COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss.

SUPERIOR COURT
CIVIL ACTION NO.: 16-1888F

IN RE CIVIL INVESTIGATIVE DEMAND NO. 2016-EPD-36, ISSUED BY THE OFFICE OF THE ATTORNEY GENERAL

APPENDIX IN OPPOSITION TO PETITION AND EMERGENCY MOTION OF EXXON MOBIL CORPORATION TO SET ASIDE OR MODIFY THE CIVIL INVESTIGATIVE DEMAND OR ISSUE A PROTECTIVE ORDER AND IN SUPPORT OF THE COMMONWEALTH'S CROSS-MOTION TO COMPEL EXXON TO COMPLY WITH CIVIL INVESTIGATIVE DEMAND NO. 2016-EPD-36

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58	Exxon blog post, Suzanne McCarron, *The truth about ExxonMobil and climate change*, ExxonMobil Perspectives, May 23, 2016, *available at* https://energyfactor.exxonmobil.com/perspectives/exxonmobil-climate-change	838-841
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61	Exxon press release, "ExxonMobil to Hold Media Call on New York Attorney General Subpoena," dated November 5, 2015, *available at* http://news.exxonmobil.com/press-release/exxonmobil-hold-media-call-new-york-attorney-general-subpoena 2	848-850

Respectfully submitted,

THE COMMONWEALTH OF MASSACHUSETTS

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Dated: August 8, 2016

CERTIFICATE OF SERVICE

I, I. Andrew Goldberg, hereby certify that on this 8th day of August, 2016, I caused a copy of the foregoing document to be served upon counsel of record by regular mail.

I. Andrew Goldberg

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss.

SUPERIOR COURT
CIVIL ACTION NO.: 16-1888F

IN RE CIVIL INVESTIGATIVE DEMAND NO. 2016-EPD-36, ISSUED BY THE OFFICE OF THE ATTORNEY GENERAL

AFFIDAVIT OF MELISSA A. HOFFER

I, Melissa A. Hoffer, hereby depose and state under oath:

1. I am Chief of the Energy and Environment Bureau of the Office of Attorney General Maura Healey (the "AGO" or "Office") of the Commonwealth of Massachusetts (the "Commonwealth"), and am one of the attorneys representing the Commonwealth in this case. I have personal knowledge of the facts stated herein, based on my experience or my consultation with others, or they are known to me in my capacity as counsel for the Commonwealth, and each of them is true and correct.

2. I submit this affidavit in support of the Commonwealth's Opposition to the Petitioner Exxon Mobil Corporation's ("Exxon") Emergency Motion to Set Aside or Modify the Civil Investigative Demand or Issue a Protective Order, and in support of the Commonwealth's Cross-Motion to Compel Exxon Mobil Corporation to Comply with Civil Investigative Demand No. 2016-EPD-36 (the "CID").

3. Attached to this affidavit as **Exhibit 1** is a true and accurate copy of a document made available by InsideClimate News as part of its series, Exxon: The Road Not Taken, identified as Henry Shaw, CO_2 Greenhouse and Climate Issues, dated March 28, 1984, *available at*

https://insideclimatenews.org/system/files_force/documents/Shaw%20Climate%20Presentation%20%281984%29.pdf (last accessed 8/5/16).

4. Attached to this affidavit as **Exhibit 2** is a true and accurate copy of the Paris Agreement to the United Nations Framework Convention on Climate Change, *available at* http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf (last accessed 8/4/16).

5. Attached to this affidavit as **Exhibit 3** is a true and accurate copy of the Executive Summary of the International Energy Agency report, *World Energy Outlook*, dated 2012, *available at* https://www.iea.org/publications/freepublications/publication/english.pdf (last accessed 8/4/16).

6. Attached to this affidavit as **Exhibit 4** is a true and accurate copy of an IW Financial report, *Managing the risks of exposure to fossil fuel companies*, *available at* http://info.iwfinancial.com/?top=897925&mid=959639&bottom=7567999 (last accessed 8/3/16).

7. Attached to this affidavit as **Exhibit 5** is a true and accurate copy of a document made available by InsideClimate News as part of its series, Exxon: The Road Not Taken, identified as a memorandum from M.B. Glaser to a distribution list of Exxon management, dated November 12, 1982, and a document, "CO_2 'Greenhouse Effect' Summary," *available at* https://insideclimatenews.org/sites/default/files/documents/1982%20Exxon%20Primer%20on%20CO2%20Greenhouse%20Effect.pdf (last accessed 8/4/16).

8. Attached to this affidavit as **Exhibit 6** is a true and accurate copy of an Exxon report, *Energy and Carbon – Managing the Risks*, dated 2014, *available at* http://cdn.exxonmobil.com/~/media/global/files/energy-and-environment/report---energy-and-carbon---managing-the-risks.pdf (last accessed on 8/1/16) or

https://web.archive.org/web/20160603194021/http://cdn.exxonmobil.com/~/media/global/files/energy-and-environment/report---energy-and-carbon---managing-the-risks.pdf (last accessed on 8/6/16).

9. Attached to this affidavit as **Exhibit 7** is a true and accurate copy of a letter from Exxon counsel, Louis L. Goldberg, Esq., to the Office of Chief Counsel of the U.S. Securities and Exchange Commission, dated February 29, 2016, *available at* https://www.sec.gov/divisions/corpfin/cf-noaction/14a-8/2016/nyscommon032216-14a8.pdf.

10. Attached to this affidavit as **Exhibit 8** is a true and accurate copy of an Exxon press release, "ExxonMobil's Energy Outlook Projects Energy Demand Increase and Decline in Carbon Intensity," dated January 25, 2016, *available at* http://news.exxonmobil.com/press-release/exxonmobils-energy-outlook-projects-energy-demand-increase-and-decline-carbon-intensit (last accessed 8/1/16).

11. Attached to this affidavit as **Exhibit 9** is a true and accurate copy of an Exxon webpage, *Meeting global needs—managing climate change business risks*, *available at* http://corporate.exxonmobil.com/en/current-issues/climate-policy/climate-perspectives/managing-climate-change-business-risks (last accessed 8/1/16).

12. Attached to this affidavit as **Exhibit 10** is a true and accurate copy of an article, Benjamin Hulac, *Document trove details link between tobacco, oil industries*, ClimateWire, July 20, 2016, *available at* http://www.eenews.net/climatewire/stories/1060040530/ (subscription required; last accessed 8/1/16).

13. Since 2013, the AGO has issued several hundred civil investigative demands ("CIDs") to or regarding companies or individuals suspected of committing unfair and deceptive business practices or other conduct in violation of Massachusetts law.

14. Of the total number of those CIDs issued, the AGO issued about twenty-five in connection with joint investigations with other states, about thirty in connection with investigations involving the federal government, and several involving both other states and the federal government. CIDs issued pursuant to G.L. c. 93A ("Chapter 93A"), § 6, have addressed, among other things, foreclosure practices of banks, business practices in the pharmaceuticals industry, the marketing and sale of securities, and solicitations and transactions involving other products and services sold in the Commonwealth.

15. Examples since 2013, which have become public through settlement with the target companies, include: investigations involving large multistate groups and the federal government (Chase Bank, Ocwen, and HSBC); investigations with small groups of states and the federal government (Citigroup, JP Morgan); a joint investigation with federal authorities (Oppenheimer); a joint investigation with another state (LPL Financial); and a joint investigation with a large multistate group (MoneyGram). Attached to this affidavit as **Exhibit 11** (Chase Bank), **Exhibit 12** (Ocwen), **Exhibit 13** (HSBC), **Exhibit 14** (Citigroup), **Exhibit 15** (JP Morgan), **Exhibit 16** (Oppenheimer), **Exhibit 17** (LPL Financial), and **Exhibit 18** (MoneyGram) are true and accurate copies of press releases issued by the Office in connection with those settlements.

16. A very recent, visible example is the AGO's 2016 participation in a joint multistate investigation into Volkswagen's "clean diesel" deception, which has so far resulted in a partial settlement providing Massachusetts with nearly $100 million in Chapter 93A civil penalties and environmental mitigation.

17. Attached to this affidavit as **Exhibit 19** is a true and accurate copy of an AGO press release announcing the partial settlement, "AG Healey Announces Major Award for More

Than 12,500 Massachusetts Consumers Under Settlement With Volkswagen Over Emissions Fraud," dated June 28, 2016, *available at* http://www.mass.gov/ago/news-and-updates/press-releases/2016/2016-06-28-vw-settlement.html (last accessed 8/6/16).

18. On July 19, 2016, Massachusetts, New York, and Maryland announced the filing of separate state suits against Volkswagen alleging state environmental law violations that were not covered under the settlement and that arose from the corporate misconduct identified through the multi-state investigation, including depositions and document productions in response to the states' CIDs.

19. Attached to this affidavit as **Exhibit 20** is a true and accurate copy of a press release announcing the separate state lawsuits against Volkswagen alleging various state environmental law violations, "NY A.G. Schneiderman, Massachusetts A.G. Healey, Maryland A.G. Frosh Announce Suits Against Volkswagen And Porsche Alleging They Knowingly Sold Over 53,000 Illegally Polluting Cars and Suvs, Violating State Environmental Laws," dated July 19, 2016, *available at* http://www.ag.ny.gov/press-release/ny-ag-schneiderman-massachusetts-ag-healey-maryland-ag-frosh-announce-suits-against (last accessed 8/8/16).

20. Attached to this affidavit as **Exhibit 21** are true and accurate copies of the following articles: Jess Bidgood, *At a Cape Cod Landmark, a Strategic Retreat From the Ocean*, N. Y. Times, Jul. 6, 2016, *available at* http://www.nytimes.com/2016/07/07/us/at-a-cape-cod-landmark-a-strategic-retreat-from-the-ocean.html (last accessed 8/7/16); David Abel, *Climate change could be even worse for Boston than previously thought*, Boston Globe, June 22, 2016, *available at* https://www.bostonglobe.com/metro/2016/06/22/climate-change-could-have-even-worse-impact-boston-than-previously-expected/S6hZ4nDPeUWNyTsx6ZckuL/story.html (last accessed 8/7/16).

21. Attached to this affidavit as **Exhibit 22** is a true and accurate copy of the Summary for Policymakers of the Intergovernmental Panel on Climate Change's Climate Change 2014 Synthesis Report, *available at* https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf (last accessed 8/7/16).

22. Attached to this affidavit as **Exhibit 23** is a true and accurate copy of an article, Sara Jerving, Katie Jennings, Masako Melissa Hirsch, and Susanne Rust, *What Exxon knew about the Earth's melting Arctic*, Los Angeles Times, October 9, 2015, *available at* http://graphics.latimes.com/exxon-arctic/ (last accessed 8/1/16).

23. Attached to this affidavit as **Exhibit 24** is a true and accurate copy of the Exxon: The Road Not Taken series of articles that InsideClimate News published serially from September 16, 2015, through December 22, 2015, consisting of the following articles:

Neela Banerjee, Lisa Song, and David Hasemyer, *Exxon's Own Research Confirmed Fossil Fuels' Role in Global Warming Decades Ago*, September 16, 2015, *available at* https://insideclimatenews.org/news/15092015/Exxons-own-research-confirmed-fossil-fuels-role-in-global-warming (last accessed 8/1/16);

Neela Banerjee, Lisa Song, David Hasemyer, *Exxon Believed Deep Dive Into Climate Research Would Protect Its Business*, September 17, 2015, *available at* https://insideclimatenews.org/news/16092015/exxon-believed-deep-dive-into-climate-research-would-protect-its-business (last accessed 8/1/16);

Lisa Song, Neela Banerjee, David Hasemyer, *Exxon Confirmed Global Warming Consensus in 1982 with In-House Climate Models*, September 22, 2015, *available at* https://insideclimatenews.org/news/18092015/exxon-confirmed-global-warming-consensus-in-1982-with-in-house-climate-models (last accessed 8/1/16);

Neela Banerjee & Lisa Song, *Exxon's Business Ambition Collided with Climate Change Under a Distant Sea*, October 8, 2015, *available at* https://insideclimatenews.org/news/08102015/Exxons-Business-Ambition-Collided-with-Climate-Change-Under-a-Distant-Sea (last accessed 8/1/16);

John H. Cushman Jr., *Highlighting the Allure of Synfuels, Exxon Played Down the Climate Risks*, October 8, 2015, *available at* https://insideclimatenews.org/news/08102015/highlighting-allure-synfuels-exxon-played-down-climate-risks (last accessed 8/1/16);

David Hasemyer and John H. Cushman Jr., *Exxon Sowed Doubt About Climate Science for Decades by Stressing Uncertainty*, October 22, 2015, *available at* https://insideclimatenews.org/news/22102015/Exxon-Sowed-Doubt-about-Climate-Science-for-Decades-by-Stressing-Uncertainty (last accessed 8/1/16);

John H. Cushman Jr., *Exxon Made Deep Cuts in Climate Research Budget in the 1980s*, November 25, 2015, *available at* https://insideclimatenews.org/news/25112015/exxon-deep-cuts-climate-change-research-budget-1980s-global-warming (last accessed 8/1/16);

Neela Banerjee, *More Exxon Documents Show How Much It Knew About Climate 35 Years Ago*, December 1, 2015, *available at* https://insideclimatenews.org/news/01122015/documents-exxons-early-co2-position-senior-executives-engage-and-warming-forecast (last accessed 8/1/16); and

Neela Banerjee, *Exxon's Oil Industry Peers Knew About Climate Dangers in the 1970s, Too*, December 22, 2015, *available at* https://insideclimatenews.org/news/22122015/exxon-mobil-oil-industry-peers-knew-about-climate-change-dangers-1970s-american-petroleum-institute-api-shell-chevron-texaco (last accessed 8/1/16).

24. Attached to this affidavit as **Exhibit 25** is a true and accurate copy of an article that appeared in InsideClimate News, *InsideClimate News Is a Pulitzer Prize Finalist for Exxon Investigation*, April 18, 2016, *available at* https://insideclimatenews.org/news/18042016/insideclimate-news-pulitzer-prize-finalist-exxon-investigation (last accessed 8/1/16).

25. Attached to this affidavit as **Exhibit 26** is a true and accurate copy of an Exxon webpage providing links to certain documents (including documents made available by InsideClimate News as part of its series, Exxon: The Road Not Taken) in support of the Exxon webpage, *ExxonMobil's perspectives on climate change* (described in ¶ 58 below), *available at* http://corporate.exxonmobil.com/en/shareholder-archive/supporting-materials (last accessed 8/6/16).

26. Attached to this affidavit as **Exhibit 27** is a true and accurate copy of a document made available by InsideClimate News as part of its series, Exxon: The Road Not Taken,

identified as an inter-office memorandum from R.W. Cohen to W. Glass, dated August 18, 1981, *available at* https://insideclimatenews.org/system/files_force/documents/%2522Catastrophic%2522%20Effects%20Letter%20%281981%29.pdf (last accessed 8/5/16).

27. Attached to this affidavit as **Exhibit 28** is a true and accurate copy of a document made available by InsideClimate News as part of its series, Exxon: The Road Not Taken, identified as a letter from Roger W. Cohen to A.M. Natkin, Exxon Office of Science and Technology, dated September 2, 1982, *available at* https://insideclimatenews.org/sites/default/files/documents/%2522Consensus%2522%20on%20CO2%20Impacts%20%281982%29.pdf (last accessed 8/5/16).

28. Attached to this affidavit as **Exhibit 29** is a true and accurate copy of a document made available by InsideClimate News as part of its series, Exxon: The Road Not Taken, identified as a letter from W.L. Ferrall to Dr. H.L. Hirsch, regarding "Controlling Atmospheric CO_2," with attached memorandum, dated Oct. 16, 1979, *available at* https://insideclimatenews.org/sites/default/files/documents/CO2%20and%20Fuel%20Use%20Projections.pdf (last accessed 8/5/16).

29. Attached to this affidavit as **Exhibit 30** is a true and accurate copy of an article, Bradley Olson and Nicole Friedman, *Exxon, Chevron Shareholders Narrowly Reject Climate-Change Stress Tests*, The Wall Street Journal, May 25, 2016, *available at* http://www.wsj.com/articles/exxon-chevron-shareholders-narrowly-reject-climate-change-stress-tests-1464206192 (last accessed 8/5/16).

30. Attached to this affidavit as **Exhibit 31** is a true and accurate copy of a blog post by Natasha Lamb and Bob Litterman, *Really? Exxon left the risk out of its climate risk report*,

May 28, 2014, *available at* https://www.greenbiz.com/blog/2014/05/28/exxonmobil-left-risk-out-climate-risk-report (last accessed 8/5/16).

31. Attached to this affidavit as **Exhibit 32** is a true and accurate copy of a document made available by InsideClimate News as part of its series, Exxon: The Road Not Taken, identified as email from Joe Walker to a "Global Climate Science Team," with attached "draft Global Climate Science Communications Plan," dated Apr. 3, 1998, *available at* https://insideclimatenews.org/sites/default/files/documents/Global%20Climate%20Science%20Communications%20Plan%20%281998%29.pdf (last accessed 8/7/16).

32. Attached to this affidavit as **Exhibit 33** is a true and accurate copy of a webpage providing the status of ratification of the Kyoto Protocol, *available at* http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php (last accessed 8/1/16).

33. Attached to this affidavit as **Exhibit 34** is a true and accurate copy of an article, Justin Gillis and Clifford Krauss, *Exxon Mobil Investigated for Possible Climate Change Lies by New York Attorney General*, N.Y. Times, November 5, 2015, *available at* http://www.nytimes.com/2015/11/06/science/exxon-mobil-under-investigation-in-new-york-over-climate-statements.html (last accessed 8/1/16).

34. Attached to this affidavit as **Exhibit 35** is a true and accurate copy of an article, Phil McKenna, *Virgin Islands and Exxon Agree to Uneasy Truce Over to Climate Probe*, InsideClimate News, July 7, 2016, *available at* https://insideclimatenews.org/news/06072016/virgin-islands-exxon-agree-climate-probe-subpoena-claude-walker-schneiderman-healey (last accessed 8/1/16).

35. Attached to this affidavit as **Exhibit 36** is a true and accurate copy of a publicly available letter from Peter Kadzik, Assistant Attorney General, U.S. Department of Justice, to the

The Honorable Ted W. Lieu and The Honorable Mark DeSaulnier, U.S. House of Representatives, dated January 12, 2016.

36. Attached to this affidavit as **Exhibit 37** is a true and accurate copy of an article, Amanda Reilly, *Fossil fuel backers accused of 'calculated disinformation,'* Energy and Environment Daily, June 23, 2016, *available at* http://www.eenews.net/eedaily/2016/06/23/stories/1060039264 (subscription required; last accessed 8/1/16).

37. Attached to this affidavit as **Exhibit 38** is a true and accurate copy of a press release from the New York Attorney General's Office, "A.G. Schneiderman, Former Vice President Al Gore And A Coalition Of Attorneys General From Across The Country Announce Historic State-Based Effort To Combat Climate Change," dated March 29, 2016, *available at* http://www.ag.ny.gov/press-release/ag-schneiderman-former-vice-president-al-gore-and-coalition-attorneys-general-across (last accessed 8/1/16). The online version of the press release contains a video recording of a March 29 New York City press conference, at which Attorney General Healey delivered remarks.

38. Attached to this affidavit as **Exhibit 39** is a true and accurate copy of a publicly available letter from Massachusetts members of the U.S. House of Representatives and the U.S. Senate to the Honorable Lamar Smith, Chairman, Committee on Science, Space, and Technology, U.S. House of Representatives, dated August 3, 2016.

39. Attached to this affidavit as **Exhibit 40** is a true and accurate copy of an article, James Osborne, *19 Senate Democrats call out Exxon, fossil fuel industry on climate change denial,* FuelFix, Jul. 11, 2016, *available at* http://fuelfix.com/blog/2016/07/11/19-senate-democrats-call-out-exxon-fossil-fuel-industry-on-climate-change-denial/ (last accessed 8/1/16).

40. Attached to this affidavit as **Exhibit 41** is a true and accurate copy of Senate Concurrent Resolution 45, 114th Cong. (2016).

41. Attached to this affidavit as **Exhibit 42** is a true and accurate copy of a dynamically generated store locator webpage ("Where to buy Mobil™ motor oil") on an Exxon website, resulting from entering the Boston zip code 02108 into the search field, *available at* https://mobiloil.com/en/retailer-locator?address=02108&tab=retailers (last accessed 8/1/16).

42. Attached to this affidavit as **Exhibit 43** are true and accurate copies of portions of Exxon websites that allow customers to find the locations of its branded stations in Massachusetts, *available at* https://www.exxon.com/en/gas-stations (last accessed 8/1/16), and http://www.exxonmobilstations.com/station-locations/united-states/massachusetts (last accessed 8/1/16).

43. Attached to this affidavit as **Exhibit 44** is a true and accurate copy of an Exxon webpage for a representative Mobil-branded station in Boston, Massachusetts, *available at* http://www.exxonmobilstations.com/2567875-comm-ave-gas-and-service-inc-boston (last accessed 8/1/16).

44. Attached to this affidavit as **Exhibit 45** is an Exxon webpage describing its interstate oil pipeline system and fuel distribution terminals in the Massachusetts cities of Springfield and Everett, *available at* http://exxonmobilpipeline.com/USA-English/EMPCo/ourcompany_where_nemw.aspx (last accessed 8/1/16).

45. Attached to this affidavit as **Exhibit 46** is a true and accurate copy of an Exxon webpage describing the company's relationship with its branded wholesalers, *available at* https://www.exxon.com/en/distribution-retail (last accessed 8/1/16).

46. Attached to this affidavit as **Exhibit 47** is a true and accurate copy of an article, *ExxonMobil Launches New U.S. Retail Fuels Platform*, CSP Daily News, January 14, 2014, describing Exxon's programs for branded wholesaler support, quoting from Grant Doeschler, identified as Exxon's U.S. branded wholesale manager, *available at* http://www.cspdailynews.com/fuels-news-prices-analysis/fuels-technology-equipment/articles/exxonmobil-launches-new-us-retail (last accessed 8/1/16).

47. To promote its sales of fossil fuel products, Exxon advertises them in Massachusetts through all types of media, including radio and television, as well as the Internet. For example, since Exxon's complaint was filed, advertisements for Mobil 1™ synthetic motor oil have run on the Massachusetts radio station FM 98.5 and on television aired in Massachusetts, with at least one commercial that identifies a webpage (mobil1.us/ournormal) advertising Exxon's motor oil and other products and identifying where consumers can buy them.

48. Attached to this affidavit as **Exhibit 48** is a true and accurate copy of an Exxon press release posted on the BusinessWire website, "ExxonMobil Partners With Massachusetts State Police: Mobil1 Advanced Fuel Economy™ motor oil to be used in entire fleet of vehicles," dated June 14, 2012, *available at* http://www.businesswire.com/news/home/20120614005807/en/ExxonMobil-Partners-Massachusetts-State-Police (last accessed 8/5/16).

49. Attached to this affidavit as **Exhibit 49** is a true and accurate copy of a Commonwealth of Massachusetts-Standard Contract Form, signed on behalf of ExxonMobil Oil Corporation, a subsidiary of Exxon Mobil Corporation, to "provide synthetic oil and other fluids to the [Massachusetts State Police]," for an anticipated term of May 16, 2011, to June 30, 2014.

50. Attached to this affidavit as **Exhibit 50** is a true and accurate copy of a webpage showing Exxon's Institutional Ownership and Holdings, as reported by Nasdaq, *available at* http://www.nasdaq.com/symbol/xom/institutional-holdings (last accessed 8/1/16).

