado; Brian Mahanna Subject: RE; Climate Change Coalition

Mike:

Looks good. One suggestion. We are thinking that use of the term "progressive" in the pledge might alienate some. How about "affirmative," "aggressive," "forceful" or something similar?

Thanks.

Scot

From: Michael Meade [mailto:Michael.Meade@ag.nv.gov] Sent: Monday, March 21, 2016 2:59 PM To: Kline, Scot <<u>scot.kline@vermont.gov</u>>; Morgan, Wendy <<u>wendy.morgan@vermont.gov</u>> Cc: Lemuel Srolovic <<u>Lemuel.Srolovic@ag.nv.gov</u>>; Peter Washburn <<u>Peter.Washburn@ag.nv.gov</u>>; Eric Soufer <<u>Eric.Soufer@ag.nv.gov</u>>; Damien LaVera <<u>Damien.LaVera@ag.nv.gov</u>>; Daniel Lavoie <<u>Daniel.Lavoie@ag.nv.gov</u>>; Brian Mahanna <<u>Brian.Mahanna@ag.nv.gov</u>>

Wendy and Scott,

Below are the broad goals and principles that we'd like to lay out as part of the coalition announcement next week. The filing of the brief and the defense of the EPA regs will highlight these principles. Let us know if you have any thoughts or edits to this. If it looks okay to you, i'll forward this around to the other offices when we have a draft release ready to go out. I'll also be asking the offices to contribute a quote from their respective AG's for the press release.

Let me know if you have any questions or comments.

Principles:

· Climate Change is Real

The evidence that global temperatures have been rising over the last century-plus is unequivocal.

Climate Change Pollution Is The Primary Driver

Natural forces do not explain the observed global warming trend.

People Are Being Harmed

Climate change represents a clear and present danger to public health, safety, our environment and our economy - now and in the future.

Immediate Action Is Necessary

Climate change - and its impacts - is worsening. We must act now to reduce emissions of climate change pollution to minimize its harm to people now and in the future.

Pledge:

We pledge to work together to fully enforce the State and federal laws that require progressive action on climate change and that prohibit false and misleading statements to the public, consumers and investors regarding climate change.

Support Progressive Federal Action; Act Against Federal Inaction

Support the federal government when it takes progressive action to address climate change, and press the federal government when it fails to take necessary action.

Support State and Regional Action

Provide legal support to progressive state and regional actions that address climate change, supporting states in their traditional role as laboratories of innovation.

Defend Progress

Serve as a backstop against efforts to impede or roll-back progress on addressing climate change.

Support Transparency And Disclosure

Ensure that legally-required disclosures of the impacts of climate change are fully and fairly communicated to the public.

Engage The Public

13

Raise public awareness regarding the impacts to public health, safety, our environment and our economy caused by climate change.

IMPORTANT NOTICE: This e-mail, including any attachments, may be confidential, privileged or otherwise legally protected. It is intended only for the addressee. If you received this e-mail in error or from someone who was not authorized to send it to you, do not disseminate, copy or otherwise use this e-mail or its attachments. Please notify the sender immediately by reply e-mail and delete the e-mail from your system.

Exhibit 32



NATIONAL

CONFIRMED: ROCKEFELLERS ADMIT FUNDING PAY-TO-PLAY ATTACK "JOURNALISM" AGAINST EXXON

BY KATIE BROWN, PHD DEC. 02, 2016

After over a year of continuous denial, two members of the Rockefeller family appeared this morning on national TV to own up to the fact that they specifically paid the Columbia School of Journalism and InsideClimate News to write hit pieces on ExxonMobil, in what can only be characterized as a pay-to-play attack on the company.

A segment that aired on <u>CBS This Morning with Charlie Rose</u> featured interviews with David Kaiser of the Rockefeller Family Fund and Valerie Rockefeller Wayne of the Rockefeller Brothers Fund, reporting:

"The charities [the Rockefellers] run funded investigations that appeared in the Los Angeles Times and InsideClimate News."

In yet another sign that the Rockefellers have suddenly decided to embrace their bankrolling of #ExxonKnew publically, NPR published <u>a column</u> over the weekend by Marcelo Gleiser who even attributed the hit pieces to the Rockefeller Family Fund, not InsideClimate or Columbia. As Gleiser put it,

"The investigative report from the RFF is quite clear in its findings."

This admission is especially striking considering that the Rockefeller foundations that are bankrolling this campaign – primarily the Rockefeller Brothers Fund and the Rockefeller Family Fund – have maintained that they have "hands-off" relationships with InsideClimate and Columbia, and therefore didn't exercise any editorial control over the results of their Exxon climate "investigations." As Lee Wasserman of the Rockefeller Family Fund said in an <u>interview</u> with *Reuters* last March,

"No specific company was targeted in our push to drive better public understanding and better climate policy."