51. Attached to this affidavit as **Exhibit 51** is a true and accurate copy of a Fidelity Investments webpage showing Exxon as a current holding of the Fidelity Independence Fund, *available at* https://fundresearch.fidelity.com/mutual-funds/summary/316145309 (last accessed 8/5/16).

52. The Massachusetts Pension Reserves Investment Trust (the Massachusetts State Pension Fund) has made a significant investment in Exxon securities, purchased through its Massachusetts-based investment manager.

53. Attached to this affidavit as **Exhibit 52** is a true and accurate copy of a webpage providing an unofficial transcript of the Exxon 2014 annual shareholder meeting, *available at* http://seekingalpha.com/article/2243043-exxon-mobils-xom-ceo-rex-tillerson-hosts-annual-shareholder-meeting-transcript?part=single (last accessed 8/2/16).

54. Attached to this affidavit as **Exhibit 53** are true and accurate copies of the following: an AGO press release, "ExxonMobil Corporation to Pay $2.9 Million Penalty for Violating Air Pollution Laws Under Settlement with AG Coakley's Office," dated June 28, 2010, *available at* http://www.mass.gov/ago/news-and-updates/press-releases/2010/exxonmobil-corporation-to-pay-29-million.html (last accessed 8/4/16); and an article, *Mass. reaches $2.9M settlement with Exxon Mobil*, Associated Press/Boston.com, June 28, 2010, *available at* http://archive.boston.com/business/articles/2010/06/28/mass_reaches_29m_settlement_with_exxonmobil/ (last accessed 8/4/16).

55. Attached to this affidavit as **Exhibit 54** is a true and accurate copy of a webpage from the National Association of Attorneys General (NAAG) Center for Tobacco and Public Health, *available at* http://www.naag.org/naag/about_naag/naag-center-for-tobacco-and-public-health.php (last accessed 8/1/16).

56. Attached to this affidavit as **Exhibit 55** is a true and accurate copy of a document made available by InsideClimate News as part of its series, Exxon: The Road Not Taken, identified as an Exxon presentation to National Oceanic and Atmospheric Administration, "Proposed Exxon Research Program to Help Assess the Greenhouse Effect," dated March 26, 1979, *available at* https://insideclimatenews.org/sites/default/files/documents/Presentation%20to%20NOAA%20%281979%29.pdf (last accessed 8/1/16).

57. Attached to this affidavit as **Exhibit 56** is a true and accurate copy of an address by Exxon Chairman and Chief Executive Officer Rex Tillerson, "Unleashing Innovation to Meet Our Energy and Environmental Needs," 36th Annual Oil and Money Conference, dated Oct. 7, 2015, *available at* http://corporate.exxonmobil.com/en/company/news-and-updates/speeches/unleashing-innovation-to-meet-our-energy-and-environmental-needs (last accessed 8/1/16).

58. Attached to this affidavit as **Exhibit 57** is a true and accurate copy of an Exxon webpage, *ExxonMobil's Perspectives on Climate Change*, *available at* http://corporate.exxonmobil.com/en/current-issues/climate-policy/climate-perspectives/our-climate-science-history (last accessed 8/1/16).

59. Attached to this affidavit as **Exhibit 58** is a true and accurate copy of an Exxon blog post, Suzanne McCarron, *The truth about ExxonMobil and climate change*, *ExxonMobil*

Perspectives, May 23, 2016, *available at* https://energyfactor.exxonmobil.com/perspectives/exxonmobil-climate-change/ (last accessed 8/1/16).

60. Attached to this affidavit as **Exhibit 59** is a true and accurate copy of an Exxon blog post, Suzanne McCarron, *The coordinated attack on ExxonMobil, ExxonMobil Perspectives*, April 20, 2016, *available at* https://energyfactor.exxonmobil.com/perspectives/coordinated-attack-on-exxonmobil/ (last accessed 8/1/16).

61. Attached to this affidavit as **Exhibit 60** is a true and accurate copy of an Exxon blog post, Suzanne McCarron, *ExxonMobil responds to state AGs, ExxonMobil Perspectives*, March 29, 2016, *available at* https://energyfactor.exxonmobil.com/perspectives/exxonmobil-responds-state-ags/ (last accessed 8/1/16).

62. Attached to this affidavit as **Exhibit 61** is a true and accurate copy of an Exxon press release, "ExxonMobil to Hold Media Call on New York Attorney General Subpoena," dated November 5, 2015, *available at* http://news.exxonmobil.com/press-release/exxonmobil-hold-media-call-new-york-attorney-general-subpoena (last accessed 8/1/16).

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 8, 2016.

Melissa A. Hoffer

EXHIBIT 1

CO_2 GREENHOUSE AND CLIMATE ISSUES

HENRY SHAW

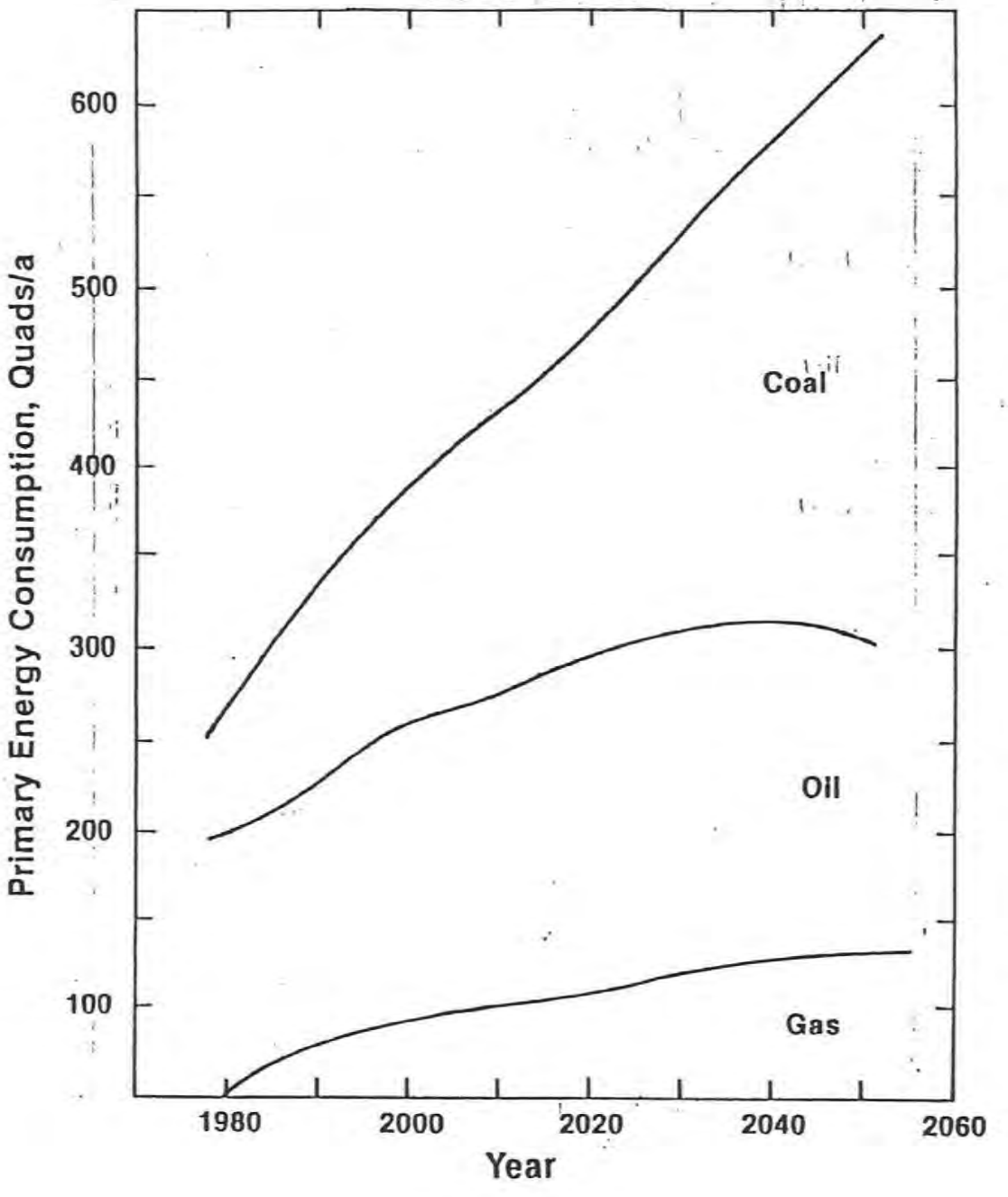
PRESENTED AT

EUSA/ER&E ENVIRONMENTAL CONFERENCE

FLORHAM PARK, NEW JERSEY

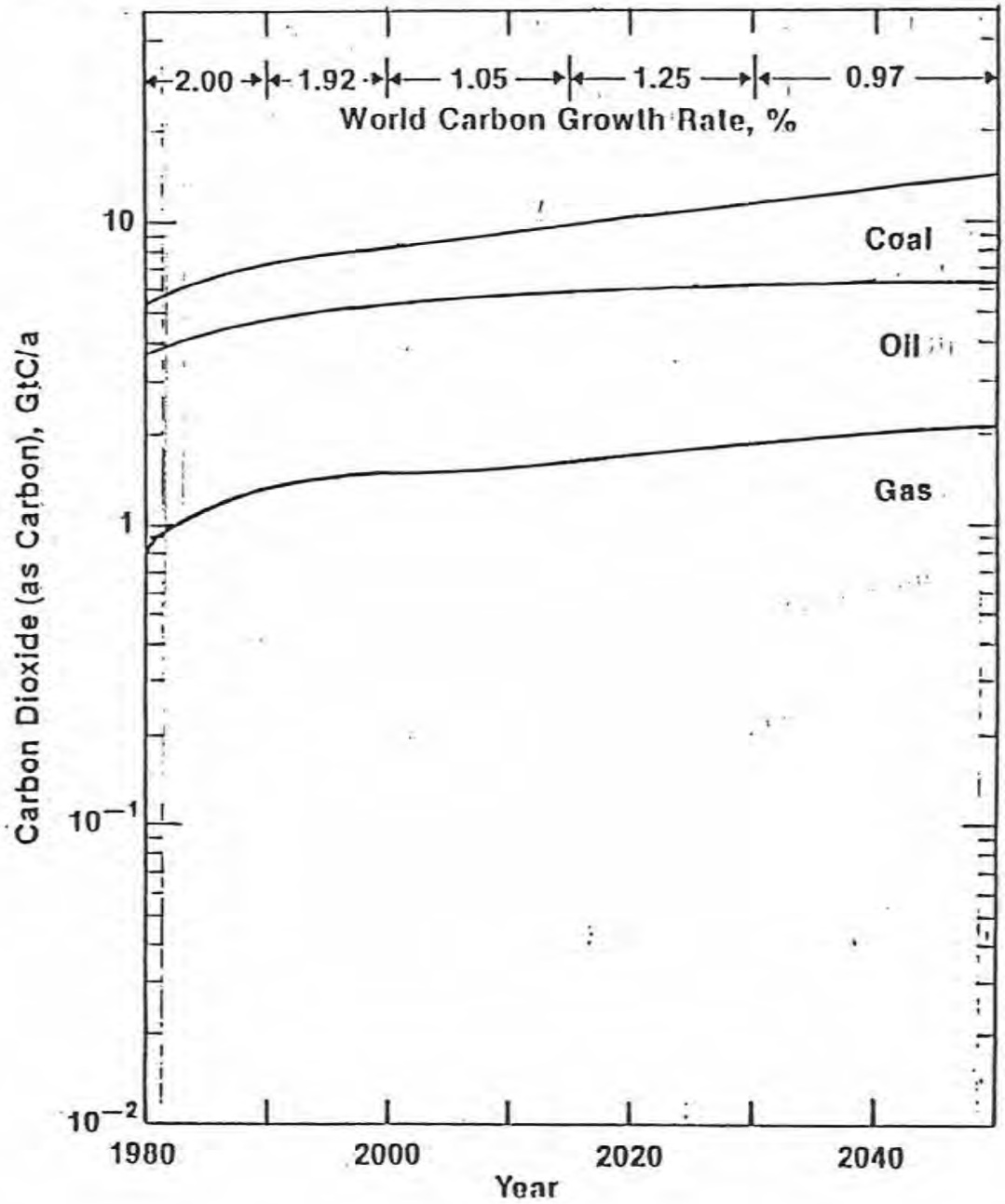
MARCH 28, 1984

PRIMARY FOSSIL FUEL ENERGY CONSUMPTION
2030 STUDY



782114-32

PROJECTED CARBON DIOXIDE (AS CARBON) FROM WORLD PRIMARY FOSSIL FUEL CONSUMPTION



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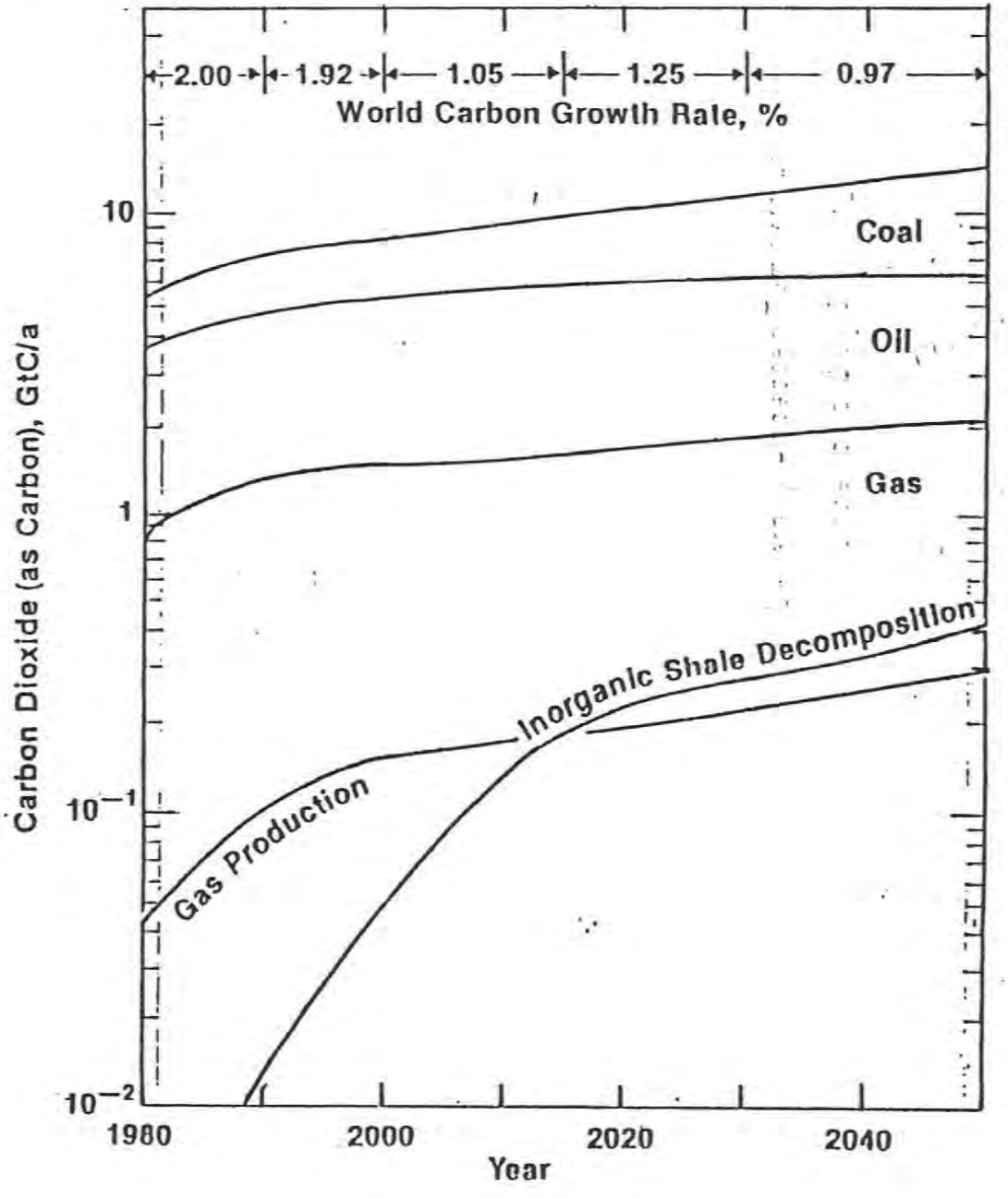

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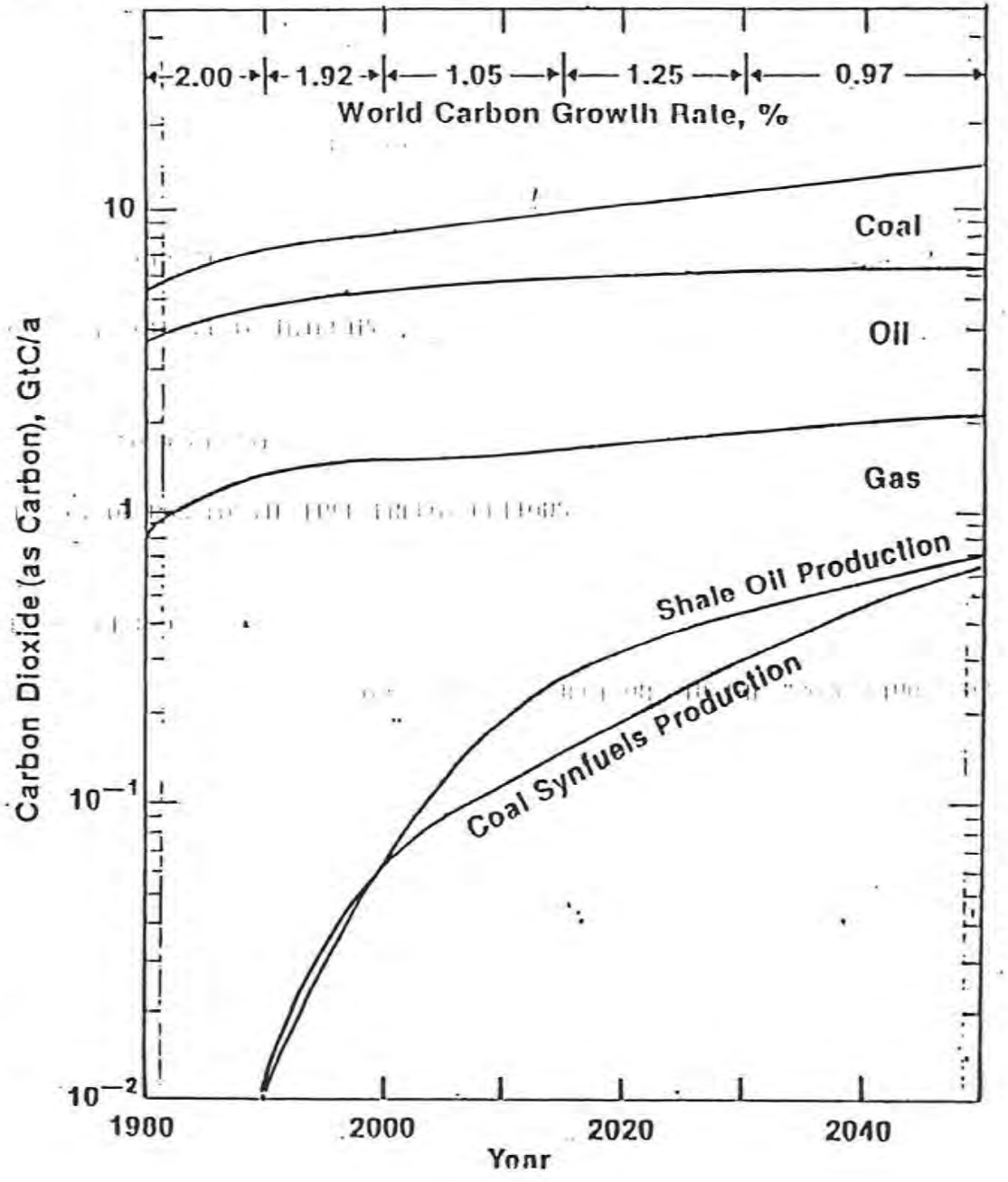


RESULTS/EFFECTS

	EPA	NRC/NAS	MIT	EXXON
• TIME FOR CO_2 DOUBLING	2060	2075	-	2090
• AVERAGE TEMPERATURE RISE	3^oC	$\sim 2^oC$	$1.5\text{-}4.5^oC$	$1.3 - 3.1^oC$
• OTHER GASES IMPACT	-1.6 to 3.3^oC	$\sim 1^oC$	-	-
• SEA LEVEL RISE	150 cm, 2040 215 cm, 2100	70 cm 2080 (3-4°C rise)	-	-
• PRECIPITATION	POSSIBLE MAJOR CHANGES	DRIER MIDWEST	SIGNIFICANT, BUT UNPREDICTABLE	-
• AGRICULTURAL	PLUSES & MINUSES	BENEFITS WILL BALANCE DEBITS	SIGNIFICANT, BUT UNPREDICTABLE	-
• AIRBORNE CO_2 FRACTION	0.6 to 0.8	0.4 - 0.6	0.4 to 0.6	0.53
• IMPACT OF ALTERNATE ENERGY SOURCES	SMALL	INSENSITIVE	LARGE	INSENSITIVE

CONCLUSIONS/RECOMMENDATIONS

EPA

THERE IS LITTLE WE CAN DO EXCEPT LEARN TO ADAPT TO A WARMER CLIMATE.

LEGISLATION IS UNLIKELY TO HAVE MUCH EFFECT.

NRC/NAS

WE MUST RESOLVE UNCERTAINTIES THROUGH RESEARCH. ENERGY TAXES CAN HAVE AN IMPACT.

LEGISLATION IS PREMATURE.

MIT/STANFORD

WE MUST START TALKING TO POLICY MAKERS. SUGGEST EXTREME REDUCTION IN FOSSIL FUEL USE THROUGH CONSERVATION AND ALTERNATE TECHNOLOGIES USING ELECTRICITY. NUCLEAR CAN HAVE IMPACT.

INTERNATIONAL DEBATE ON LEGISLATION IS NEEDED.

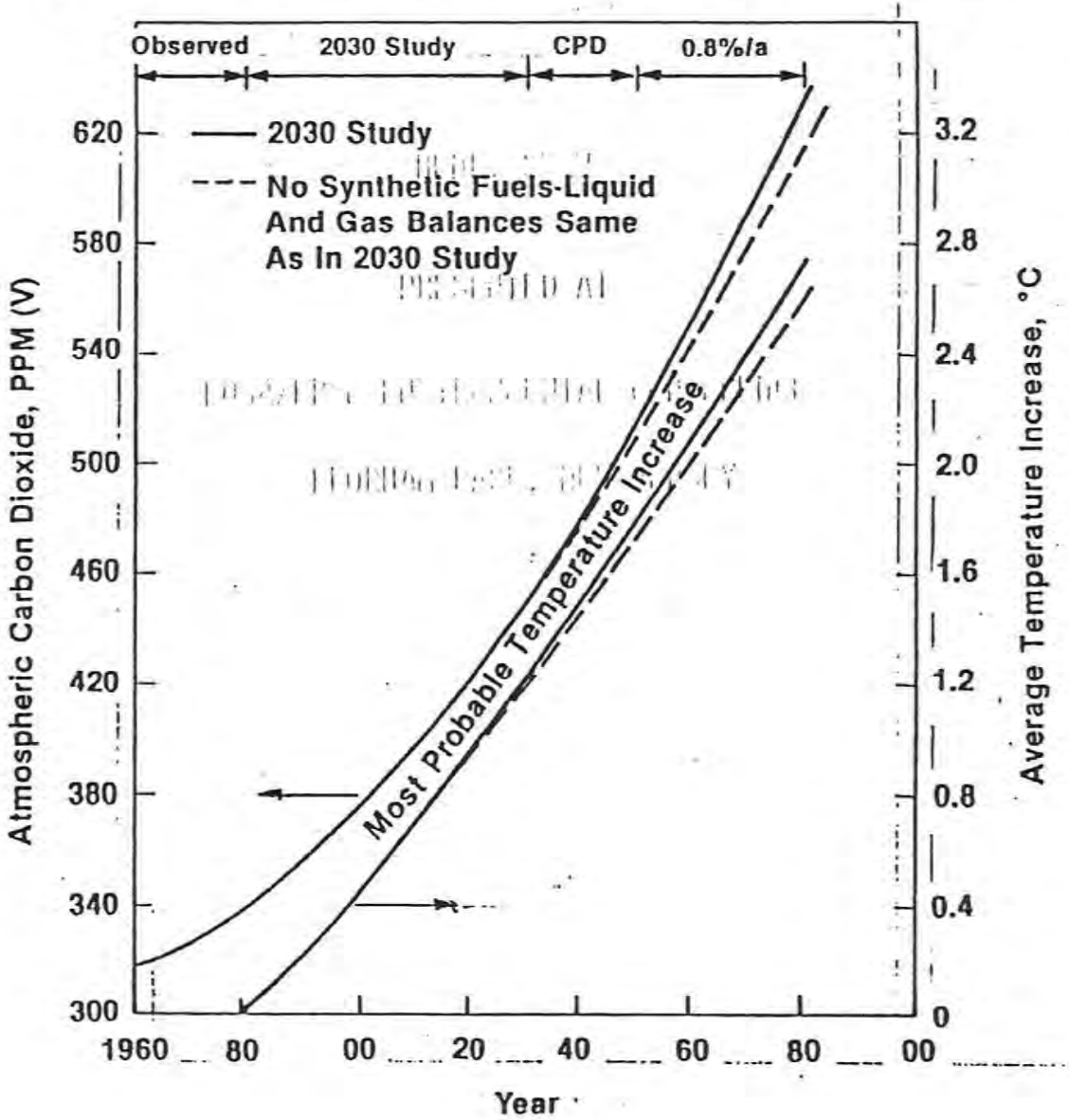
EXXON

THERE IS ADEQUATE TIME TO STUDY THE PROBLEM.

LEGISLATION IS PREMATURE.

BACK - UP

GROWTH OF ATMOSPHERIC CO_2 AND INSTANTANEOUS GLOBAL TEMPERATURE INCREASE AS A FUNCTION OF TIME



App. 294

782284-32

QUANTITY OF CO_2 PRODUCED FROM FUELS

MtC/EJ PRODUCT (% EFFICIENCY)

FUEL	PRODUCTION	REFINING	COMBUSTION	TOTAL	RATIO TO GAS
Coal	-	-	24.3	24.3	1.8
Petroleum					
Gasoline	-	5.5(90)	18.8	24.3	1.8
Fuel Oil		1.9(95)	19.9	21.8	1.6
Natural Gas	-	-	13.5	13.5	1.0
Coal Synthetics					
H-Coal (Gasoline)	18.5(65)	17.2(75)	18.8	54.5	4.1
EDS (Gasoline)	18.5(65)	13.5(80)	18.8	50.8	3.8
SNG	27 (60)	-	13.5	40.5	3.0
Shale Oil (Gasoline)	13.9(75)	6.5(88)	18.8	39.2	2.9
Electricity from Coal	67.4(36)			67.4	5.0

CO_2 GREENHOUSE AND CLIMATE ISSUES

AS PART OF CPPD's TECHNOLOGY FORECASTING ACTIVITIES IN 1981, I WROTE A CO_2 GREENHOUSE FORECAST BASED ON PUBLICALLY AVAILABLE INFORMATION. SOON THEREAFTER, S&T REQUESTED AN UPDATE OF THE FORECAST USING EXXON FOSSIL FUEL PROJECTIONS. THIS REQUEST WAS FOLLOWED LATE IN 1981 WITH A REQUEST BY CPD FOR ASSISTANCE IN EVALUATING THE POTENTIAL IMPACT OF THE CO_2 EFFECT IN THE "2030 STUDY". AFTER MEETING CPD'S SPECIFIC NEED, A FORMAL TECHNOLOGY FORECAST UPDATE WAS ISSUED TO S&T IN THE BEGINNING OF APRIL 1982. IT WAS SUBSEQUENTLY SENT FOR REVIEW TO THE EXXON AFFILIATES. THE PRIMARY FOSSIL FUEL VOLUMETRIC PROJECTIONS WERE CONVERTED TO AN ENERGY BASIS IN QUADS/YEAR, AS SHOWN ON THE

VG-1 FIRST VUGRAPH. SINCE SHALE LOSSES WERE NOT INCLUDED BY CPD, THEY WERE ESTIMATED AND ADDED TO OIL ENERGY. THE TOTAL CARBON CONTENT PER UNIT ENERGY OF THE U.S. RESOURCES OF COAL AND OIL SHALE WERE AVERAGED IN ORDER TO CALCULATE LBS. CO_2/MBTU FOR EACH RESOURCE:

		RATIO
OIL	= 170 LBS. CO_2/MBTU	1.5
GAS	= 115	1.0
COAL	= 207	1.8

THESE NUMBERS WERE CHECKED AGAINST SOME INFORMATION ON WORLD RESOURCES AND FOUND TO BE ADEQUATE.

WE THEN ESTIMATED THE TOTAL CO_2 EMITTED FROM THE OXIDATION OF THESE

VG-2 FUELS, AS SHOWN IN THIS VUGRAPH. THIS IS A SEMILOG PLOT WHICH TENDS TO PICTORIALLY OVEREMPHASIZE THE IMPORTANCE OF GAS. WE CHOOSE THIS TYPE OF GRAPH TO ENABLE US TO SHOW CERTAIN DETAILS THAT WOULD BE HARD TO DETECT ON A LINEAR PLOT. THE RATE OF CO_2 EMISSIONS GROWS AT ABOUT A 20% HIGHER RATE THAN ENERGY. THIS IS DUE, IN PART, TO THE SHARP INCREASES IN THE USE OF COAL. OTHER FACTORS THAT CONTRIBUTE TO THE HIGHER CARBON GROWTH RATE ARE SHOWN ON

OL-1 (RED) OVERLAY #1 AND INCLUDE THE ENTRAINED CO_2 ASSOCIATED WITH NATURAL GAS IN GAS PRODUCTION GROWING FROM ABOUT 5% TO 15% IN 2050. SIMILARLY, U.S. OIL SHALES CONTAIN A FAIR AMOUNT OF CARBONATE-CONTAINING MINERALS CONSISTING PRIMARILY OF LIMESTONE AND DOLOMITE WHICH DECOMPOSE AS A FUNCTION OF RETORTING TEMPERATURE, FROM 25% AT RELATIVELY LOW TEMPERATURES SUCH AS CONVENTIONAL RETORTING TO 100% AT ELEVATED TEMPERATURES. WE ASSUMED, VERY CONSERVATIVELY, THAT 65% OF THE CARBONATE-CONTAINING MINERALS WOULD DECOMPOSE IN PRODUCING SHALE OIL. THE CO_2 IN GAS PRODUCTION WAS ADDED TO THE CO_2 EMISSIONS FROM GAS, AND THE SHALE CARBONATE DECOMPOSITION WAS ADDED TO CO_2 EMISSIONS FROM OIL. IN ADDITION, THE PROCESSING OF COAL AND OIL SHALE TO FUELS RESULTS IN A FAIR AMOUNT OF CO_2

OL-2 (BLUE) PRODUCTION. THIS IS SHOWN ON OVERLAY #2.

THE CLIMATIC EFFECT OF NOT HAVING A SYNFUELS INDUSTRY AND NOT EMITTING CO_2 IN NATURAL GAS PRODUCTION, I.E., SUBTRACTING THE CO_2 PRODUCED

VG-2 FROM THE SOURCES MENTIONED IN THE TWO OVERLAYS OF VUGRAPH #2, WOULD BE TO DELAY THE DOUBLING TIME BY ABOUT 5 YEARS.

OUR NEXT TASK IS TO CONVERT THE AMOUTN OF CO_2 EMITTED FROM FOSSIL FUEL OXIDATION INTO A PROJECTION OF HOW IT MAY IMPACT ON CLIMATE. THIS, HOWEVER, REQUIRES A NUMBER OF ASSUMPTIONS. FIRST OF ALL, WE MUST ESTIMATE HOW MUCH OF THE CO_2 STAYS IN THE ATMOSPHERE. THIS MUST BE CHECKED BY CONDUCTING A CARBON BALANCE AROUND THE EARTH. WE ASSUMED THAT ABOUT 1/2 OF THE CO_2 GENERATED FROM FOSSIL FUELS REMAINS IN THE ATMOSPHERE. THIS IS A CONSERVATIVE ASSUMPTION SINCE A FAIR AMOUNT OF CO_2 CAN BE TRACED TO DEFORESTATION. SECOND, WE MUST ESTIMATE HOW MUCH CO_2 EXISTED IN THE ATMOSPHERE PRIOR TO THE INDUSTRIAL REVOLUTION BECAUSE CO_2 CONCENTRATION WAS ASSUMED CONSTANT UP TO THAT TIME. THERE ARE TWO SCHOOLS OF THOUGHT, DEPENDING ON THE METHOD OF CHEMICAL ANALYSIS. ISOTOPE MEASUREMENTS IN TREE-RINGS INDICATE THAT THE ATMOSPHERE CONTAINED 260 TO 270 PPM CO_2 PRIOR TO THE INDUSTRIAL REVOLUTION. CORRECTIONS TO MEASUREMENTS ACTUALLY CARRIED OUT ABOUT THAT TIME INDICATE THE CONCENTRATION TO HAVE BEEN 290 TO 300 PPM CO_2. THIRD, WE MUST ESTIMATE WHEN THE CO_2 EFFECT WILL EXCEED THE CLIMATIC NOISE THRESHOLD OF $0.5^{o}C$.

A GRAPH SHOWING ALL THESE ASSUMPTIONS IS REPRODUCED ON THE LAST

VG-3 VUGRAPH. MOST CLIMATOLOGISTS ASSUME THAT THE CO_2 EFFECT WILL BE DETECTABLE BY THE YEAR 2000. IF SO, WE MUST TAKE INTO ACCOUNT THAT IT TAKES ABOUT TWO DECADES TO EQUILIBRATE THE OCEANS TO A NEW TEMPERATURE. THUS, THE THRESHOLD WOULD OCCUR AT 340 PPM CO_2 AND WOULD CAUSE A TEMPERATURE RISE OF $3^{o}C$ IN 2090 WHEN THE CURRENT AMOUNT OF ATMOSPHERIC CO_2 WOULD DOUBLE, IF THE PRE-INDUSTRIAL CONCENTRATION HAD BEEN BETWEEN 290 AND 300 PPM. IF THE PREINDUSTRIAL CO_2 HAD BEEN BETWEEN 260 AND 270 PPM, THEN A DOUBLING WOULD CAUSE A $2^{o}C$ RISE IN GLOBAL AVERAGE TEMPERATURE. THESE VALUES FALL TOWARD THE LOWER END OF THE GENERALLY ACCEPTED TEMPERATURE RANGE FOR A DOUBLING OF $3 \pm 1.5^{o}C$, AND ARE CONSISTENT WITH THE RECENTLY PUBLISHED 50TH PERCENTILE LINE IN THE NAS REPORT.

A 2 TO 3°C INCREASE IN GLOBAL AVERAGE TEMPERATURE CAN BE AMPLIFIED TO ABOUT 10°C AT THE POLES. THIS COULD CAUSE POLAR ICE MELTING AND A POSSIBLE SEA-LEVEL RISE OF 0.7 METER BY 2080. THE TIME SCALE FOR SUCH A CATASTROPHE IS MEASURED IN CENTURIES. OTHER POTENTIAL EFFECTS ASSOCIATED WITH A HIGH ATMOSPHERIC CO_2 CONCENTRATION AND A WARMER CLIMATE ARE:

- REDISTRIBUTION OF RAINFALL
- POSITIVE AND NEGATIVE CHANGES IN AGRICULTURAL PRODUCTIVITY
- ACCELERATED GROWTH OF PESTS AND WEEDS
- DETRIMENTAL HEALTH EFFECTS
- POPULATION MIGRATION

SOCIETY MUST CAREFULLY STUDY THE PROBLEM IN ORDER TO ESTABLISH A DESIRABLE COURSE OF ACTION. WE CAN EITHER ADAPT OUR CIVILIZATION TO A WARMER PLANET OR AVOID THE PROBLEM BY SHARPLY CURTAILING THE USE OF FOSSIL FUELS. THE GENERAL CONCENSUS IS THAT SOCIETY HAS SUFFICIENT TIME TO TECHNOLOGICALLY ADAPT TO A CO_2 GREENHOUSE EFFECT.

OUR CONCLUSION WAS RECENTLY REAFFIRMED BY A NUMBER OF STUDIES WHICH RECEIVED WIDE PRESS PUBLICITY. THESE STUDIES INCLUDE THOSE OF THE EPA, NRC/NAS, AND MIT/NSF AND ARE SUMMARIZED IN THE NEXT 4 VU-GRAPHS.

EXHIBIT 2

PARIS AGREEMENT

UNITED NATIONS
2015

PARIS AGREEMENT

The Parties to this Agreement,

Being Parties to the United Nations Framework Convention on Climate Change, hereinafter referred to as "the Convention",

Pursuant to the Durban Platform for Enhanced Action established by decision 1/CP.17 of the Conference of the Parties to the Convention at its seventeenth session,

In pursuit of the objective of the Convention, and being guided by its principles, including the principle of equity and common but differentiated responsibilities and respective capabilities, in the light of different national circumstances,

Recognizing the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge,

Also recognizing the specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, as provided for in the Convention,

Taking full account of the specific needs and special situations of the least developed countries with regard to funding and transfer of technology,

Recognizing that Parties may be affected not only by climate change, but also by the impacts of the measures taken in response to it,

Emphasizing the intrinsic relationship that climate change actions, responses and impacts have with equitable access to sustainable development and eradication of poverty,

Recognizing the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change,

Taking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities,

Acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity,

Recognizing the importance of the conservation and enhancement, as appropriate, of sinks and reservoirs of the greenhouse gases referred to in the Convention,

Noting the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth, and noting the importance for some of the concept of "climate justice", when taking action to address climate change,

Affirming the importance of education, training, public awareness, public participation, public access to information and cooperation at all levels on the matters addressed in this Agreement,

Recognizing the importance of the engagements of all levels of government and various actors, in accordance with respective national legislations of Parties, in addressing climate change,

Also recognizing that sustainable lifestyles and sustainable patterns of consumption and production, with developed country Parties taking the lead, play an important role in addressing climate change,

Have agreed as follows:

Article 1

For the purpose of this Agreement, the definitions contained in Article 1 of the Convention shall apply. In addition:

(a) "Convention" means the United Nations Framework Convention on Climate Change, adopted in New York on 9 May 1992;

(b) "Conference of the Parties" means the Conference of the Parties to the Convention;

(c) "Party" means a Party to this Agreement.

Article 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

2. This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

Article 3

As nationally determined contributions to the global response to climate change, all Parties are to undertake and communicate ambitious efforts as defined in Articles 4, 7, 9, 10, 11 and 13 with the view to achieving the purpose of this Agreement as set out in Article 2. The efforts of all Parties will represent a progression over time, while recognizing the need to support developing country Parties for the effective implementation of this Agreement.

Article 4

1. In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

2. Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

3. Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

4. Developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances.

5. Support shall be provided to developing country Parties for the implementation of this Article, in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing country Parties will allow for higher ambition in their actions.

6. The least developed countries and small island developing States may prepare and communicate strategies, plans and actions for low greenhouse gas emissions development reflecting their special circumstances.

7. Mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans can contribute to mitigation outcomes under this Article.

8. In communicating their nationally determined contributions, all Parties shall provide the information necessary for clarity, transparency and understanding in accordance with decision 1/CP.21 and any relevant decisions of the Conference of the Parties serving as the meeting of the Parties to this Agreement.

9. Each Party shall communicate a nationally determined contribution every five years in accordance with decision 1/CP.21 and any relevant decisions of the Conference of the Parties serving as the meeting of the Parties to this Agreement and be informed by the outcomes of the global stocktake referred to in Article 14.

10. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall consider common time frames for nationally determined contributions at its first session.

11. A Party may at any time adjust its existing nationally determined contribution with a view to enhancing its level of ambition, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

12. Nationally determined contributions communicated by Parties shall be recorded in a public registry maintained by the secretariat.

13. Parties shall account for their nationally determined contributions. In accounting for anthropogenic emissions and removals corresponding to their nationally determined contributions, Parties shall promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

14. In the context of their nationally determined contributions, when recognizing and implementing mitigation actions with respect to anthropogenic emissions and removals, Parties should take into account, as appropriate, existing methods and guidance under the Convention, in the light of the provisions of paragraph 13 of this Article.

15. Parties shall take into consideration in the implementation of this Agreement the concerns of Parties with economies most affected by the impacts of response measures, particularly developing country Parties.

16. Parties, including regional economic integration organizations and their member States, that have reached an agreement to act jointly under paragraph 2 of this Article shall notify the secretariat of the terms of that agreement, including the emission level allocated to each Party within the relevant time period, when they communicate their nationally determined contributions. The secretariat shall in turn inform the Parties and signatories to the Convention of the terms of that agreement.

17. Each party to such an agreement shall be responsible for its emission level as set out in the agreement referred to in paragraph 16 of this Article in accordance with paragraphs 13 and 14 of this Article and Articles 13 and 15.

18. If Parties acting jointly do so in the framework of, and together with, a regional economic integration organization which is itself a Party to this Agreement, each member State of that regional economic integration organization individually, and together with the regional economic integration organization, shall be responsible for its emission level as set out in the agreement communicated under paragraph 16 of this Article in accordance with paragraphs 13 and 14 of this Article and Articles 13 and 15.

19. All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

Article 5

1. Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1 (d), of the Convention, including forests.

2. Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches.

Article 6

1. Parties recognize that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity.

2. Parties shall, where engaging on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes towards nationally determined contributions, promote sustainable development and ensure environmental integrity and transparency, including in governance, and shall apply robust accounting to ensure, inter alia, the avoidance of double counting, consistent with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

3. The use of internationally transferred mitigation outcomes to achieve nationally determined contributions under this Agreement shall be voluntary and authorized by participating Parties.

4. A mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development is hereby established under the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Agreement for use by Parties on a voluntary basis. It shall be supervised by a body designated by the Conference of the Parties serving as the meeting of the Parties to this Agreement, and shall aim:

(a) To promote the mitigation of greenhouse gas emissions while fostering sustainable development;

(b) To incentivize and facilitate participation in the mitigation of greenhouse gas emissions by public and private entities authorized by a Party;

(c) To contribute to the reduction of emission levels in the host Party, which will benefit from mitigation activities resulting in emission reductions that can also be used by another Party to fulfil its nationally determined contribution; and

(d) To deliver an overall mitigation in global emissions.

5. Emission reductions resulting from the mechanism referred to in paragraph 4 of this Article shall not be used to demonstrate achievement of the host Party's nationally determined contribution if used by another Party to demonstrate achievement of its nationally determined contribution.

6. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall ensure that a share of the proceeds from activities under the mechanism referred to in paragraph 4 of this Article is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.

7. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall adopt rules, modalities and procedures for the mechanism referred to in paragraph 4 of this Article at its first session.

8. Parties recognize the importance of integrated, holistic and balanced non-market approaches being available to Parties to assist in the implementation of their nationally determined contributions, in the context of sustainable development and poverty eradication, in a coordinated and effective manner, including through, inter alia, mitigation, adaptation, finance, technology transfer and capacity-building, as appropriate. These approaches shall aim to:

(a) Promote mitigation and adaptation ambition;

(b) Enhance public and private sector participation in the implementation of nationally determined contributions; and

(c) Enable opportunities for coordination across instruments and relevant institutional arrangements.

9. A framework for non-market approaches to sustainable development is hereby defined to promote the non-market approaches referred to in paragraph 8 of this Article.

Article 7

1. Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2.

2. Parties recognize that adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions, and that it is a key component of and makes a contribution to the long-term global response to climate change to protect people, livelihoods and ecosystems, taking into account the urgent and immediate needs of those developing country Parties that are particularly vulnerable to the adverse effects of climate change.

3. The adaptation efforts of developing country Parties shall be recognized, in accordance with the modalities to be adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement at its first session.

4. Parties recognize that the current need for adaptation is significant and that greater levels of mitigation can reduce the need for additional adaptation efforts, and that greater adaptation needs can involve greater adaptation costs.

5. Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.

6. Parties recognize the importance of support for and international cooperation on adaptation efforts and the importance of taking into account the needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change.

7. Parties should strengthen their cooperation on enhancing action on adaptation, taking into account the Cancun Adaptation Framework, including with regard to:

(a) Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions;

(b) Strengthening institutional arrangements, including those under the Convention that serve this Agreement, to support the synthesis of relevant information and knowledge, and the provision of technical support and guidance to Parties;

(c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making;

(d) Assisting developing country Parties in identifying effective adaptation practices, adaptation needs, priorities, support provided and received for adaptation actions and efforts, and challenges and gaps, in a manner consistent with encouraging good practices; and

(e) Improving the effectiveness and durability of adaptation actions.

8. United Nations specialized organizations and agencies are encouraged to support the efforts of Parties to implement the actions referred to in paragraph 7 of this Article, taking into account the provisions of paragraph 5 of this Article.

9. Each Party shall, as appropriate, engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions, which may include:

(a) The implementation of adaptation actions, undertakings and/or efforts;

(b) The process to formulate and implement national adaptation plans;

(c) The assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems;

(d) Monitoring and evaluating and learning from adaptation plans, policies, programmes and actions; and

(e) Building the resilience of socioeconomic and ecological systems, including through economic diversification and sustainable management of natural resources.

10. Each Party should, as appropriate, submit and update periodically an adaptation communication, which may include its priorities, implementation and support needs, plans and actions, without creating any additional burden for developing country Parties.

11. The adaptation communication referred to in paragraph 10 of this Article shall be, as appropriate, submitted and updated periodically, as a component of or in conjunction with other communications or documents, including a national adaptation plan, a nationally determined contribution as referred to in Article 4, paragraph 2, and/or a national communication.

12. The adaptation communications referred to in paragraph 10 of this Article shall be recorded in a public registry maintained by the secretariat.

13. Continuous and enhanced international support shall be provided to developing country Parties for the implementation of paragraphs 7, 9, 10 and 11 of this Article, in accordance with the provisions of Articles 9, 10 and 11.

14. The global stocktake referred to in Article 14 shall, inter alia:

(a) Recognize adaptation efforts of developing country Parties;

(b) Enhance the implementation of adaptation action taking into account the adaptation communication referred to in paragraph 10 of this Article;

(c) Review the adequacy and effectiveness of adaptation and support provided for adaptation; and

(d) Review the overall progress made in achieving the global goal on adaptation referred to in paragraph 1 of this Article.

Article 8

1. Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage.