That same month, InsideClimate News reported:

"Rockefeller Family Fund Director Lee Wasserman said the charity supports public interest journalism, including InsideClimate News, but **keeps at arm's length from the work being done**.

'We first learned about it when everybody else read about it,' Wasserman said. 'The information that was unearthed was stunning and struck us as beyond the pale of what a corporation interested in protecting the public interest would do. ... As a matter of good governance, we felt it imperative to sever our tie with the corporation.'"

7/29/2020

And, of course, InsideClimate's website <u>claims</u>: "Donors who support our award-winning environmental journalism do not have access to our editorial process or decision-making."

The Columbia School of Journalism has also denied that the Rockefellers had any say in what they've been up to. In fact, the <u>Columbia Journalism Review</u> interviewed Dean of the Columbia Graduate School of Journalism, Steve Coll, and reported the exchange this way:

"Both the [Los Angeles] Times and Coll have reiterated that the project's funders had a hands-off relationship with its journalism...In addressing those complaints in his written response to Exxon Mobil, Coll mentioned the energy giant's support of Columbia University research in other fields: 'You therefore understand that the issue is not who provided funding for this or any other Columbia University project, but whether the work is done independent of the funders...The fact is that this reporting was not subject to any influence or control by the funders, the *Times* maintained full editorial control over all that it chose to publish, and your letter provides no information to doubt that this is so.'" (emphasis added)

Coll went on to explain,

"It's similar to the ethics that had to be managed in the days when this kind of work was supported by commercial advertising," Coll says. "[Advertisers] were very financially important to the newspaper, but the publisher and the editor in the newsroom figured out how to build a wall between the advertisers and the work. And that's exactly what we have to do here: **We have to build a wall between the funders and the work. That's what I'm responsible for**." (emphasis added)

Failure to disclose

The Rockefellers haven't always been so forthcoming about their involvement in these hit pieces. In fact, when the Columbia stories appeared in the *Los Angeles Times* last year, there was <u>no mention</u> whatsoever that the Columbia School of Journalism was funded by Rockefellers. Only after Energy In Depth and other news outlets <u>called them</u> <u>out</u> did the outlet quietly add a correction noting the funding source, but that happened several months after the stories were published.

It wasn't just an oversight by the *LA Times*, either. Even the website of the Columbia Energy and Environment Reporting Fellowship <u>did not originally disclose its Rockefeller funding</u> according to an <u>archived copy of the page</u>. But once again, after they were called out, the fellowship's website was quietly updated to include its financial connections to the Rockefeller Family Fund and other #ExxonKnew organizations.

After this disclosure problem came to light, the Columbia Journalism Review <u>reported</u> that it raises ethical questions, specifically about funding sources for non-profit organizations that produce what many might mistake for objective reporting. As the CJR <u>explains</u>,

"But the practice also **raises questions of balance** in what subjects get reported, as well as **appropriate disclosure of the outside funders and their political leanings**. In the case of Columbia, The Energy and Environmental Reporting Project is **funded in part by a group of philanthropic organizations, at least one with a clear advocacy bent** on the issue. The **names of the funders were not listed** on the <u>two articles</u> when they were published by the Los Angeles Times, though they were **later added online**." (emphasis added) Some have even suggested that the Columbia School of Journalism stands to <u>lose</u> its once sterling reputation in the wake of this scandal.

Forced to come clean?

Considering all the things that the #ExxonKnew campaign has tried to keep hidden, owning up to bankrolling the entire #ExxonKnew effort was likely not in the original plan. But since they've been exposed to this great extent, they've pretty much had to come clean. That's why they're appearing on CBS This Morning and writing columns like the one that appeared in <u>New York Review of Books</u> in which, Lee Wasserman of Rockefeller Family Fund admitted that his organization "paid for a team of independent reporters from Columbia University's Graduate School of Journalism to try and determine what Exxon and other oil and gas companies had really known about climate science, and when."

This new strategy has put the spotlight on the family and revealed dissent among their ranks by those in the Rockefeller family that feel the campaign <u>against</u> Exxon is "deeply misguided." In the CBS segment today, <u>Ariana Rockefeller</u> of the Rockefeller Foundation (which is the flagship foundation and is separate from Rockefeller Family Fund and Rockefeller Brothers Fund) said the Rockefellers bankrolling #ExxonKnew "do not speak on behalf of all 200 family members." She also told the <u>New York Times</u> Rockefeller Brothers Fund and Rockefeller Family Fund's efforts are "counterproductive to our goal of protecting the environment by undermining Exxon's ongoing good work in clean and renewable energy."