2. The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Agreement and may be enhanced and strengthened, as determined by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

3. Parties should enhance understanding, action and support, including through the Warsaw International Mechanism, as appropriate, on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change.

4. Accordingly, areas of cooperation and facilitation to enhance understanding, action and support may include:

(a) Early warning systems;

(b) Emergency preparedness;

(c) Slow onset events;

(d) Events that may involve irreversible and permanent loss and damage;

(e) Comprehensive risk assessment and management;

(f) Risk insurance facilities, climate risk pooling and other insurance solutions;

(g) Non-economic losses; and

(h) Resilience of communities, livelihoods and ecosystems.

5. The Warsaw International Mechanism shall collaborate with existing bodies and expert groups under the Agreement, as well as relevant organizations and expert bodies outside the Agreement.

Article 9

1. Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention.

2. Other Parties are encouraged to provide or continue to provide such support voluntarily.

3. As part of a global effort, developed country Parties should continue to take the lead in mobilizing climate finance from a wide variety of sources, instruments and channels, noting the significant role of public funds, through a variety of actions, including supporting country-driven strategies, and taking into account the needs and priorities of developing country Parties. Such mobilization of climate finance should represent a progression beyond previous efforts.

4. The provision of scaled-up financial resources should aim to achieve a balance between adaptation and mitigation, taking into account country-driven strategies, and the priorities and needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change and have significant capacity constraints, such as the least developed countries and small island developing States, considering the need for public and grant-based resources for adaptation.

5. Developed country Parties shall biennially communicate indicative quantitative and qualitative information related to paragraphs 1 and 3 of this Article, as applicable, including, as available, projected levels of public financial resources to be provided to developing country Parties. Other Parties providing resources are encouraged to communicate biennially such information on a voluntary basis.

6. The global stocktake referred to in Article 14 shall take into account the relevant information provided by developed country Parties and/or Agreement bodies on efforts related to climate finance.

7. Developed country Parties shall provide transparent and consistent information on support for developing country Parties provided and mobilized through public interventions biennially in accordance with the modalities, procedures and guidelines to be adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement, at its first session, as stipulated in Article 13, paragraph 13. Other Parties are encouraged to do so.

8. The Financial Mechanism of the Convention, including its operating entities, shall serve as the financial mechanism of this Agreement.

9. The institutions serving this Agreement, including the operating entities of the Financial Mechanism of the Convention, shall aim to ensure efficient access to financial resources through simplified approval procedures and enhanced readiness support for developing country Parties, in particular for the least developed countries and small island developing States, in the context of their national climate strategies and plans.

Article 10

1. Parties share a long-term vision on the importance of fully realizing technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions.

2. Parties, noting the importance of technology for the implementation of mitigation and adaptation actions under this Agreement and recognizing existing technology deployment and dissemination efforts, shall strengthen cooperative action on technology development and transfer.

3. The Technology Mechanism established under the Convention shall serve this Agreement.

4. A technology framework is hereby established to provide overarching guidance to the work of the Technology Mechanism in promoting and facilitating enhanced action on technology development and transfer in order to support the implementation of this Agreement, in pursuit of the long-term vision referred to in paragraph 1 of this Article.

5. Accelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development. Such effort shall be, as appropriate, supported, including by the Technology Mechanism and, through financial means, by the Financial Mechanism of the Convention, for collaborative approaches to research and development, and facilitating access to technology, in particular for early stages of the technology cycle, to developing country Parties.

6. Support, including financial support, shall be provided to developing country Parties for the implementation of this Article, including for strengthening cooperative action on technology development and transfer at different stages of the technology cycle, with a view to achieving a balance between support for mitigation and adaptation. The global stocktake referred to in Article 14 shall take into account available information on efforts related to support on technology development and transfer for developing country Parties.

Article 11

1. Capacity-building under this Agreement should enhance the capacity and ability of developing country Parties, in particular countries with the least capacity, such as the least developed countries, and those that are particularly vulnerable to the adverse effects of climate change, such as small island developing States, to take effective climate change action, including, inter alia, to implement adaptation and mitigation actions, and should facilitate technology development, dissemination and deployment, access to climate finance, relevant aspects of education, training and public awareness, and the transparent, timely and accurate communication of information.

2. Capacity-building should be country-driven, based on and responsive to national needs, and foster country ownership of Parties, in particular, for developing country Parties, including at the national, subnational and local levels. Capacity-building should be guided by lessons learned, including those from capacity-building activities under the Convention, and should be an effective, iterative process that is participatory, cross-cutting and gender-responsive.

3. All Parties should cooperate to enhance the capacity of developing country Parties to implement this Agreement. Developed country Parties should enhance support for capacity-building actions in developing country Parties.

4. All Parties enhancing the capacity of developing country Parties to implement this Agreement, including through regional, bilateral and multilateral approaches, shall regularly communicate on these actions or measures on capacity-building. Developing country Parties should regularly communicate progress made on implementing capacity-building plans, policies, actions or measures to implement this Agreement.

5. Capacity-building activities shall be enhanced through appropriate institutional arrangements to support the implementation of this Agreement, including the appropriate institutional arrangements established under the Convention that serve this Agreement. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall, at its first session, consider and adopt a decision on the initial institutional arrangements for capacity-building.

Article 12

Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement.

Article 13

1. In order to build mutual trust and confidence and to promote effective implementation, an enhanced transparency framework for action and support, with built-in flexibility which takes into account Parties' different capacities and builds upon collective experience is hereby established.

2. The transparency framework shall provide flexibility in the implementation of the provisions of this Article to those developing country Parties that need it in the light of their capacities. The modalities, procedures and guidelines referred to in paragraph 13 of this Article shall reflect such flexibility.

3. The transparency framework shall build on and enhance the transparency arrangements under the Convention, recognizing the special circumstances of the least developed countries and small island developing States, and be implemented in a facilitative, non-intrusive, non-punitive manner, respectful of national sovereignty, and avoid placing undue burden on Parties.

4. The transparency arrangements under the Convention, including national communications, biennial reports and biennial update reports, international assessment and review and international consultation and analysis, shall form part of the experience drawn upon for the development of the modalities, procedures and guidelines under paragraph 13 of this Article.

5. The purpose of the framework for transparency of action is to provide a clear understanding of climate change action in the light of the objective of the Convention as set out in its Article 2, including clarity and tracking of progress towards achieving Parties' individual nationally determined contributions under Article 4, and Parties' adaptation actions under Article 7, including good practices, priorities, needs and gaps, to inform the global stocktake under Article 14.

6. The purpose of the framework for transparency of support is to provide clarity on support provided and received by relevant individual Parties in the context of climate change actions under Articles 4, 7, 9, 10 and 11, and, to the extent possible, to provide a full overview of aggregate financial support provided, to inform the global stocktake under Article 14.

7. Each Party shall regularly provide the following information:

(a) A national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases, prepared using good practice methodologies accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties serving as the meeting of the Parties to this Agreement; and

(b) Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4.

8. Each Party should also provide information related to climate change impacts and adaptation under Article 7, as appropriate.

9. Developed country Parties shall, and other Parties that provide support should, provide information on financial, technology transfer and capacity-building support provided to developing country Parties under Articles 9, 10 and 11.

10. Developing country Parties should provide information on financial, technology transfer and capacity-building support needed and received under Articles 9, 10 and 11.

11. Information submitted by each Party under paragraphs 7 and 9 of this Article shall undergo a technical expert review, in accordance with decision 1/CP.21. For those developing country Parties that need it in the light of their capacities, the review process shall include assistance in identifying capacity-building needs. In addition, each Party shall participate in a facilitative, multilateral consideration of progress with respect to efforts under Article 9, and its respective implementation and achievement of its nationally determined contribution.

12. The technical expert review under this paragraph shall consist of a consideration of the Party's support provided, as relevant, and its implementation and achievement of its nationally determined contribution. The review shall also identify areas of improvement for the Party, and include a review of the consistency of the information with the modalities, procedures and guidelines referred to in paragraph 13 of this Article, taking into account the flexibility accorded to the Party under paragraph 2 of this Article. The review shall pay particular attention to the respective national capabilities and circumstances of developing country Parties.

13. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall, at its first session, building on experience from the arrangements related to transparency under the Convention, and elaborating on the provisions in this Article, adopt common modalities, procedures and guidelines, as appropriate, for the transparency of action and support.

14. Support shall be provided to developing countries for the implementation of this Article.

15. Support shall also be provided for the building of transparency-related capacity of developing country Parties on a continuous basis.

Article 14

1. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall periodically take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals (referred to as the "global stocktake"). It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the

means of implementation and support, and in the light of equity and the best available science.

2. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall undertake its first global stocktake in 2023 and every five years thereafter unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

3. The outcome of the global stocktake shall inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international cooperation for climate action.

Article 15

1. A mechanism to facilitate implementation of and promote compliance with the provisions of this Agreement is hereby established.

2. The mechanism referred to in paragraph 1 of this Article shall consist of a committee that shall be expert-based and facilitative in nature and function in a manner that is transparent, non-adversarial and non-punitive. The committee shall pay particular attention to the respective national capabilities and circumstances of Parties.

3. The committee shall operate under the modalities and procedures adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement at its first session and report annually to the Conference of the Parties serving as the meeting of the Parties to this Agreement.

Article 16

1. The Conference of the Parties, the supreme body of the Convention, shall serve as the meeting of the Parties to this Agreement.

2. Parties to the Convention that are not Parties to this Agreement may participate as observers in the proceedings of any session of the Conference of the Parties serving as the meeting of the Parties to this Agreement. When the Conference of the Parties serves as the meeting of the Parties to this Agreement, decisions under this Agreement shall be taken only by those that are Parties to this Agreement.

3. When the Conference of the Parties serves as the meeting of the Parties to this Agreement, any member of the Bureau of the Conference of the Parties representing a Party to the Convention but, at that time, not a Party to this Agreement, shall be replaced by an additional member to be elected by and from amongst the Parties to this Agreement.

4. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall keep under regular review the implementation of this Agreement and shall make, within its mandate, the decisions necessary to promote its effective implementation. It shall perform the functions assigned to it by this Agreement and shall:

(a) Establish such subsidiary bodies as deemed necessary for the implementation of this Agreement; and

(b) Exercise such other functions as may be required for the implementation of this Agreement.

5. The rules of procedure of the Conference of the Parties and the financial procedures applied under the Convention shall be applied *mutatis mutandis* under this Agreement, except as may be otherwise decided by consensus by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

6. The first session of the Conference of the Parties serving as the meeting of the Parties to this Agreement shall be convened by the secretariat in conjunction with the first session of the Conference of the Parties that is scheduled after the date of entry into force of this Agreement. Subsequent ordinary sessions of the Conference of the Parties serving as the meeting of the Parties to this Agreement shall be held in conjunction with ordinary sessions of the Conference of the Parties, unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

7. Extraordinary sessions of the Conference of the Parties serving as the meeting of the Parties to this Agreement shall be held at such other times as may be deemed necessary by the Conference of the Parties serving as the meeting of the Parties to this Agreement or at the written request of any Party, provided that, within six months of the request being communicated to the Parties by the secretariat, it is supported by at least one third of the Parties.

8. The United Nations and its specialized agencies and the International Atomic Energy Agency, as well as any State member thereof or observers thereto not party to the Convention, may be represented at sessions of the Conference of the Parties serving as the meeting of the Parties to this Agreement as observers. Any body or agency, whether national or international, governmental or non-governmental, which is qualified in matters covered by this Agreement and which has informed the secretariat of its wish to be represented at a session of the Conference of the Parties serving as the meeting of the Parties to this Agreement as an observer, may be so admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of procedure referred to in paragraph 5 of this Article.

Article 17

1. The secretariat established by Article 8 of the Convention shall serve as the secretariat of this Agreement.

2. Article 8, paragraph 2, of the Convention on the functions of the secretariat, and Article 8, paragraph 3, of the Convention, on the arrangements made for the functioning of the secretariat, shall apply *mutatis mutandis* to this Agreement. The secretariat shall, in addition, exercise the functions assigned to it under this Agreement and by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

Article 18

1. The Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation established by Articles 9 and 10 of the Convention shall serve, respectively, as the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Agreement. The provisions of the Convention relating to the functioning of these two bodies shall apply *mutatis mutandis* to this Agreement. Sessions of the meetings of the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Agreement shall be held in conjunction with the meetings of, respectively, the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of the Convention.

2. Parties to the Convention that are not Parties to this Agreement may participate as observers in the proceedings of any session of the subsidiary bodies. When the subsidiary bodies serve as the subsidiary bodies of this Agreement, decisions under this Agreement shall be taken only by those that are Parties to this Agreement.

3. When the subsidiary bodies established by Articles 9 and 10 of the Convention exercise their functions with regard to matters concerning this Agreement, any member of the bureaux of those subsidiary bodies representing a Party to the Convention but, at that time, not a Party to this Agreement, shall be replaced by an additional member to be elected by and from amongst the Parties to this Agreement.

Article 19

1. Subsidiary bodies or other institutional arrangements established by or under the Convention, other than those referred to in this Agreement, shall serve this Agreement upon a decision of the Conference of the Parties serving as the meeting of the Parties to this Agreement. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall specify the functions to be exercised by such subsidiary bodies or arrangements.

2. The Conference of the Parties serving as the meeting of the Parties to this Agreement may provide further guidance to such subsidiary bodies and institutional arrangements.

Article 20

1. This Agreement shall be open for signature and subject to ratification, acceptance or approval by States and regional economic integration organizations that are Parties to the Convention. It shall be open for signature at the United Nations Headquarters in New York from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. Instruments of ratification, acceptance, approval or accession shall be deposited with the Depositary.

2. Any regional economic integration organization that becomes a Party to this Agreement without any of its member States being a Party shall be bound by all the obligations under this Agreement. In the case of regional economic integration organizations with one or more member States that are Parties to this Agreement,

the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under this Agreement. In such cases, the organization and the member States shall not be entitled to exercise rights under this Agreement concurrently.

3. In their instruments of ratification, acceptance, approval or accession, regional economic integration organizations shall declare the extent of their competence with respect to the matters governed by this Agreement. These organizations shall also inform the Depositary, who shall in turn inform the Parties, of any substantial modification in the extent of their competence.

Article 21

1. This Agreement shall enter into force on the thirtieth day after the date on which at least 55 Parties to the Convention accounting in total for at least an estimated 55 per cent of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession.

2. Solely for the limited purpose of paragraph 1 of this Article, "total global greenhouse gas emissions" means the most up-to-date amount communicated on or before the date of adoption of this Agreement by the Parties to the Convention.

3. For each State or regional economic integration organization that ratifies, accepts or approves this Agreement or accedes thereto after the conditions set out in paragraph 1 of this Article for entry into force have been fulfilled, this Agreement shall enter into force on the thirtieth day after the date of deposit by such State or regional economic integration organization of its instrument of ratification, acceptance, approval or accession.

4. For the purposes of paragraph 1 of this Article, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by its member States.

Article 22

The provisions of Article 15 of the Convention on the adoption of amendments to the Convention shall apply *mutatis mutandis* to this Agreement.

Article 23

1. The provisions of Article 16 of the Convention on the adoption and amendment of annexes to the Convention shall apply *mutatis mutandis* to this Agreement.

2. Annexes to this Agreement shall form an integral part thereof and, unless otherwise expressly provided for, a reference to this Agreement constitutes at the same time a reference to any annexes thereto. Such annexes shall be restricted to lists, forms and any other material of a descriptive nature that is of a scientific, technical, procedural or administrative character.

Article 24

The provisions of Article 14 of the Convention on settlement of disputes shall apply *mutatis mutandis* to this Agreement.

Article 25

1. Each Party shall have one vote, except as provided for in paragraph 2 of this Article.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States that are Parties to this Agreement. Such an organization shall not exercise its right to vote if any of its member States exercises its right, and vice versa.

Article 26

The Secretary-General of the United Nations shall be the Depositary of this Agreement.

Article 27

No reservations may be made to this Agreement.

Article 28

1. At any time after three years from the date on which this Agreement has entered into force for a Party, that Party may withdraw from this Agreement by giving written notification to the Depositary.

2. Any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal.

3. Any Party that withdraws from the Convention shall be considered as also having withdrawn from this Agreement.

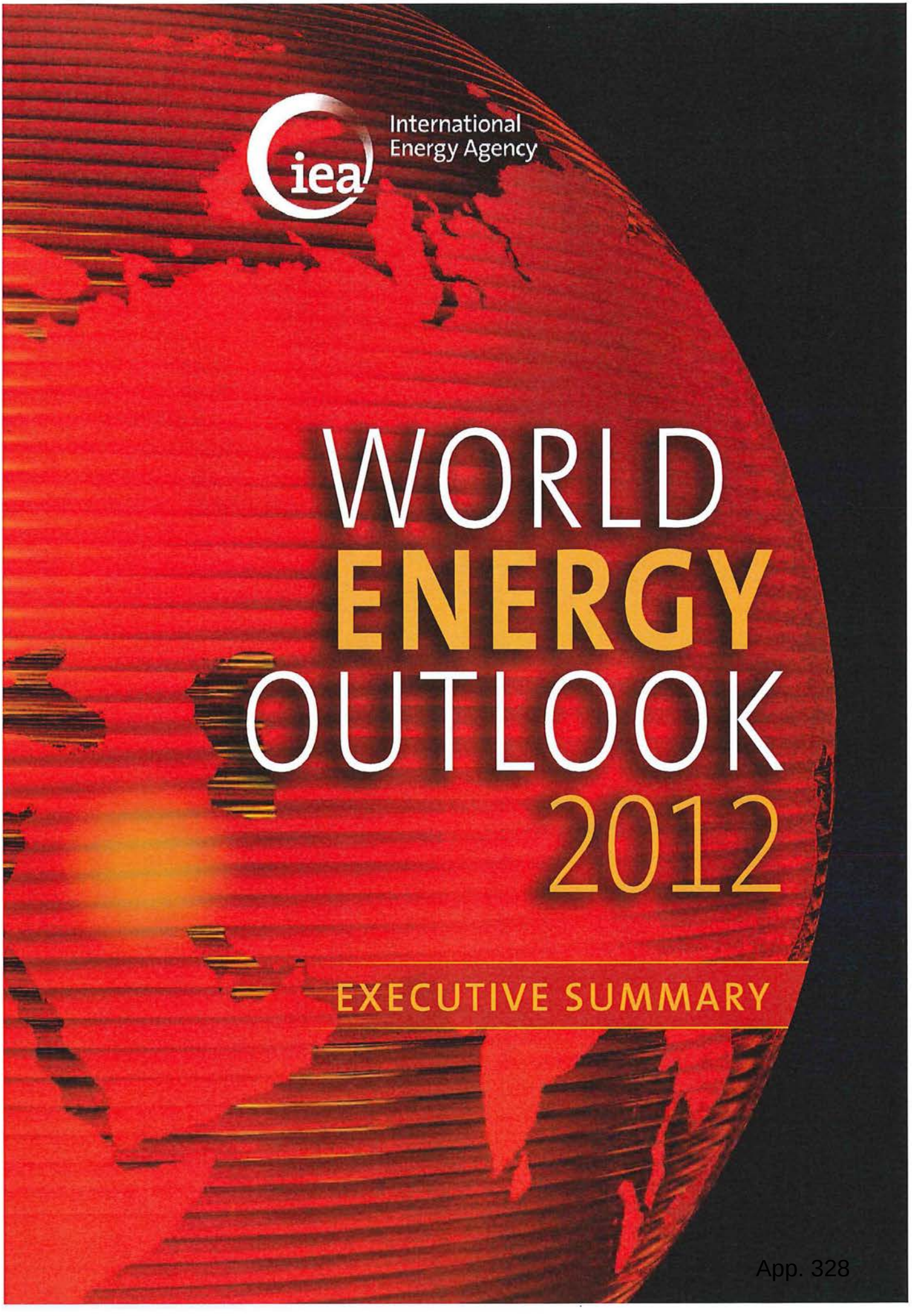
Article 29

The original of this Agreement, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

DONE at Paris this twelfth day of December two thousand and fifteen.

IN WITNESS WHEREOF, the undersigned, being duly authorized to that effect, have signed this Agreement.

EXHIBIT 3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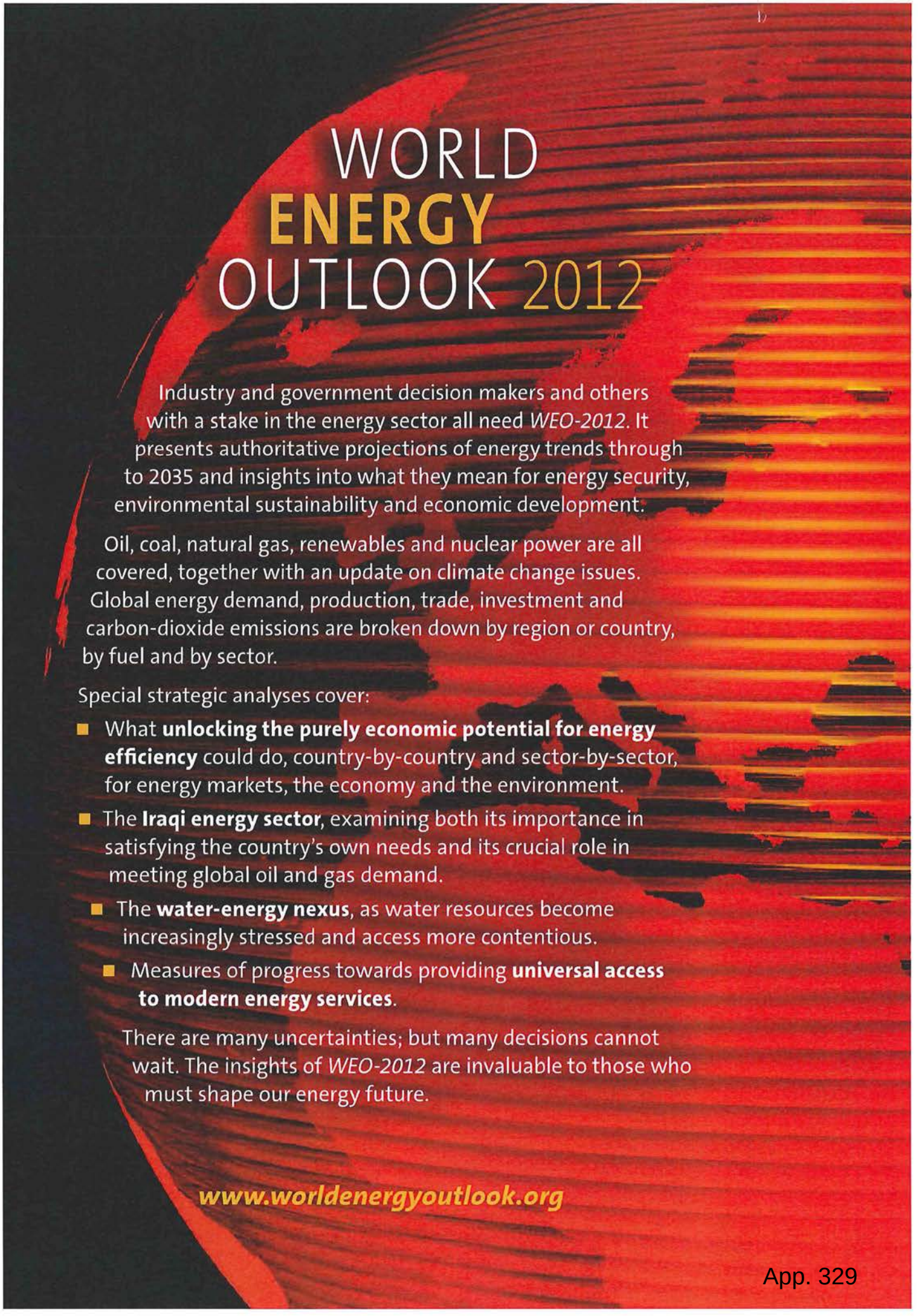
2012
EXECUTIVE SUMMARY


WORLD
ENERGY
OUTLOOK 2012
Industry and government decision makers and others with a stake in the energy sector all need *WEO-2012*. It presents authoritative projections of energy trends through to 2035 and insights into what they mean for energy security, environmental sustainability and economic development.
Oil, coal, natural gas, renewables and nuclear power are all covered, together with an update on climate change issues. Global energy demand, production, trade, investment and carbon-dioxide emissions are broken down by region or country, by fuel and by sector.
Special strategic analyses cover:
What **unlocking the purely economic potential for energy efficiency** could do, country-by-country and sector-by-sector, for energy markets, the economy and the environment.
The **Iraqi energy sector**, examining both its importance in satisfying the country's own needs and its crucial role in meeting global oil and gas demand.
The **water-energy nexus**, as water resources become increasingly stressed and access more contentious.
Measures of progress towards providing **universal access to modern energy services**.
There are many uncertainties; but many decisions cannot wait. The insights of *WEO-2012* are invaluable to those who must shape our energy future.
www.worldenergyoutlook.org

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 28 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

IEA member countries:

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Japan
Korea (Republic of)
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

The European Commission also participates in the work of the IEA.

International Energy Agency

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75739 Paris Cedex 15, France

www.iea.org

A new global energy landscape is emerging

The global energy map is changing, with potentially far-reaching consequences for energy markets and trade. It is being redrawn by the resurgence in oil and gas production in the United States and could be further reshaped by a retreat from nuclear power in some countries, continued rapid growth in the use of wind and solar technologies and by the global spread of unconventional gas production. Perspectives for international oil markets hinge on Iraq's success in revitalising its oil sector. If new policy initiatives are broadened and implemented in a concerted effort to improve global energy efficiency, this could likewise be a game-changer. On the basis of global scenarios and multiple case studies, this *World Energy Outlook* assesses how these new developments might affect global energy and climate trends over the coming decades. It examines their impact on the critical challenges facing the energy system: to meet the world's ever-growing energy needs, led by rising incomes and populations in emerging economies; to provide energy access to the world's poorest; and to bring the world towards meeting its climate change objectives.

Taking all new developments and policies into account, the world is still failing to put the global energy system onto a more sustainable path. Global energy demand grows by more than one-third over the period to 2035 in the New Policies Scenario (our central scenario), with China, India and the Middle East accounting for 60% of the increase. Energy demand barely rises in OECD countries, although there is a pronounced shift away from oil, coal (and, in some countries, nuclear) towards natural gas and renewables. Despite the growth in low-carbon sources of energy, fossil fuels remain dominant in the global energy mix, supported by subsidies that amounted to $523 billion in 2011, up almost 30% on 2010 and six times more than subsidies to renewables. The cost of fossil-fuel subsidies has been driven up by higher oil prices; they remain most prevalent in the Middle East and North Africa, where momentum towards their reform appears to have been lost. Emissions in the New Policies Scenario correspond to a long-term average global temperature increase of 3.6 °C.

The tide turns for US energy flows

Energy developments in the United States are profound and their effect will be felt well beyond North America – and the energy sector. The recent rebound in US oil and gas production, driven by upstream technologies that are unlocking light tight oil and shale gas resources, is spurring economic activity – with less expensive gas and electricity prices giving industry a competitive edge – and steadily changing the role of North America in global energy trade. By around 2020, the United States is projected to become the largest global oil producer (overtaking Saudi Arabia until the mid-2020s) and starts to see the impact of new fuel-efficiency measures in transport. The result is a continued fall in US oil imports, to the extent that North America becomes a net oil exporter around 2030. This accelerates the switch in direction of international oil trade towards Asia, putting a focus on the security of the strategic routes that bring Middle East oil to Asian markets. The

United States, which currently imports around 20% of its total energy needs, becomes all but self-sufficient in net terms – a dramatic reversal of the trend seen in most other energy-importing countries.

But there is no immunity from global markets

No country is an energy "island" and the interactions between different fuels, markets and prices are intensifying. Most oil consumers are used to the effects of worldwide fluctuations in price (reducing its oil imports will not insulate the United States from developments in international markets), but consumers can expect to see growing linkages in other areas. A current example is how low-priced natural gas is reducing coal use in the United States, freeing up coal for export to Europe (where, in turn, it has displaced higher-priced gas). At its lowest level in 2012, natural gas in the United States traded at around one-fifth of import prices in Europe and one-eighth of those in Japan. Going forward, price relationships between regional gas markets are set to strengthen as liquefied natural gas trade becomes more flexible and contract terms evolve, meaning that changes in one part of the world are more quickly felt elsewhere. Within individual countries and regions, competitive power markets are creating stronger links between gas and coal markets, while these markets also need to adapt to the increasing role of renewables and, in some cases, to the reduced role of nuclear power. Policy makers looking for simultaneous progress towards energy security, economic and environmental objectives are facing increasingly complex – and sometimes contradictory – choices.

A blueprint for an energy-efficient world

Energy efficiency is widely recognised as a key option in the hands of policy makers but current efforts fall well short of tapping its full economic potential. In the last year, major energy-consuming countries have announced new measures: China is targeting a 16% reduction in energy intensity by 2015; the United States has adopted new fuel-economy standards; the European Union has committed to a cut of 20% in its 2020 energy demand; and Japan aims to cut 10% from electricity consumption by 2030. In the New Policies Scenario, these help to speed up the disappointingly slow progress in global energy efficiency seen over the last decade. But even with these and other new policies in place, a significant share of the potential to improve energy efficiency – four-fifths of the potential in the buildings sector and more than half in industry – still remains untapped.

Our Efficient World Scenario shows how tackling the barriers to energy efficiency investment can unleash this potential and realise huge gains for energy security, economic growth and the environment. These gains are not based on achieving any major or unexpected technological breakthroughs, but just on taking actions to remove the barriers obstructing the implementation of energy efficiency measures that are economically viable. Successful action to this effect would have a major impact on global energy and climate trends, compared with the New Policies Scenario. The growth in global primary energy demand to 2035 would be halved. Oil demand would peak just before 2020 and would be almost 13 mb/d lower by 2035, a reduction equal to the current production of Russia and

Norway combined, easing the pressure for new discoveries and development. Additional investment of $11.8 trillion (in year-2011 dollars) in more energy-efficient technologies would be more than offset by reduced fuel expenditures. The accrued resources would facilitate a gradual reorientation of the global economy, boosting cumulative economic output to 2035 by $18 trillion, with the biggest gross domestic product (GDP) gains in India, China, the United States and Europe. Universal access to modern energy would be easier to achieve and air quality improved, as emissions of local pollutants fall sharply. Energy-related carbon-dioxide (CO_2) emissions would peak before 2020, with a decline thereafter consistent with a long-term temperature increase of 3 °C.

We propose policy principles that can turn the Efficient World Scenario into reality. Although the specific steps will vary by country and by sector, there are six broad areas that need to be addressed. Energy efficiency needs to be made clearly visible, by strengthening the measurement and disclosure of its economic gains. The profile of energy efficiency needs to be raised, so that efficiency concerns are integrated into decision making throughout government, industry and society. Policy makers need to improve the affordability of energy efficiency, by creating and supporting business models, financing vehicles and incentives to ensure that investors reap an appropriate share of the rewards. By deploying a mix of regulations to discourage the least-efficient approaches and incentives to deploy the most efficient, governments can help push energy-efficient technologies into the mainstream. Monitoring, verification and enforcement activities are essential to realise expected energy savings. These steps would need to be underpinned by greater investment in energy efficiency governance and administrative capacity at all levels.

Energy efficiency can keep the door to 2 °C open for just a bit longer

Successive editions of this report have shown that the climate goal of limiting warming to 2 °C is becoming more difficult and more costly with each year that passes. Our 450 Scenario examines the actions necessary to achieve this goal and finds that almost four-fifths of the CO_2 emissions allowable by 2035 are already locked-in by existing power plants, factories, buildings, etc. If action to reduce CO_2 emissions is not taken before 2017, all the allowable CO_2 emissions would be locked-in by energy infrastructure existing at that time. Rapid deployment of energy-efficient technologies – as in our Efficient World Scenario – would postpone this complete lock-in to 2022, buying time to secure a much-needed global agreement to cut greenhouse-gas emissions.

No more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2 °C goal, unless carbon capture and storage (CCS) technology is widely deployed. This finding is based on our assessment of global "carbon reserves", measured as the potential CO_2 emissions from proven fossil-fuel reserves. Almost two-thirds of these carbon reserves are related to coal, 22% to oil and 15% to gas. Geographically, two-thirds are held by North America, the Middle East, China and Russia. These findings underline the importance of CCS as a key option to mitigate CO_2 emissions, but its pace of deployment remains highly uncertain, with only a handful of commercial-scale projects currently in operation.

Trucks deliver a large share of oil demand growth

Growth in oil consumption in emerging economies, particularly for transport in China, India and the Middle East, more than outweighs reduced demand in the OECD, pushing oil use steadily higher in the New Policies Scenario. Oil demand reaches 99.7 mb/d in 2035, up from 87.4 mb/d in 2011, and the average IEA crude oil import price rises to $125/barrel (in year-2011 dollars) in 2035 (over $215/barrel in nominal terms). The transport sector already accounts for over half of global oil consumption, and this share increases as the number of passenger cars doubles to 1.7 billion and demand for road freight rises quickly. The latter is responsible for almost 40% of the increase in global oil demand: oil use for trucks – predominantly diesel – increases much faster than that for passenger vehicles, in part because fuel-economy standards for trucks are much less widely adopted.

Non-OPEC oil output steps up over the current decade, but supply after 2020 depends increasingly on OPEC. A surge in unconventional supplies, mainly from light tight oil in the United States and oil sands in Canada, natural gas liquids, and a jump in deepwater production in Brazil, push non-OPEC production up after 2015 to a plateau above 53 mb/d, from under 49 mb/d in 2011. This is maintained until the mid-2020s, before falling back to 50 mb/d in 2035. Output from OPEC countries rises, particularly after 2020, bringing the OPEC share in global production from its current 42% up towards 50% by 2035. The net increase in global oil production is driven entirely by unconventional oil, including a contribution from light tight oil that exceeds 4 mb/d for much of the 2020s, and by natural gas liquids. Of the $15 trillion in upstream oil and gas investment that is required over the period to 2035, almost 30% is in North America.

Much is riding on Iraq's success

Iraq makes the largest contribution by far to global oil supply growth. Iraq's ambition to expand output after decades of conflict and instability is not limited by the size of its resources or by the costs of producing them, but will require co-ordinated progress all along the energy supply chain, clarity on how Iraq plans to derive long-term value from its hydrocarbon wealth and successful consolidation of a domestic consensus on oil policy. In our projections, oil output in Iraq exceeds 6 mb/d in 2020 and rises to more than 8 mb/d in 2035. Iraq becomes a key supplier to fast-growing Asian markets, mainly China, and the second-largest global exporter by the 2030s, overtaking Russia. Without this supply growth from Iraq, oil markets would be set for difficult times, characterised by prices that are almost $15/barrel higher than the level in the New Policies Scenario by 2035.

Iraq stands to gain almost $5 trillion in revenue from oil exports over the period to 2035, an annual average of $200 billion, and an opportunity to transform the country's prospects. The energy sector competes with a host of other spending needs in Iraq, but one urgent priority is to catch up and keep pace with rising electricity demand: if planned new capacity is delivered on time, grid-based electricity generation will be sufficient to meet peak demand by around 2015. Gathering and processing associated gas – much of which is currently flared – and developing non-associated gas offers the promise of a more

efficient gas-fuelled power sector and, once domestic demand is satisfied, of gas exports. Translating oil export receipts into greater prosperity will require strengthened institutions, both to ensure efficient, transparent management of revenues and spending, and to set the course necessary to encourage more diverse economic activity.

Different shades of gold for natural gas

Natural gas is the only fossil fuel for which global demand grows in all scenarios, showing that it fares well under different policy conditions; but the outlook varies by region. Demand growth in China, India and the Middle East is strong: active policy support and regulatory reforms push China's consumption up from around 130 billion cubic metres (bcm) in 2011 to 545 bcm in 2035. In the United States, low prices and abundant supply see gas overtake oil around 2030 to become the largest fuel in the energy mix. Europe takes almost a decade to get back to 2010 levels of gas demand: the growth in Japan is similarly limited by higher gas prices and a policy emphasis on renewables and energy efficiency.

Unconventional gas accounts for nearly half of the increase in global gas production to 2035, with most of the increase coming from China, the United States and Australia. But the unconventional gas business is still in its formative years, with uncertainty in many countries about the extent and quality of the resource base. As analysed in a *World Energy Outlook Special Report* released in May 2012, there are also concerns about the environmental impact of producing unconventional gas that, if not properly addressed, could halt the unconventional gas revolution in its tracks. Public confidence can be underpinned by robust regulatory frameworks and exemplary industry performance. By bolstering and diversifying sources of supply, tempering demand for imports (as in China) and fostering the emergence of new exporting countries (as in the United States), unconventional gas can accelerate movement towards more diversified trade flows, putting pressure on conventional gas suppliers and on traditional oil-linked pricing mechanisms for gas.

Will coal remain a fuel of choice?

Coal has met nearly half of the rise in global energy demand over the last decade, growing faster even than total renewables. Whether coal demand carries on rising strongly or changes course will depend on the strength of policy measures that favour lower-emissions energy sources, the deployment of more efficient coal-burning technologies and, especially important in the longer term, CCS. The policy decisions carrying the most weight for the global coal balance will be taken in Beijing and New Delhi – China and India account for almost three-quarters of projected non-OECD coal demand growth (OECD coal use declines). China's demand peaks around 2020 and is then steady to 2035; coal use in India continues to rise and, by 2025, it overtakes the United States as the world's second-largest user of coal. Coal trade continues to grow to 2020, at which point India becomes the largest net importer of coal, but then levels off as China's imports decline. The sensitivity of these trajectories to changes in policy, the development of alternative fuels (*e.g.* unconventional gas in China) and the timely availability of infrastructure, create much uncertainty for international steam coal markets and prices.

If nuclear falls back, what takes its place?

The world's demand for electricity grows almost twice as fast as its total energy consumption, and the challenge to meet this demand is heightened by the investment needed to replace ageing power sector infrastructure. Of the new generation capacity that is built to 2035, around one-third is needed to replace plants that are retired. Half of all new capacity is based on renewable sources of energy, although coal remains the leading global fuel for power generation. The growth in China's electricity demand over the period to 2035 is greater than total current electricity demand in the United States and Japan. China's coal-fired output increases almost as much as its generation from nuclear, wind and hydropower combined. Average global electricity prices increase by 15% to 2035 in real terms, driven higher by increased fuel input costs, a shift to more capital-intensive generating capacity, subsidies to renewables and CO_2 pricing in some countries. There are significant regional price variations, with the highest prices persisting in the European Union and Japan, well above those in the United States and China.

The anticipated role of nuclear power has been scaled back as countries have reviewed policies in the wake of the 2011 accident at the Fukushima Daiichi nuclear power station. Japan and France have recently joined the countries with intentions to reduce their use of nuclear power, while its competitiveness in the United States and Canada is being challenged by relatively cheap natural gas. Our projections for growth in installed nuclear capacity are lower than in last year's *Outlook* and, while nuclear output still grows in absolute terms (driven by expanded generation in China, Korea, India and Russia), its share in the global electricity mix falls slightly over time. Shifting away from nuclear power can have significant implications for a country's spending on imports of fossil fuels, for electricity prices and for the level of effort needed to meet climate targets.

Renewables take their place in the sun

A steady increase in hydropower and the rapid expansion of wind and solar power has cemented the position of renewables as an indispensable part of the global energy mix; by 2035, renewables account for almost one-third of total electricity output. Solar grows more rapidly than any other renewable technology. Renewables become the world's second-largest source of power generation by 2015 (roughly half that of coal) and, by 2035, they approach coal as the primary source of global electricity. Consumption of biomass (for power generation) and biofuels grows four-fold, with increasing volumes being traded internationally. Global bioenergy resources are more than sufficient to meet our projected biofuels and biomass supply without competing with food production, although the land-use implications have to be managed carefully. The rapid increase in renewable energy is underpinned by falling technology costs, rising fossil-fuel prices and carbon pricing, but mainly by continued subsidies: from $88 billion globally in 2011, they rise to nearly $240 billion in 2035. Subsidy measures to support new renewable energy projects need to be adjusted over time as capacity increases and as the costs of renewable technologies fall, to avoid excessive burdens on governments and consumers.

A continuing focus on the goal of universal energy access

Despite progress in the past year, nearly 1.3 billion people remain without access to electricity and 2.6 billion do not have access to clean cooking facilities. Ten countries – four in developing Asia and six in sub-Saharan Africa – account for two-thirds of those people without electricity and just three countries – India, China and Bangladesh – account for more than half of those without clean cooking facilities. While the Rio+20 Summit did not result in a binding commitment towards universal modern energy access by 2030, the UN Year of Sustainable Energy for All has generated welcome new commitments towards this goal. But much more is required. In the absence of further action, we project that nearly one billion people will be without electricity and 2.6 billion people will still be without clean cooking facilities in 2030. We estimate that nearly $1 trillion in cumulative investment is needed to achieve universal energy access by 2030.

We present an Energy Development Index (EDI) for 80 countries, to aid policy makers in tracking progress towards providing modern energy access. The EDI is a composite index that measures a country's energy development at the household and community level. It reveals a broad improvement in recent years, with China, Thailand, El Salvador, Argentina, Uruguay, Vietnam and Algeria showing the greatest progress. There are also a number of countries whose EDI scores remain low, such as Ethiopia, Liberia, Rwanda, Guinea, Uganda and Burkina Faso. The sub-Saharan Africa region scores least well, dominating the lower half of the rankings.

Energy is becoming a thirstier resource

Water needs for energy production are set to grow at twice the rate of energy demand. Water is essential to energy production: in power generation; in the extraction, transport and processing of oil, gas and coal; and, increasingly, in irrigation for crops used to produce biofuels. We estimate that water withdrawals for energy production in 2010 were 583 billion cubic metres (bcm). Of that, water consumption – the volume withdrawn but not returned to its source – was 66 bcm. The projected rise in water consumption of 85% over the period to 2035 reflects a move towards more water-intensive power generation and expanding output of biofuels.

Water is growing in importance as a criterion for assessing the viability of energy projects, as population and economic growth intensify competition for water resources. In some regions, water constraints are already affecting the reliability of existing operations and they will increasingly impose additional costs. In some cases, they could threaten the viability of projects. The vulnerability of the energy sector to water constraints is widely spread geographically, affecting, among others, shale gas development and power generation in parts of China and the United States, the operation of India's highly water-intensive fleet of power plants, Canadian oil sands production and the maintenance of oil-field pressures in Iraq. Managing the energy sector's water vulnerabilities will require deployment of better technology and greater integration of energy and water policies.

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EXHIBIT 4

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Managing the risks of exposure to fossil fuel companies

Investors who are not yet sold on the idea that environmental, social and governance (ESG) factors can affect corporate financial performance may be overlooking material risks. From individual investors and asset managers to top officials at the United Nations, there are many stakeholders who have been advocating for greater recognition of the risks associated with the fossil fuel industry's business model. Looking beyond near-term risks, such as the cost of cleaning up environmental disasters, there are fundamental questions about whether fossil fuel companies like ExxonMobil have a long-term future in the marketplace.

One of the primary concerns for investors is that increased regulation of carbon emissions and related market forces will effectively render a large portion of known fossil fuel reserves "unburnable." This would place a significant amount of shareholder value at risk, as the valuations of major energy companies are based in large part on the quantity of fossil fuel reserves in their possession.

Quantifying the risks of owning fossil fuel stocks

Fossil fuel companies' proven reserves of coal, oil and gas are valued at approximately $20 trillion. However, multiple scientific studies have looked at the current climate situation and concluded that the vast majority of these resources must not be burned for the international community to retain even a reasonable chance of limiting climate change to 2 degrees Celsius — a goal recognized by virtually every national government and many prominent international organizations.

According to the Carbon Tracker Initiative, the industry's current reserves contain almost 2,800 gigatons of carbon dioxide — roughly five times the amount that can be added to the atmosphere without completely discarding the 2-degree target. If 80 percent of these reserves — approximately $16 trillion in assets — become "stranded," what impact will it have on fossil fuel companies' share price?

This question is driving a wide range of stakeholders to reconsider their investments in the fossil fuel industry.

Material effects of regulatory intervention could come sooner than expected

The latest report from the Intergovernmental Panel on Climate Change (IPCC) suggested that the planet is already on track to experience more severe consequences from global warming than previously projected. This means regulatory interventions may need to be more dramatic and come faster than expected, which increases the risk facing investors with exposure to fossil fuel companies.

In the United States, cap and trade markets are currently functioning in California and the Northeast, where the Regional Greenhouse Gas Initiative (RGGI) includes nine participating states and several observers. In 2013, following larger-than-expected declines in emissions driven by the economic

recession and utilities' growing use of gas as a replacement for coal and oil, the emissions cap used by the RGGI was cut almost in half, from 165 million tons to 91 million tons.

The European Union (EU) took several steps to strengthen its Emissions Trading System (ETS) last year and additional reforms are expected to be forthcoming. Worldwide, more than 40 nations are in the process of developing market-driven systems to help cut their output of GHGs by putting a price on emissions. The EU and Australia have even taken preliminary steps toward integrating their carbon markets.

Putting a specific price or limit on carbon emissions through direct taxation or regulation isn't the only way that governments can affect the fortunes of fossil fuel companies. For example, if new restrictions are placed on horizontal drilling and hydraulic fracturing, it may become prohibitively costly for companies to develop some of their proven reserves.

Development of other types of unconventional reserves, including bituminous sands (also known as "tar sands") and oilfields located in sensitive environments, is also highly controversial and these activities could be more tightly regulated going forward, increasing the cost of production and potentially forcing companies to abandon some assets.

The financial risk facing fossil fuel companies is constantly increasing as these firms pour increasingly large sums into exploring for new reserves in more remote environments and developing new extraction equipment and processes.

SEC: More disclosure may be necessary under existing rules

Shareholders are not the only ones calling for more transparency. The U.S. Securities and Exchange Commission (SEC) has advised publicly traded corporations that, under existing disclosure regulations, they may be required to publish information about how climate change could affect their financial performance. In a 2010 guidance document, the SEC noted that factors which may need to be disclosed to investors include the direct and indirect effects of legal and regulatory developments, as well as potential operational impacts of climate change.

Investors are taking action to address the risk of climate change

Investors aren't sitting back as the risks of owning fossil fuel stocks become ever clearer.

Within the institutional investment community, funds operating under active ownership strategies are estimated to be worth at least $4.7 trillion, according to the Global Sustainable Investment Alliance. Various guidelines, including the UN-backed Principles for Responsible Investment (PRI), which has more 1,000 signatories managing over $30 trillion in assets, encourage this movement.