The Rockefeller's decision to come clean as the masterminds behind the #ExxonKnew campaign has not had the effect they had hoped for. It has exposed a deep rift within their family and raised serious ethical questions about editorial control in non-profit journalism. In an interestingly timed email, InsideClimate News <u>announced</u> it is seeking donations "to ensure that our award-winning nonprofit news organization remains **fiercely independent** and courageously persistent." (emphasis added) That 'fierce independence' apparently doesn't apply when the Rockefellers are signing the checks.

Exhibit 33

IN THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF TEXAS FORT WORTH DIVISION

EXXON MOBIL CORPORATION,	§
	8
Plaintiff,	§
	§
V.	§
	8
ERIC TRADD SCHNEIDERMAN,	8
Attorney General of New York, in his	§
official capacity, MAURA TRACY	§
HEALEY, Attorney General of	8
Massachusetts, in her official capacity,	§
	§
Defendants.	§

Civil Action No. 4:16-CV-469-K

ORDER

After careful consideration of the parties' briefs regarding whether the Court has personal jurisdiction over Defendants Eric Tradd Schneiderman, Attorney General of New York, and Maura Tracy Healey, Attorney General of Massachusetts, the Court **TRANSFERS** this action, in the interest of justice, to the United States District Court for the Southern District of New York, Manhattan Division, pursuant to 28 U.S.C.

§ 1406(a) for all future proceedings.

Exxon Mobil Corporation ("Exxon") filed its First Amended Complaint for Declaratory and Injunctive Relief (Doc. No. 100) against Attorney General Schneiderman and Attorney General Healey because of their issuance of a subpoena and civil investigative demand ("CID") to investigate whether Exxon committed consumer and securities fraud. After initially cooperating with the subpoena, Exxon stopped producing documents to the Office of the New York Attorney General when Exxon began to believe Attorney General Schneiderman's investigation was biased and in bad faith. Exxon also believes that Attorney General Healey's investigation is pretextual in nature and has unconstitutional objectives. The CID issued by Attorney General Healey demands production of communications and documents relating to climate change that Exxon has produced or received over the last 40 years.

Exxon asserts that the attorneys general are conducting their investigations in an effort to get Exxon to change its policy position relating to climate change. Exxon brings several causes of action against Attorney General Schneiderman and Attorney General Healey which include: (1) Conspiracy; (2) Violation of Exxon's first and fourteenth amendment rights; (3) Violation of Exxon's fourth and fourteenth amendment rights; (4) Violation of Exxon's fourteenth amendment rights; (5) Violation of Exxon's rights under the Dormant Commerce Clause; (6) Federal preemption; and (7) Abuse of process.

The merits of each of Exxon's claims involve important issues that should be determined by a court, however, this Court is not the proper venue to rule on the merits of Exxon's claims. "The district court of a district in which is filed a case laying venue in the wrong division or district shall dismiss, or if it be in the interest of
justice, transfer such case to any district or division in which it could have been brought." 28 U.S.C.

§ 1406(a). The United States District Court for the Southern District of New York is the proper venue for this case because "a substantial part of the events or omissions giving rise to the claim occurred" in New York City, New York at the AGs United for Clean Power press conference on March 29, 2016. *See* 28 U.S.C. § 1391.

Exxon claims that the ultimate goal of the attorneys general is to silence everyone in the oil and gas industry from debating the climate change issue at any level. Exxon believes that the CID and the subpoena are being used as tools to cultivate the political goals of Attorney General Healey and Attorney General Schneiderman. One of the central reasons that Exxon believes that the subpoena and CID were issued to push a political agenda is because of events that occurred on the day of the AGs United for Clean Power press conference hosted by Attorney General Schneiderman, in New York City, New York. Exxon says that the actions of the attorneys general at, and before, the press conference indicate their investigations are politically motivated and that they are using the document production requests as a means to pressure Exxon to change its position in the policy debate about climate change.