High-profile activists have shown that there are many ways for investors to approach environmental issues. For example, the California Public Employees' Retirement system (CalPERS) creates a "focus list" each year and engages with certain companies that it believes are underperforming on ESG metrics. The organization estimates that between 1992 and 2005, this activism has helped create more than $3 billion in shareholder value.

Particularly with regard to investments in fossil fuel companies, it is clear that a growing number of investors are more inclined to deal with the uncertainties associated with divestment or active ownership, rather than remaining exposed to the inherent risks of owning stock in companies that ascribe to an unsustainable business model.

As part of this trend, shareholder resolutions addressing environmental risks have proliferated and support for these initiatives has grown. According to the Sustainable Investments Institute, more than 100 sustainability-related resolutions received at least 20 percent support from shareholders last year, up from about 80 resolutions in 2012 and less than 30 a decade earlier.

Ceres has compiled a list of the resolutions filed by investors in its network during the current proxy season, which include calls for increased corporate disclosure. In addition to issuing standardized sustainability reports, many companies are facing pressure to set specific targets for reducing greenhouse gas (GHG) emissions.

It is also clear that investors are looking at risks related to specific production practices, the most notable example being hydraulic fracturing. Three of the shareholder resolutions filed this year call on energy companies to disclose how they are accounting for the environmental risks associated with fracking operations.

Those who practice active ownership have achieved some noteworthy successes. ExxonMobil recently agreed to issue a report addressing its exposure to the risk of assets being stranded by climate change. Two groups, Arjuna Capital and corporate responsibility advocate As You Sow, had brought a shareholder resolution on this topic, which was withdrawn after the company agreed to issue the report. They initially praised ExxonMobil's "huge first step in the right direction" and credited the company for showing leadership on this issue.

However, in its report, ExxonMobil largely rejected the idea that the economic value of its reserves will be seriously affected by climate change policies, arguing that not only all of its current hydrocarbon reserves but also "substantial future industry investments" will be needed to meet global energy needs. Natasha Lamb, director of equity research at Arjuna Capital, released a statement criticizing the company for downplaying the scope of the risks it is facing.

"The question is not whether or not we'll face the low carbon standard, but whether they are prepared to address it." Lamb said, adding that "at least now investors know that Exxon is not addressing the low carbon scenario."

ExxonMobil also recently became the first company to agree to disclose its exposure to environmental risks stemming from hydraulic fracturing. This was in response to a resolution filed by the New York City Comptroller's office, which controls more than $1 billion worth of ExxonMobil stock through municipal pension funds. A proposal on this subject gained more than 30 percent support from shareholders last year.

"Corporate transparency in this arena is truly necessary for assessing risk and ensuring that all stakeholders have the information they need to make informed decisions," New York City Comptroller Scott Stringer said in a press release. His office withdrew its resolution as part of a deal with the company.

Despite the promise to issue a report on fracking risks, stakeholders remain skeptical about how revealing it will be. Citing an interview with ExxonMobil spokesperson Alan Jeffers, Bloomberg

News pointed out that much of the data to be released "will be comprised of data and analyses Exxon has [already] published in publicly available filings or the corporate website."

As these examples show, engagement has limits. In the current environmental situation, which scientists say is increasingly dire, incremental actions to improve disclosure and risk management may not add up to a viable strategy for controlling the pace of climate change. Some stakeholders argue that there is only one way to send a clear message about the severity of climate change to fossil fuel companies: outright divestment.

Some divestment advocates draw a parallel to the successful campaign to isolate the South African government during the apartheid era, arguing that there is a moral imperative to take meaningful action on climate change while it is still possible. Furthermore, it is seen as highly unlikely that any amount of incremental progress on environmental issues will ever allow fossil fuel companies to alter the fundamentally unsustainable nature of their business model.

IW Financial can assist with divestment and portfolio realignment

There are many reasons why it may not be practical for investors to immediately begin shedding fossil fuel stocks from their portfolios, including tax implications, fiduciary responsibilities and the need to account for portfolio risk profiles. However, stakeholders can still take action without launching into an all-out selloff.

IW Financial has collected comprehensive information on public companies' environmental and climate change policies, as well as the governance structures that are in place to implement these policies, including board and senior officer involvement. Our in-depth corporate sustainability research allows us to effectively assist clients with either divestment or more nuanced approaches to portfolio realignment.

Recently, IW Financial has worked with clients to design and implement index based solutions that address the issues of carbon and climate change in various ways. Solutions provided range from basic solutions that avoid investment in all companies with proven carbon reserves to more robust solutions that seek to identify those companies with progressive policies on climate change management and to avoid those companies at risk of significant stranded carbon assets.

We have seen first hand how the trend toward ESG integration has accelerated as more capital market participants have come to recognize the value of considering extra-financial factors when making investment decisions. Today, more than 10 percent of all professionally managed assets in the U.S. marketplace are invested "responsibly," according to US SIF—The Forum for Sustainable and Responsible Investment.

The growing focus on the risks faced by fossil fuel companies is yet another manifestation of this trend.

EXHIBIT 5

EXXON RESEARCH AND ENGINEERING COMPANY
P.O. BOX 101, FLORHAM PARK, NEW JERSEY 07932

M. B. GLASER
Manager
Environmental Affairs Programs

Cable: ENGREXXON, N.Y.

November 12, 1982

CO_2 "Greenhouse" Effect

82EAP 266

TO: See Distribution List Attached

Attached for your information and guidance is briefing material on the CO_2 "Greenhouse" Effect which is receiving increased attention in both the scientific and popular press as an emerging environmental issue. A brief summary is provided along with a more detailed technical review prepared by CPPD.

The material has been given wide circulation to Exxon management and is intended to familiarize Exxon personnel with the subject. It may be used as a basis for discussing the issue with outsiders as may be appropriate. However, it should be restricted to Exxon personnel and not distributed externally.

Very truly yours,

M. B. Glaser

M. B. GLASER

MBG:rva

Attachments

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SUMMARY

Atmospheric monitoring programs show the level of carbon dioxide in the atmosphere has increased about 8% over the last twenty-five years and now stands at about 340 ppm. This observed increase is believed to be the continuation of a trend which began in the middle of the last century with the start of the Industrial Revolution. Fossil fuel combustion and the clearing of virgin forests (deforestation) are believed to be the primary anthropogenic contributors although the relative contribution of each is uncertain.

The carbon dioxide content of the atmosphere is of concern since it can affect global climate. Carbon dioxide and other trace gases contained in the atmosphere such as water vapor, ozone, methane, carbon monoxide, oxides of nitrogen, etc. absorb part of the infrared rays reradiated by the earth. This increase in absorbed energy warms the atmosphere inducing warming at the earth's surface. This phenomenon is referred to as the "greenhouse effect".

Predictions of the climatological impact of a carbon dioxide induced "greenhouse effect" draw upon various mathematical models to gauge the temperature increase. The scientific community generally discusses the impact in terms of doubling of the current carbon dioxide content in order to get beyond the noise level of the data. We estimate doubling could occur around the year 2090 based upon fossil fuel requirements projected in Exxon's long range energy outlook. The question of which predictions and which models best simulate a carbon dioxide induced climate change is still being debated by the scientific community. Our best estimate is that doubling of the current concentration could increase average global temperature by about 1.3° to 3.1°C. The increase would not be uniform over the earth's surface with the polar caps likely to see temperature increases on the order of 10°C and the equator little, if any, increase.

Considerable uncertainty also surrounds the possible impact on society of such a warming trend, should it occur. At the low end of the predicted temperature range there could be some impact on agricultural growth and rainfall patterns which could be beneficial in some regions and detrimental in others. At the high end, some scientists suggest there could be considerable adverse impact including the flooding of some coastal land masses as a result of a rise in sea level due to melting of the Antarctic ice sheet. Such an effect would not take place until centuries after a 3°C global average temperature increase actually occurred.

There is currently no unambiguous scientific evidence that the earth is warming. If the earth is on a warming trend, we're not likely to detect it before 1995. This is about the earliest projection of when the temperature

might rise the 0.5° needed to get beyond the range of normal temperature fluctuations. On the other hand, if climate modeling uncertainties have exaggerated the temperature rise, it is possible that a carbon dioxide induced "greenhouse effect" may not be detected until 2020 at the earliest.

The "greenhouse effect" is not likely to cause substantial climatic changes until the average global temperature rises at least 1°C above today's levels. This could occur in the second to third quarter of the next century. However, there is concern among some scientific groups that once the effects are measurable, they might not be reversible and little could be done to correct the situation in the short term. Therefore, a number of environmental groups are calling for action now to prevent an undesirable future situation from developing.

Mitigation of the "greenhouse effect" would require major reductions in fossil fuel combustion. Shifting between fossil fuels is not a feasible alternative because of limited long-term supply availability for certain fuels although oil does produce about 18% less carbon dioxide per Btu of heat released than coal, and gas about 32% less than oil. The energy outlook suggests synthetic fuels will have a negligible impact at least through the mid 21st century contributing less than 10% of the total carbon dioxide released from fossil fuel combustion by the year 2050. This low level includes the expected contribution from carbonate decomposition which occurs during shale oil recovery and assumes essentially no efficiency improvements in synthetic fuels processes above those currently achievable.

Overall, the current outlook suggests potentially serious climate problems are not likely to occur until the late 21st century or perhaps beyond at projected energy demand rates. This should provide time to resolve uncertainties regarding the overall carbon cycle and the contribution of fossil fuel combustion as well as the role of the oceans as a reservoir for both heat and carbon dioxide. It should also allow time to better define the effect of carbon dioxide and other infrared absorbing gases on surface climate. Making significant changes in energy consumption patterns now to deal with this potential problem amid all the scientific uncertainties would be premature in view of the severe impact such moves could have on the world's economies and societies.

EXHIBIT 6

Energy and Carbon -- Managing the Risks

ExxonMobil[1] 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.

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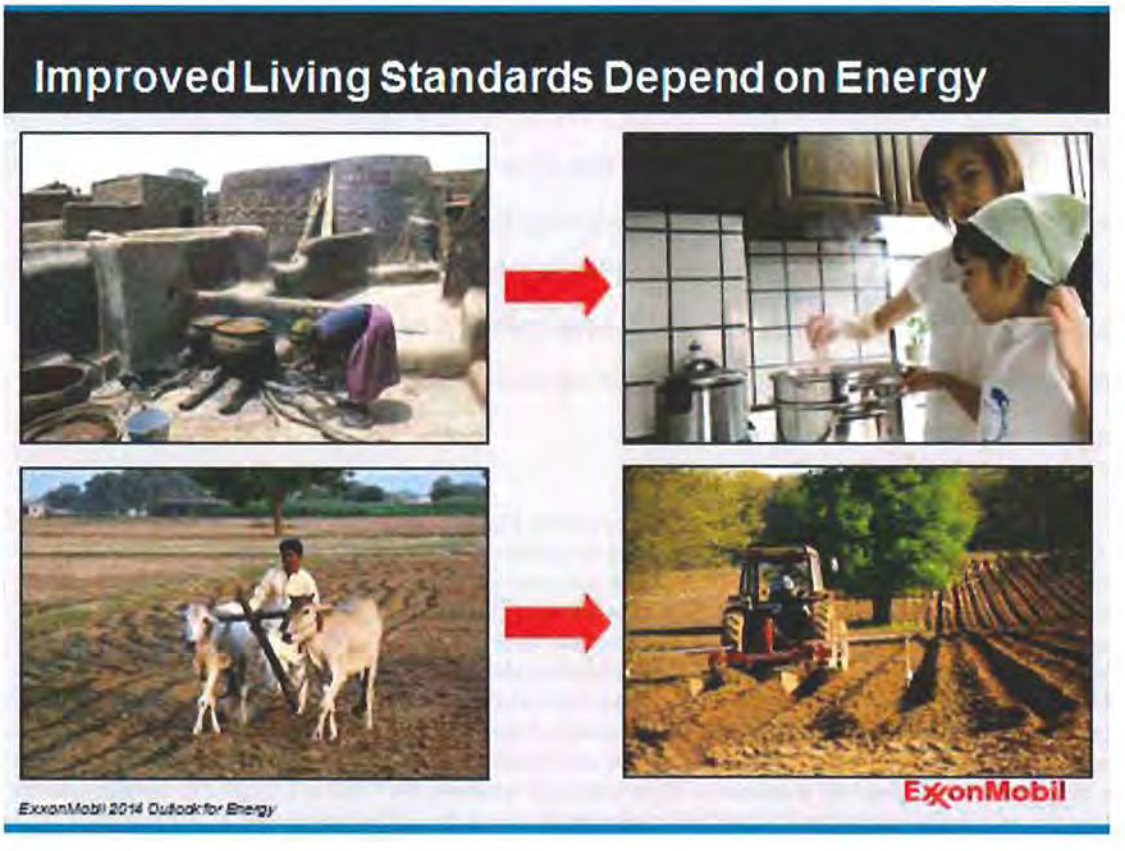
[1] As used in this document, "ExxonMobil" means Exxon Mobil Corporation and/or one or more of its affiliated companies. Statements of future events or conditions in this report are forward-looking statements. Actual future results, including economic conditions and growth rates; energy demand and supply 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.



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.

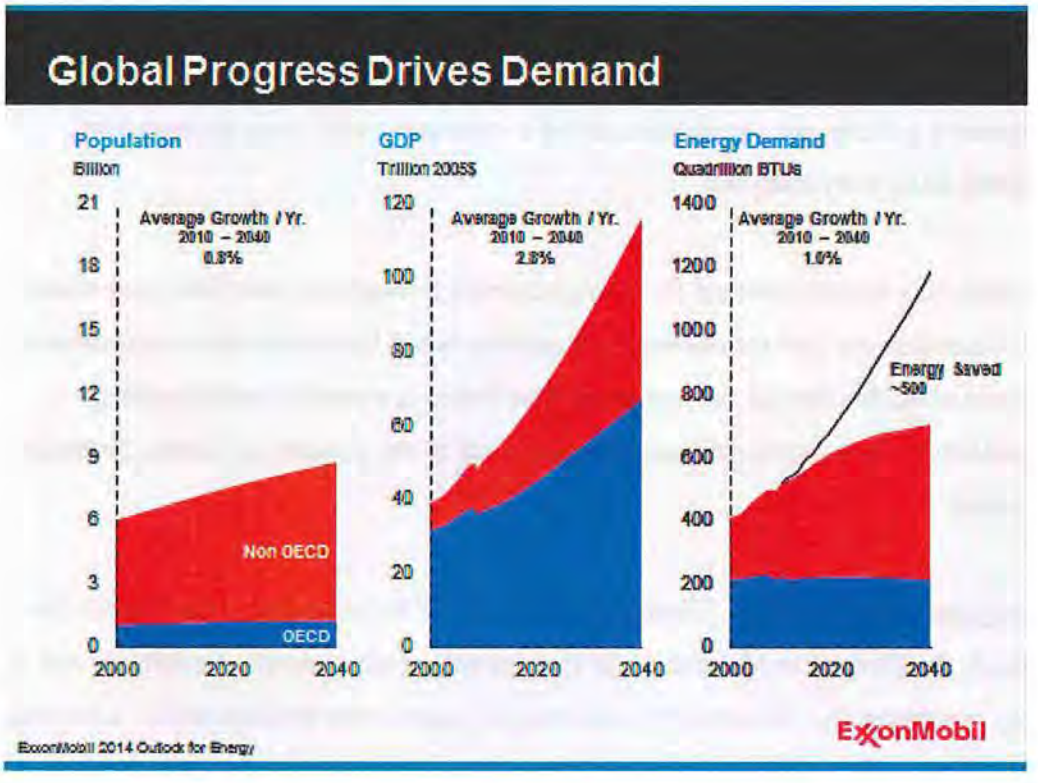
ExxonMobil's current *Outlook for Energy* extends through the year 2040, and contains several conclusions that are relevant to questions raised by stakeholder organizations. Understanding this factual and analytical foundation is crucial to understanding ExxonMobil's investment decisions and approach to the prospect of further constraints on carbon.

World population increases. 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.

World GDP grows. 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.

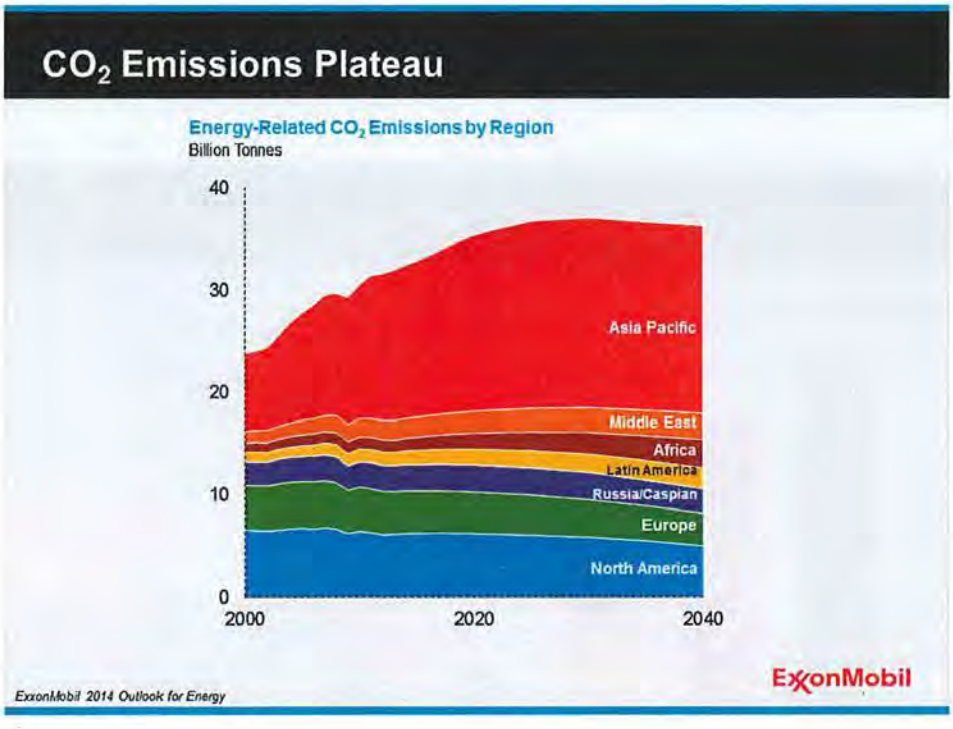
largely the poorest and least developed of the world's countries that benefit most from this anticipated growth. However, this level of GDP growth requires more accessible, reliable and affordable energy to fuel growth, and it is vulnerable populations who would suffer most should that growth be artificially constrained.



Energy demand grows with population and GDP. 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 carbon-intensive 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.

Energy-related CO2 emissions stabilize and start decreasing. 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]

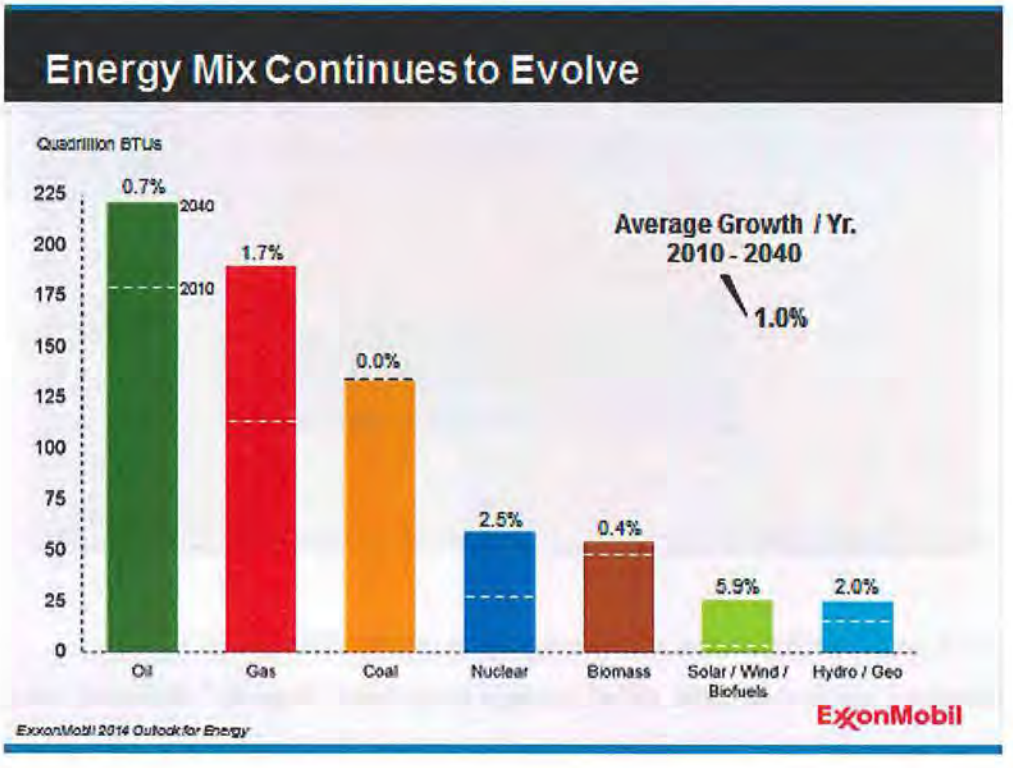


As part of our Outlook process, we do not project overall atmospheric GHG concentration, nor do we model global average temperature impacts.[4] However, we do project an energy-related CO2 emissions profile through 2040, and this can be compared

[3] For example, the IEA predicts that energy-related emissions will grow by 20%, on trend but slightly higher than our Outlook. See www.worldenergyOutlook.org.
[4] These would require data inputs that are well beyond our company's ability to reasonably measure or verify.

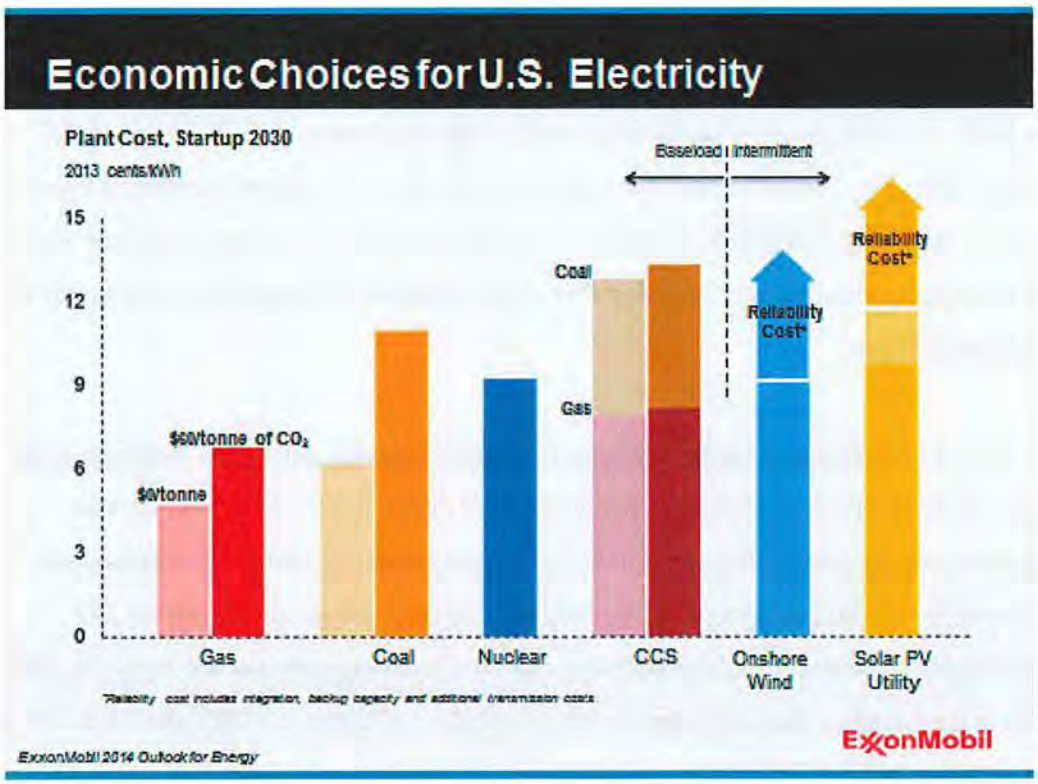
to the energy-related CO2 emissions profiles from various scenarios outlined by the Intergovernmental Panel on Climate Change (IPCC). When we do this, our Outlook emissions profile through 2040 would closely approximate the IPCC's intermediate RCP 4.5 emissions profile pathway in shape, but is slightly under it in magnitude.[5]

All economic energy sources are needed to meet growing global demand. 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.

The cost limitations of renewables are likely to persist even when higher costs of carbon are considered.



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.

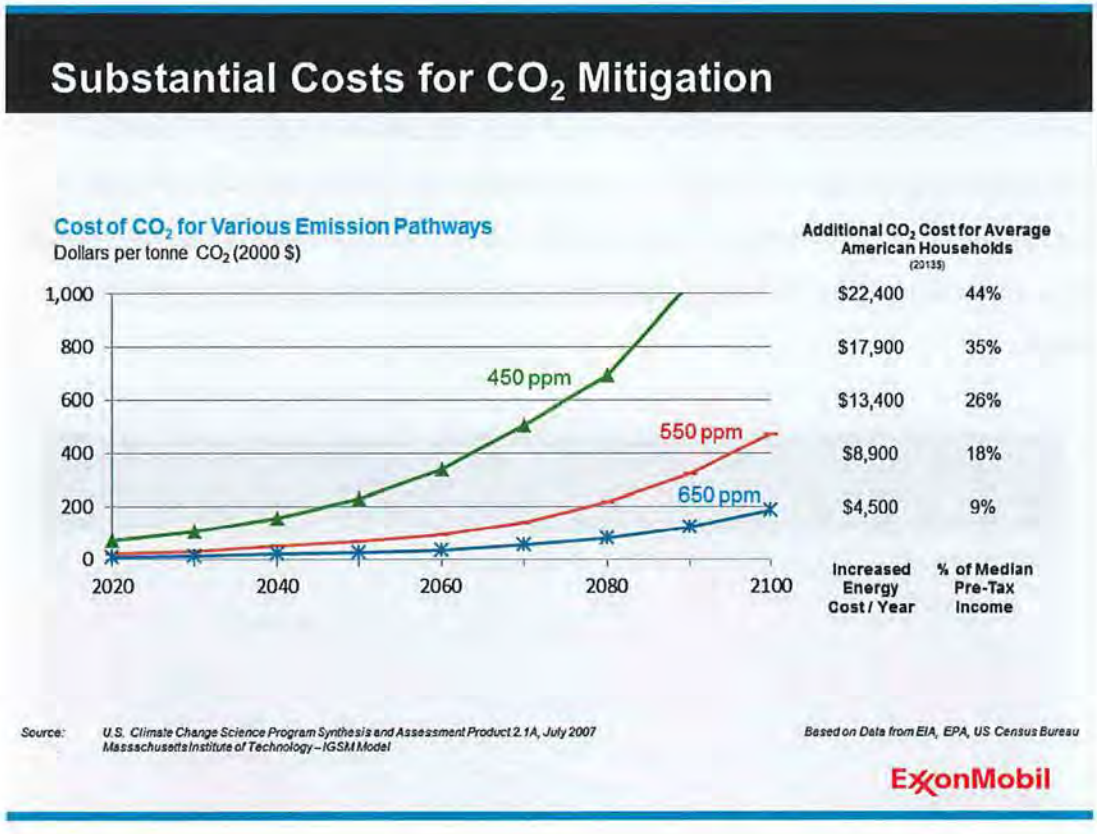
4. Carbon Budget and Carbon Asset Risk Implications

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

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.

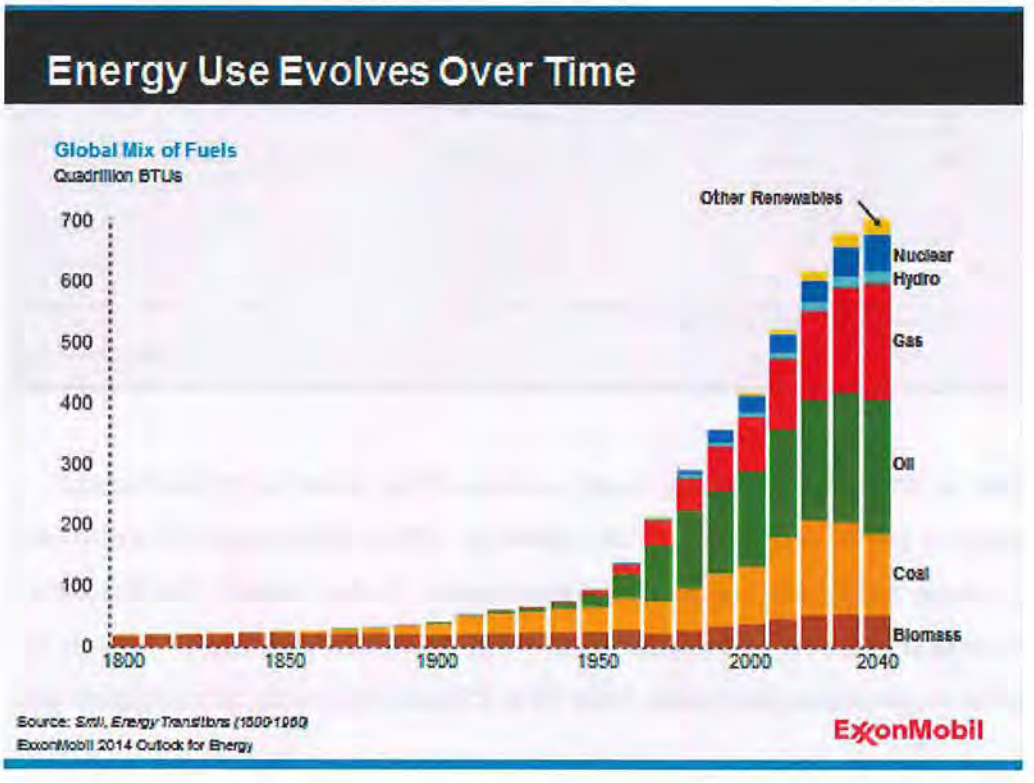


In 2008, the International Energy Agency estimated that reducing greenhouse gas emissions to just 50 percent below 2005 levels by 2050 would require $45 trillion in added energy supply and infrastructure investments.[6] In this scenario, the IEA estimated that *each year* between 2005 and 2050 the world would need to construct 24 to 32 one-thousand-megawatt nuclear plants, build 30 to 35 coal plants with carbon capture and

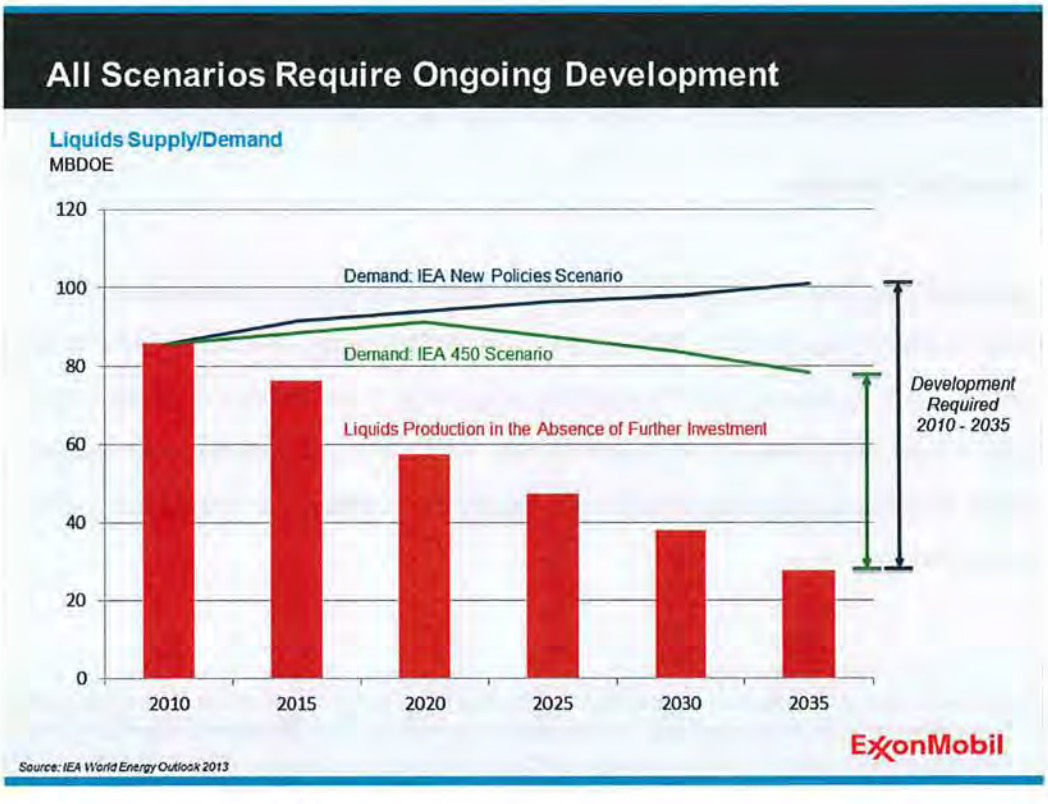
[6] See *IEA Energy Technology Perspectives 2008, Scenarios & Strategies to 2050.*

sequestration capabilities, and install 3,700 to 17,800 wind turbines of four megawatt capacity.

Transforming the energy system will take time. 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.



A "low carbon scenario" will impact economic development. 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.



[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 (http://www.iea.org/topics/energypoverty/).

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

ExxonMobil's actions. 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

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.

Government policy. 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

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]

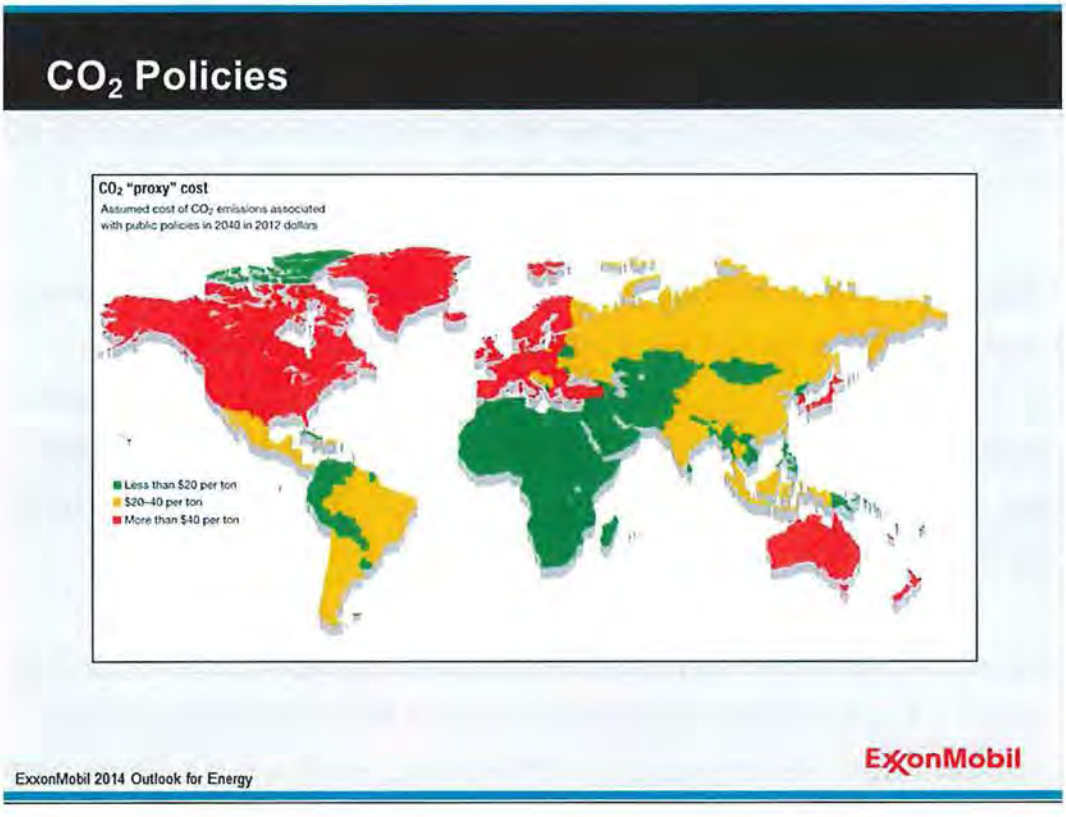
6. Planning Bases and Investments

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 period[11], 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.

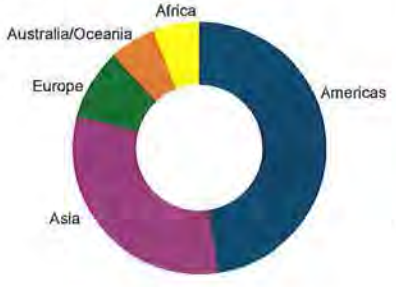
Appendix

EXXONMOBIL PROVED RESERVES - AT DECEMBER 31, 2013

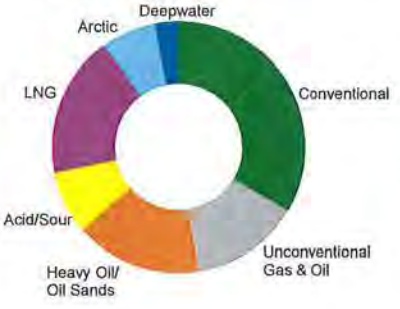
	United States	Canada/ S. Amer. (2)	Europe	Africa	Asia	Australia/ Oceania	Total	Worldwide	Canada/ S. Amer. (2)	Canada/ S. Amer. (2)	Total
	Crude Oil							Natural Gas Liquids (2)	Bitumen	Synthetic Oil	
Total liquids proved reserves (1) (millions of barrels)	2,338	284	273	1,193	3,308	155	7,551	1,479	3,630	579	13,239
	Natural Gas										
Total 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)

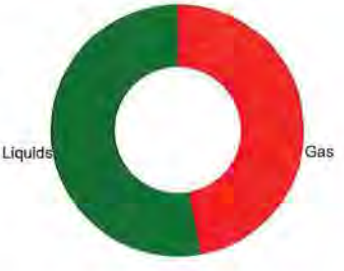
By Region



By Resource Type

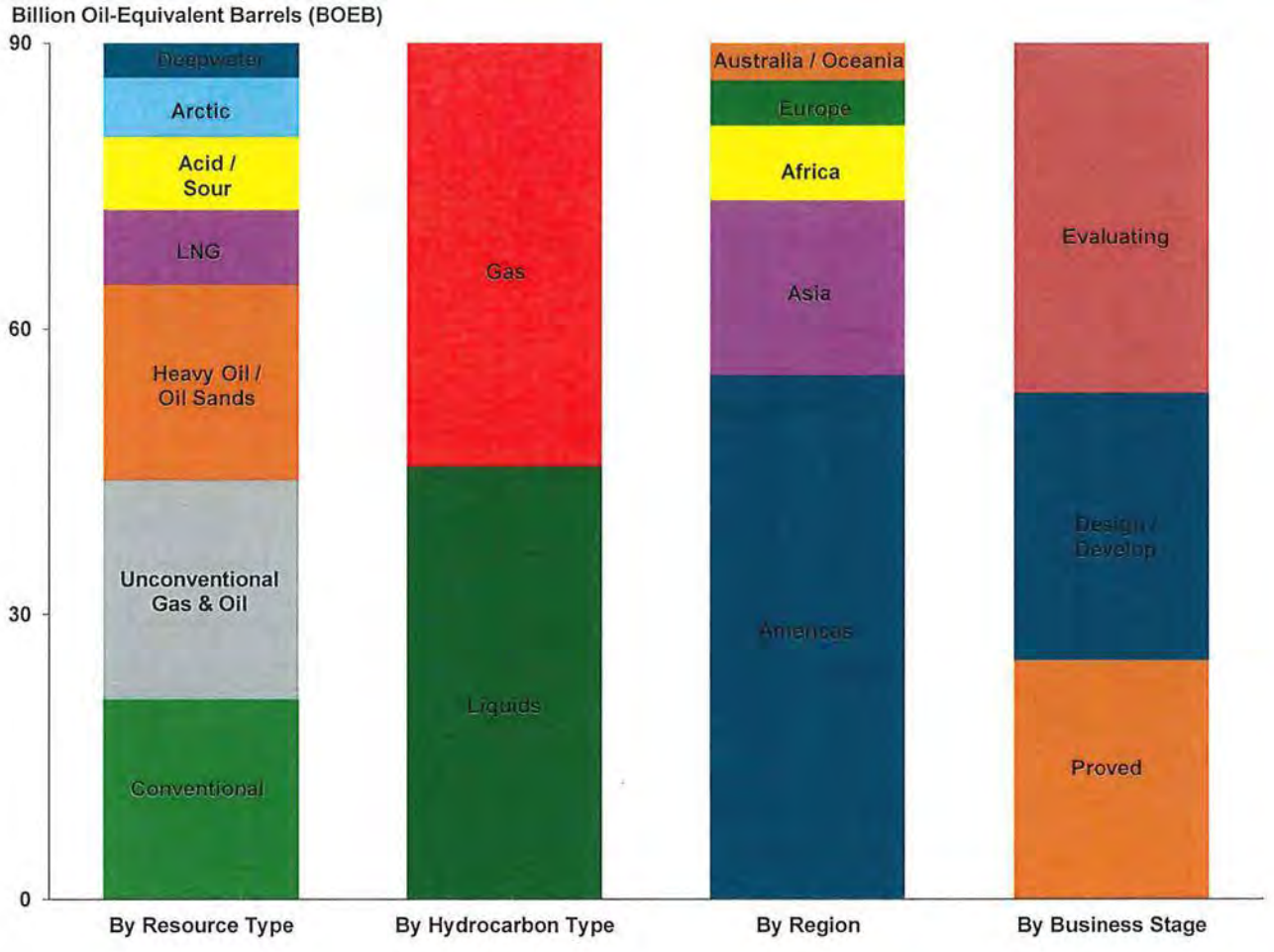


By Hydrocarbon Type



(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)



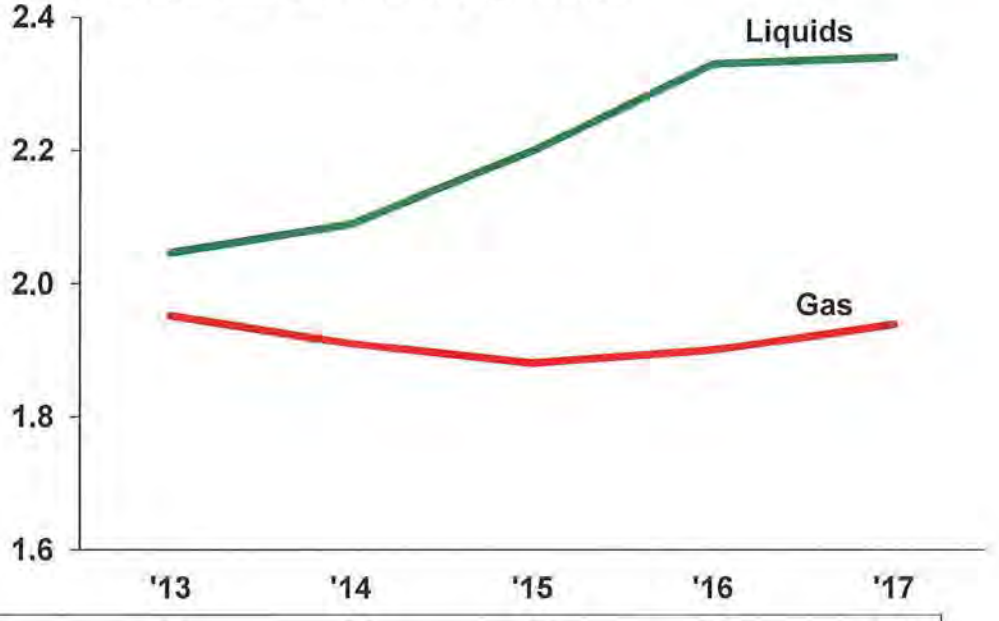
(1) Source: 2013 ExxonMobil Financial & Operating Review (page 21) and 2014 Analyst Meeting (slide 49).