According to emails presented to the Court regarding the planning of the AGs United for Clean Power press conference, the morning before the press conference the attorneys general attended a closed door meeting in New York City which included a presentation by a global warming activist, Dr. Peter Frumhoff, and a presentation by a prominent global warming litigation attorney, Mr. Matthew Pawa. After the closed door meeting, Attorney General Healey, Attorney General Schneiderman, several other states' attorneys general, and former Vice President Al Gore spoke at the AGs United for Clean Power press conference. At that press conference the attorneys general spoke about the negative effects of climate change and the importance of taking action in the fight against climate change. Attorney General Schneiderman reminded everyone of his ongoing investigation of Exxon and Attorney General Healey reiterated that companies in the fossil fuel industry, such as Exxon, must be held accountable for deceiving investors and the public. Attorney General Healey stated that there was a troubling disconnect between what Exxon knew about climate change and what Exxon told investors and the public regarding climate change. Exxon says that "[t]he statements of Attorney General Schneiderman, Attorney General Healey, Mr. Gore and others made clear that the press conference was a purely political event." A few weeks after the press conference, on April 19, 2016, Attorney General Healey issued her own CID to Exxon's registered agent in Massachusetts.

Exxon says the press conference and the meetings before the press conference show the actual reason why the attorneys general issued the CID and subpoena.

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They want to pursue their respective political agendas, silence Exxon, and violate other constitutional rights of Exxon. Exxon asserts that it is being investigated improperly by the attorneys general. The remarks made at the press conference by Attorney General Healey that singled out Exxon and that signaled what her investigation would uncover before she even issued the CID; Exxon says show the political nature of the investigation. Was the action by the attorneys general attempting to squelch public discourse by a private company that may not toe the same line as these two attorneys general? Are the two attorneys general trying to further their personal agendas by using the vast power of the government to silence the voices of all those who disagree with them?

The attorneys general say now that they are investigating Exxon because of two different periodicals published in the fall of 2015 (arguably trying to pursue the same climate change policy agendas as the attorneys general are). The periodicals state that starting in the late 1970s Exxon knew about and started researching the possibility of climate change. The Court is uncertain if it is common practice for attorneys general to begin to investigate a company after reading an article that accuses a company of possibly committing wrongdoing decades ago. What the Court does know is that Exxon has publicly acknowledged since 2006 the possible significant risks to society and ecosystems from rising greenhouse gas emissions, yet the attorneys general have only recently felt compelled to look further into Exxon's documents from the last 40

years to see if Exxon knew more than it shared with the public and investors about climate change.

Exxon offers evidence that the reason the attorneys general have chosen to act now is to achieve the goals at this time of an "Exxon campaign" to coincide with the 2016 national election. In January 2016, according to emails discussing the planning of the meeting, attorneys and activists met at the offices of the Rockefeller Family Fund in New York City, New York to discuss goals of an "Exxon campaign," which sought "to delegitimize [Exxon] as a political actor" and "to force officials to disassociate themselves from Exxon." According to emails from the planning process of the meeting at the Rockefeller Family Fund, Mr. Pawa, a prominent global warming litigation attorney who presented to the attorneys general before the AGs United for Clean Power press conference, and a group of climate change activists discussed goals of an "Exxon campaign" at the meeting in January 2016. In the emails discussing the planning of the meeting at the Rockefeller Family Fund provided to the Court (the existence of these remarks is not disputed by either Attorney General Healey or Attorney General Schneiderman), the goals of the "Exxon campaign" are:

> • To establish in the public's mind that Exxon is a corrupt institution that has pushed humanity (and all creation) towards climate chaos and grave harm.

- To delegitimize Exxon as a political actor.
- To force officials to disassociate themselves from Exxon, their money, and their historic opposition to climate progress, for example, by refusing campaign donations, refusing to take meetings, calling for a price on carbon, etc.
- To call into question climate advantages of fracking, compared to coal.
- To drive divestment from Exxon.
- To drive Exxon and climate change into the center of the 2016 election cycle.

Mr. Pawa, an attorney and climate change activist, and Mr. Frumhoff, a climate change activist and director of science and policy at the Union of Concerned Scientists, presented to the attorneys general two months later in the closed door meeting before the March 29, 2016 AGs United for Clean Power press conference in New York City. Mr. Pawa and Mr. Frumhoff have worked together in the past to seek change in climate change policy. In 2012, Mr. Pawa presented at a workshop organized by Mr. Frumhoff which discussed, among other things related to climate change, "the viability of diverse strategies, including the legal merits of targeting carbon producers (as opposed to carbon emitters) for U.S.-focused climate mitigation" and "strategies to win access to internal documents" of fossil fuel companies. While this Court is not aware of what exactly happened during the

closed door meeting before the AGs United for Clean Power press conference in March 2016, the draft agenda located in emails discussing the planning of the meeting provided to the Court stated that the meeting would include presentations on the "imperative of taking action now on climate change," presented by Mr. Frumhoff, and "climate change litigation," presented by Mr. Pawa.

The day after the closed door meeting, on March 30, 2016, Mr. Pawa emailed the Office of the New York Attorney General to ask how he should respond if asked by a reporter from *The Wall Street Journal* whether he attended the closed door meeting with the attorneys general. The Office of the New York Attorney General responded by instructing Mr. Pawa "to not confirm that you attended or otherwise discuss the event." Does this reluctance to be open suggest that the attorneys general are trying to hide something from the public?

The "Climate Change Coalition Common Interest Agreement" entered into by the Office of the New York Attorney General and the Massachusetts Attorney General's Office causes the Court to further question if the attorneys general are trying to hide something. Attorney General Healey and Attorney General Schneiderman entered into the Climate Change Coalition Common Interest Agreement with other attorneys general, where they memorialized the twin goals of the coalition to (1) limit climate change and (2) ensure dissemination of accurate information about climate change—these two goals seem laudable, but that is not the end of the story. The aspect of the Climate Change Coalition Common Interest Agreement that raises a question with this Court is that the Agreement states that the Parties to the Agreement, which includes the Office of the New York Attorney General and the Massachusetts Attorney General's Office, "shall. . . refuse to disclose any Shared Information unless required by law" which includes "(1) information shared in organizing a meeting of the Parties on March 29, 2016, (2) information shared at and after the March 29 meeting . . . and (3) information shared after the execution of this Agreement." (emphasis added). Discovery regarding this refusal would seem in order.

The Court recognizes the authority of the attorneys general to conduct their respective investigations, however, the Court also recognizes how the attorneys general have conveniently cherry picked what they share with the media about their investigations. Since the investigations began, Attorney General Healey and Attorney General Schneiderman have not shied away from sharing with the media that they are investigating Exxon for fraud. Attorney General Healey did not hesitate to announce to the media at the AGs United for Clean Power press conference, before she issued the CID to Exxon, her plan to investigate Exxon and how Exxon has been deceiving investors and the public. Within a week of issuing the subpoena to Exxon, in November 2015, Attorney General Schneiderman appeared on a *PBS NewHour* segment titled "Has Exxon Mobil misled the public about its climate change research?" to discuss the purpose and focus of his investigation. In August 2016,

Attorney General Schneiderman shared with *The New York Times* his theory of investigating Exxon for overstating Exxon's oil and gas reserves and assets. In September 2016, a spokesman from Attorney General Schneiderman's office also shared with *The Wall Street Journal* information regarding the Exxon investigation.

Attorney General Schneiderman and Attorney General Healey, despite these media appearances by both, are not willing to share the information related to the events at the March 29, 2016 meeting at the AGs United for Clean Power press conference. Should not the attorneys general want to share all information related to the AGs United for Clean Power press conference to ensure the public that the events surrounding the press conference lacked political motivation and were in fact about the pursuit of justice? The attorneys general should want to remove any suspicion of the event being politically charged since it was attended by (1) former Vice President Al Gore, a known climate change policy advocate in the political arena, (2) Mr. Peter Frumhoff, a well-known climate change activist, and (3) Mr. Matthew Pawa, a prominent global warming litigation attorney who attended a meeting two months prior to the press conference at the Rockefeller Family Fund to discuss an "Exxon campaign" seeking to delegitimize Exxon as a political actor. Any request for information about the events surrounding the AGs United for Clean Power press conference should be welcomed by the attorneys general.

Exxon also asserts that Attorney General Schneiderman's shift in focus in investigating Exxon is a sign of his political motives. Originally Attorney General Schneiderman stated that his office was focused on investigating Exxon's historic climate change research. Exxon says that Attorney General Schneiderman's recent shift in investigative theory, which is now focused on ferreting out whether Exxon committed securities fraud relating to its oil and gas reserves and assets, is a sign that Attorney General Schneiderman is searching for a way to have leverage over Exxon in the public policy debate about climate change.

If Attorney General Schneiderman is genuinely concerned about seeking protection for New York's citizens for Exxon's possible securities fraud regarding its oil and gas reserves and assets, then he can seek protection for the New York state investment groups that he may represent in a securities class action filed against Exxon relating to that very issue currently before this Court, *Ramirez v. Exxon Mobil Corp., et. al.*, 16-cv-3111-K.

The merits of Exxon's claims, which involve important issues, should be considered in the proper venue. Accordingly, this case is **TRANSFERRED** to the United States District Court for the Southern District of New York, Manhattan Division. 28 U.S.C. § 1406.

SO ORDERED.

Signed March 29th, 2017.

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ED KINKEADE UNITED STATES DISTRICT JUDGE