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 (2)

Millions Oil-Equivalent Barrels Per Day (MOEBD), net



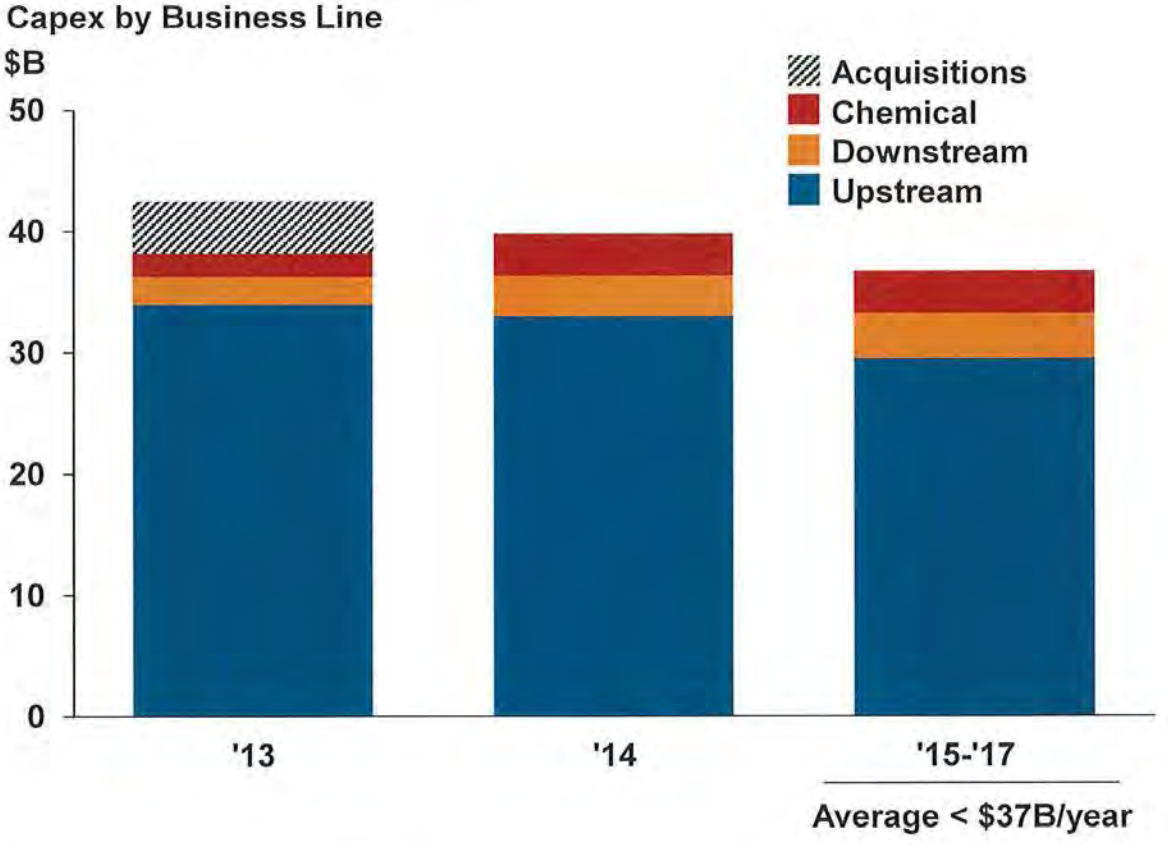
	'13	'14	'15	'16	'17
Total	4.0	4.0	4.1	4.2	4.3

- 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)			
	United States	Canada/ South America	Europe	Africa	Asia	Australia/ Oceania	Total	United States	Canada/ South America	Outside Americas	Worldwide
2013	*(millions of dollars)*							*(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 barrel of net oil-equivalent production)			
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 oil-equivalent 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 States	Canada/ S. America	Europe	Africa	Asia	Australia/ 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

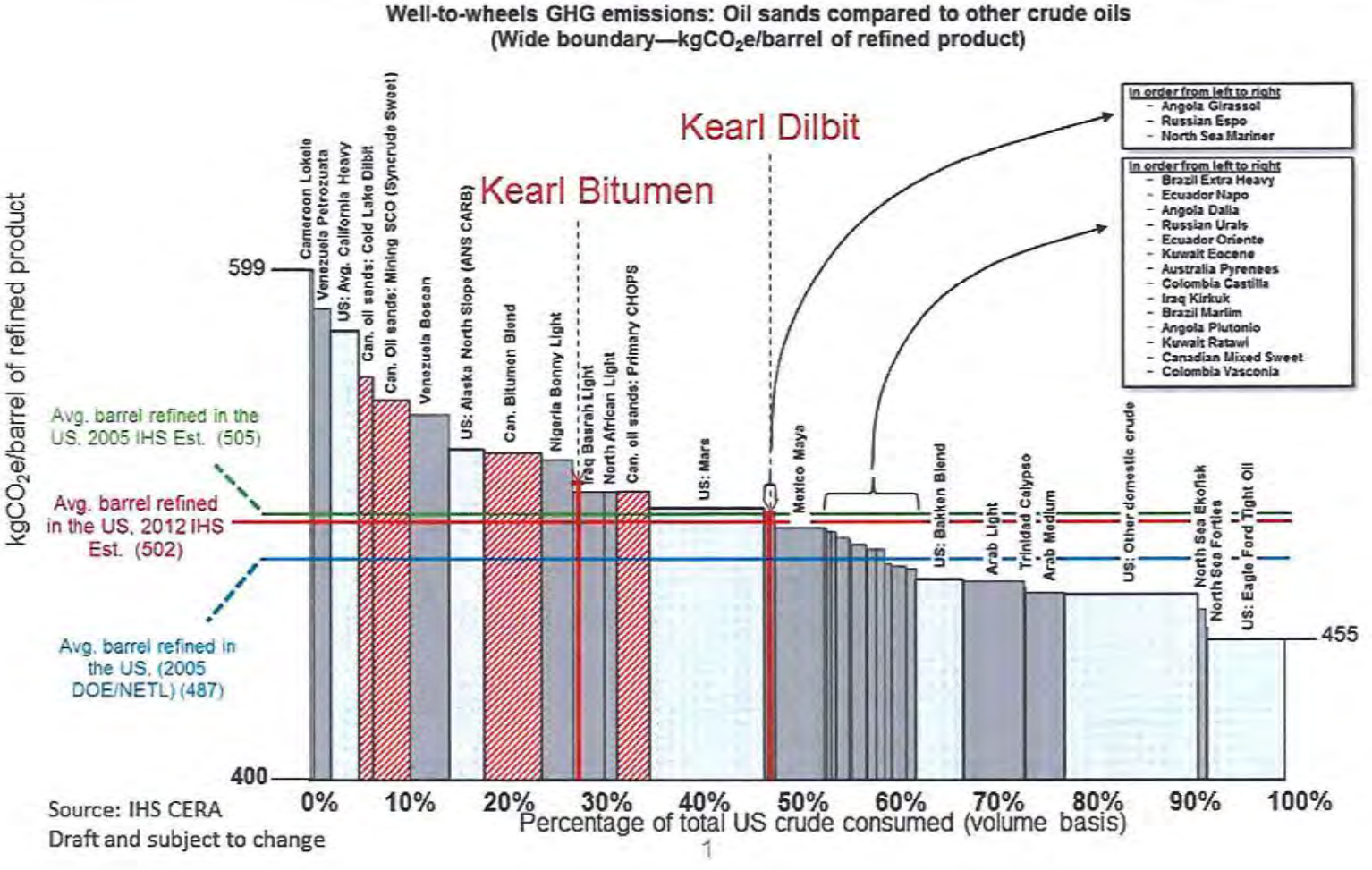


EXHIBIT 7

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Paris
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February 29, 2016

Office of Chief Counsel
Division of Corporation Finance
Securities and Exchange Commission
100 F Street, NE
Washington, D.C. 20549
via email: shareholderproposals@sec.gov

Ladies and Gentlemen:

On behalf of Exxon Mobil Corporation, a New Jersey corporation (the "**Company**" or "ExxonMobil"), we are writing in response to the letter dated February 22, 2016 (the "**Proponent Letter**") from Sanford J. Lewis on behalf of the New York State Common Retirement Fund (the "**Proponent**"), which was written in response to the letter dated January 22, 2016 (the "**Company No Action Letter**") sent to the Securities and Exchange Commission (the "**SEC**") by Louis L. Goldberg of the law firm Davis Polk on behalf of the Company with respect to a shareholder proposal dated December 3, 2015 (the "**Proposal**") submitted to the Company by the Proponent. For the reasons stated below and in the Company No Action Letter, the Company rejects the Proponent Letter's claims and continues to request that the SEC not recommend any enforcement action if, in reliance on Rule 14a-8, the Company omits the Proposal from its 2016 proxy materials.

1. The Proposal is vague and indefinite under Rule 14a-8(i)(3) because it fails to define what a "2 degree target" is and a scenario that would lead to it, such that neither a shareholder voting on the Proposal nor management in implementing the Proposal could be certain as to its request.

The Proponents are asking shareholders to vote on a Proposal that contains terms subject to multiple and conflicting interpretations. We disagree with the Proponent Letter's claim that a 2 degree target is "consistently understood among diverse sources including financial analysts, investment advisors, the general press and public" generally. Shareholders making their voting decisions are limited to the text of the Proposal itself, which merely refers to "a scenario in which reduction in demand results from carbon restrictions and related rules or commitments adopted by governments consistent with the globally agreed upon 2 degree target." It assumes that there is a common understanding of "2 degree target" and the actions necessary to reach it, both of which claims we dispute.

The Proponent Letter cites certain institutional investors and alleges these investors understand what scenarios or governmental policies and commitments would lead to a 2 degree

target. First, we contend this is not the case since, as indicated in the Company No Action Letter, there exist a wide range of probabilistic analyses as to the emission reductions necessary to make a 2 degree target more likely than not, and a virtually infinite combination of policy actions that could be taken by hundreds of governments around the world to attempt to achieve those targets. Moreover, the knowledge of specific institutions which have made an extensive study of the 2 degree issue cannot be imparted to shareholders generally. The argument in the Proponent Letter requires all of the Company's shareholders to have a high level of specific knowledge and expertise in climate change and related policy in order to understand and evaluate the Proposal's undefined reference to a 2 degree target.[1]

The Proponent Letter refers to numerous varied and complicated external analyses and reports, of which only a limited portion is either excerpted or explained in the Proponent Letter, to bolster the Proponent Letter's position that there is a "consistently understood" meaning of the 2 degree target. Based on prior Staff decisions, the Proposal cannot contain any particular set of external guidelines as a reference,[2] so it is not appropriate to end run the inability to actually include those references in the Proposal by citing to them in the Proponent Letter, as if they should be understood to be part of the Proposal.

Further, in addition to the vagueness of the 2 degree target itself, the specific types of analysis referred to in the Proponent Letter, none of which can be assumed to be within the knowledge of shareholders voting on the Proposal, are in any case themselves vague. As the Proponent Letter points out, "there are many pathways to achieving" the 2 degree target. The Company and the scientific community agree with this statement, which illustrates why the Proposal is inherently vague.

As previously explained in the Company No Action Letter, if one way of achieving the 2 degree target is to engage in massive worldwide deployment of nuclear and other renewable energy generation, this will require one specific type of analysis. However, if the method for achieving the 2 degree target is instead the widespread use of more technologically advanced carbon capture and sequestration or dramatic gains in energy efficiency, an entirely different analysis is necessary. While the Proponent Letter states that "there is much more consensus around" what methods will be required to reach the 2 degree target, the Proponent Letter tellingly does not cite to any examples of this claimed consensus. As a result, shareholders cannot be expected to have sufficient knowledge of the range of methods that could be employed under the Proposal, much less which of those methods shareholders are being asking the Company to assess. Thus the Proposal fails to address essential aspects of its own implementation, making it vague.

Finally, the Proponent Letter claims that the Company's publicly available March 2014 report titled "Energy and Carbon – Managing the Risks" (the "**2014 Report**") "adequately

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[1] As an example of the complexity of the 2 degree target, the United Nations Intergovernmental Panel on Climate Change, in its advice to policymakers, explains that various projections need to be made based on factors such as "population size, economic activity, lifestyle, energy use, land use patterns, technology and climate change" to determine a pathway that would be "representative of a scenario that aims to keep global warming *likely* below 2°C above pre-industrial temperatures." See page 8 at https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf.

[2] For example, see https://www.sec.gov/divisions/corpfin/cf-noaction/14a-8/2011/bartlettnaylor032111-14a8.pdf.

describes what [the Company] calls the low carbon/2 degree scenario" and is evidence that the Company in 2014 "had a clear sense of what it understood the 2 degree scenario to be." However, despite the 2014 Report's reference to a "low carbon scenario" as a scenario where world temperature increases do not exceed 2 degrees Celsius above pre-industrial levels by 2100, the 2014 Report never claims to predict the specific policy actions likely to be taken by governments around the world to meet such a scenario or the timing for implementing them. These are the exact variables that make the 2 degree scenario, and how to reach it, uncertain and vague within the context of the Proposal: For example, it is one thing to limit global temperature increases to 2 degrees Celsius by 2100 if significant measures are implemented immediately to reduce the growth in global greenhouse gas emissions; but it is an entirely different scenario if such measures are not put into place until later in the century. [3] The 2014 Report thus cannot and does not indicate a "clear sense" on the Company's part of policy steps to be taken to achieve a 2 degree scenario. It is the very difficulty of predicting specific future policy actions to be taken by hundreds of different governments around the world that leads the Company to use a proxy cost of carbon in its investment planning – which is intended to capture the expected cost of the wide range of actions governments might take to restrict carbon in the future—rather than attempting to predict which among a wide range of potential policy scenarios might be chosen.

2. The Proposal is vague and indefinite because current and future public policy related to a 2 degree target is vague and unclear.

The Proponent Letter inaccurately claims "enough is known about the general direction of public policy related to the 2 degree target" and claims that there is a clear meaning to the Proposal's reference to such public policies. Global solutions and approaches to meeting the 2 degree target remain highly uncertain and encompass a wide range of possibilities as described in more detail in the Company No Action Letter. The most recent indication of such global public policy is the results of the 21st Conference of Parties to the United Nations Framework Convention on Climate Change, which led to an agreement on December 12, 2015 (the "Paris Agreement") in which 195 governments agreed to take steps including setting and reporting "intended nationally determined contributions (the "**intended reductions**") with the aim of achieving a 2 degree target. However, as demonstrated in the Company No Action Letter, the Paris Agreement itself indicates that the intended reductions submitted by the parties to date are insufficient to meet the 2 degree target. Further, the Paris Agreement itself is inconsistent in the specific temperature goal it sets; in places, it refers to the need to limit temperature increase to "well below" 2 degrees, and in other places it refers to simply limiting increases to "below" 2 degrees. Given that another aspirational target set in the Paris Agreement is to limit temperature increase to 1.5 degrees, the difference between "well below" and "below" 2 degrees could be quite substantial.

In addition, the Paris Agreement has not yet been ratified and so is not binding, and even assuming it is ratified by sufficient nations in the future, the intended reductions of each nation will not be binding, and there will be no legal enforcement mechanism to force signatories to comply with their intended reductions. Further, the U.S.'s intended reduction relies heavily on the "Clean Power Plan," a set of regulations aimed at reducing carbon dioxide emissions from

[3] Indeed, as pointed out in the Company No Action Letter, organizations such as the Intergovernmental Panel on Climate Change have revised their estimated time at which global greenhouse gas emissions must peak to meet the 2 degree target by 2100, demonstrating the uncertainty surrounding this target.

the power generation sector, which is the subject of litigation with an uncertain outcome. In short, there remains significant uncertainty regarding the specific future public policy steps to be taken to implement the Paris Agreement. Therefore, as stated in the Company No Action Letter, the use of the term 2 degree as a core element of the Proposal renders the Proposal inherently vague and indefinite, because current and future public policy surrounding the 2 degree target, and how to get there, is highly uncertain. Given this uncertainty, it is impossible for shareholders to know what actual policy actions they are asking the Company to assess when voting on the Proposal.

3. The vagueness of the Proposal is not excused simply because the Proponent Letter claims the Proposal gives the Company "flexibility."

The Proponent Letter claims on page 8 that the vague references to a 2 degree target in the Proposal were intended to provide "flexibility for the Company to review other publicly available materials, including those of its peers, to evaluate and determine the range of plausible pathways to achieve the 2 degree scenario and choose the trajectory or trajectories that it views as most likely." Leaving aside the fact that the Proposal itself makes no reference to this supposed "flexibility" being offered to the Company, this quote from the Proponent Letter simply serves to demonstrate the inherent vagueness of the Proposal because it admits that there is a "range of plausible pathways to achieve the 2 degree scenario." Accordingly, shareholders cannot reasonably be expected to understand that the Proposal intends for the Company to exercise this type of "flexibility," nor does the Proposal inform shareholders of the wide range of different pathways from which the Company would supposedly have discretion to choose. The request that the Company "review other publicly available materials" demonstrates the insufficiency of the language of the Proposal itself. If the Proponent Letter is asking the Company to review numerous public materials to choose a particular 2 degree pathway, shareholders armed with only the text of the Proposal itself cannot reasonably be expected to know which pathway they are being asked to support.

4. The Company's 2014 Report clearly shows that the Proposal has been substantially implemented.

As discussed in the Company No Action Letter, the Company prepared its 2014 Report in connection with the withdrawal of a prior shareholder proposal from Arjuna Capital and As You Sow that requested an analysis of the potential for the Company's oil and gas assets to become stranded as a result of global public policy regarding climate change. The 2014 Report's analysis and conclusion – that none of the Company's proved reserves [4] is or will become "stranded," even under a 2 degree pathway, is updated annually via the Company's Outlook for Energy (the "**Outlook for Energy**") [5] and Corporate Citizenship Report ("**CCR**"), but the fundamental analysis and conclusions remain unchanged. As a result, the 2014 Report's conclusions as updated by the Outlook for Energy and CCR remains sufficient to meet the essential objective of the Proposal as explained in the Company No Action Letter.

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[4] The Company determines its proved reserves in full compliance with SEC reporting standards, including the test of "reasonable certainty." These reserves are updated and reported annually in the Company's 10-K filing, including discounted cash flows as required. Proved reserves are a fundamental element of a company's valuation.

[5] http://cdn.exxonmobil.com/~/media/global/files/outlook-for-energy/2016/2016-outlook-for-energy.pdf

The 2014 Report addresses two key points: (1) it assesses the reasonableness of a 2 degree target considering the need to satisfy global energy demand and the likelihood that the world will take the dramatic, immediate policy and regulatory steps and incur the resulting significant economic burden that would be required to achieve the 2 degree target with current technologies;[5] and (2) assuming one possible 2 degree scenario, using a reputable independent forecast (the International Energy Agency 450 PPM Scenario), the Company demonstrates in the 2014 Report on pages 11-12 and the associated graph,[7] the world's continued need for significant investment in hydrocarbon energy sources. By example, the graph demonstrates that even under a 2 degree scenario, absent significant new investment in hydrocarbon resources, by 2030 demand for hydrocarbons will exceed supply by almost 50%.

The Company's Outlook for Energy is updated annually for the key building blocks that underpin energy supply and demand, including developments in climate policy. This annual analysis has led the Company to incorporate a proxy cost of carbon due to the likelihood of government policies that will impose an additional cost on carbon. As indicated above, the Company's assessment of carbon policies in the Outlook for Energy are consistent with the cumulative commitments made in the Paris Agreement and its 2 degree target. The Company uses the proxy cost of carbon in relevant long-term investment decisions to ensure the resiliency of its investments. An important element of the Outlook for Energy and the Company's investment planning is to "stress test" the Company's demand projections and investment economics to understand and test critical variables that can materially impact the outcomes. This is further described in the 2014 Report on pages 16-18.

In short, the 2014 Report concludes that, even if a 450 PPM/low carbon scenario were to occur, the Company's publicly available Outlook for Energy[8] demonstrates that there will be sufficient demand for the carbon-based energy the Company plans to produce between now and 2040.

Page 8 of the Proponent Letter states that "the Company is merely being asked to use the same tools it used to forecast demand and price through 2040 to develop an alternative scenario consistent with the agreement reached by 196 nations to address the global problem of climate change." The Company has fully met this request. Page 49 of the Company's 2016 Outlook for Energy report, an earlier version of which provided the basis for the 2014 Report, demonstrates that the Company has taken into account the commitments of the parties to the Paris Agreement in analyzing the effects public climate change policies are expected to have on the global demand for energy before 2040. In fact as noted previously the Company's projections for emissions reductions in the most recent Outlook for Energy are at least as aggressive as the intended reductions. This is additional evidence that the Company has already substantially implemented the essential objective of the Proposal, which itself (incorrectly, as discussed above) referred to the Paris Agreement as a stand-in for a 2 degree scenario.

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[5] Commitments from the Paris Agreement demonstrate this latter point, which, based on several independent assessments, is consistent but less aggressive than the Company's most recent Outlook for Energy as discussed in more detail in this letter.

[7] http://cdn.exxonmobil.com/~/media/global/files/energy-and-environment/report---energy-and-carbon---managing-the-risks.pdf.

[8] See page 7 at http://cdn.exxonmobil.com/~/media/global/files/outlook-for-energy/2016/2016-outlook-for-energy.pdf. See also http://corporate.exxonmobil.com/en/current-issues/climate-policy/climate-perspectives/managing-climate-change-business-risks.

In addition, while the Proponent Letter cites current and in-process analyses by certain companies, including BHP Billiton, that the Proponent Letter claims are adequate analyses under a 2 degree scenario, these analyses draw similar conclusions to the Company's 2014 Report. For example, the BHP Billiton "Climate Change: Portfolio Analysis" report cited favorably by the Proponent Letter makes similar conclusions as the 2014 Report when the BHP Billiton report on page 2 states that "Even as the world addresses climate change, independent experts such as the International Energy Agency expect that fossil fuels are likely to continue to supply the majority of the world's energy needs for decades to come, including in a 2°C world." [9] These similarities support the conclusion that the Company has already substantially implemented the essential objective of the Proposal.

Finally, page 2 of the Proponent Letter demonstrates some confusion between the Company's use of a proxy cost of carbon over its planning horizon of up to $80 per ton in some regions and the $2,000+ per ton estimate for achieving a low carbon scenario by 2100. The Proponent Letter uses this superficial numerical discrepancy between $80 and $2000 to claim that the Company's proxy cost for carbon does not substantially implement the Proposal's objective. However, this is an apples and oranges comparison. The $2000 per ton figure represents a third party estimate of the approximate cost per ton of carbon dioxide in the year 2100 required to reach a 2 degree scenario using currently known technologies. By contrast, the Company's proxy cost of carbon, used to develop the Outlook for Energy, represents the Company's estimate of the cost of expected policy actions to reduce carbon emissions over the Company's business planning horizon to 2040, which matches the horizon requested by Proponents. The Company is comfortable that its proxy cost of up to $80 in some regions appropriately captures the cost of expected rising carbon restrictions through 2040, which more than covers the approximately 16-year life of the Company's current proved reserves. [10] As such, the Proponent Letter's claim that the Company's use of a proxy cost of carbon is not evidence of substantial implementation is unfounded: The Company has tied its analysis of a proxy cost of carbon and that cost's effect on the Company's oil and gas reserves to the time period between now and 2040, exactly as requested in the Proposal.

5. Rule 14a-8(l)

As discussed in the Company No Action Letter, should the Staff not agree with our opinion that the Proposal can be excluded from the Company's 2016 proxy materials, the Company does not intend to include the names of both the lead filer and the co-filer in its proxy materials, but rather will make information concerning the co-filer available to shareholders on request consistent with long-standing Company practice. This approach is especially necessary as in some cases the Company receives proposals with over two dozen co-filers. The Proponent Letter argues that the clear discretion provided to issuers under Rule 14a-8(l) in determining how to present proponent information in the issuer's proxy statement can be rendered null simply by proponents' purporting to include their names as part of the Proposal itself. We believe Rule 14a-8(l) is perfectly clear in allowing issuers, not proponents, to determine whether to include proponent information in the proxy statement or to make such information available on request. The Company therefore reaffirms its intention, if the Proposal is included in the Company's 2016 proxy materials, to identify only the State of New York as lead filer in the proxy statement and to

[9] http://www.bhpbilliton.com/~/media/5874999cef0a41a59403d13e3f8de4ee.ashx.

[10] See footnote 4 above in this letter.

make information regarding the Church of England as co-filer available on request, consistent with the Company's long-standing practice for other proposals that include co-filers.

* * *

For the reasons stated above and in the Company No Action Letter, the Company rejects the Proponent Letter's claims and continues to request that the SEC not recommend any enforcement action if, in reliance on Rule 14a-8, the Company omits the Proposal from its 2016 proxy materials.

Respectfully yours,

Louis L. Goldberg

Attachment

cc w/ att: James E. Parsons, Coordinator – Corporate Securities & Finance Law, ExxonMobil

Patrick Doherty, Director of Corporate Governance, New York State Common Retirement Fund

Andrew Brown, Secretary, Church Commissioners for England

Adam C.T. Matthews, Head of Engagement, Church Commissioners for England

Sonia Kowal, President, Zevin Asset Management, LLC

Jagdeep Singh Bachher, Chief Investment Officer, The Regents of the University of California

Elizabeth A. Pearce, Vermont State Treasurer, Vermont Pension Investment Committee

Ann Krumboltz, Executive Director, The Brainerd Foundation

Timothy Smith, Walden Asset Management

EXHIBIT 8

ExxonMobil
Energy lives here™

News and updates › **News releases**

News Jan 25, 2016 - 09:00 a.m. EST

ExxonMobil's Energy Outlook Projects Energy Demand Increase and Decline in Carbon Intensity

- Global energy demand expected to increase 25 percent between 2014-2040, driven by population and economic growth
- Carbon intensity of the global economy to fall by half due to significant energy efficiency gains and a gradual transition to less carbon-intensive energy types

Dateline:

IRVING, Texas

Public Company Information:

NYSE: XOM

IRVING, Texas--(BUSINESS WIRE)--Global energy demand will increase 25 percent between 2014 and 2040, driven by population growth and economic expansion, ExxonMobil said today in the 2016 edition of The Outlook for Energy. At the same time, energy efficiency gains and increased use of renewable energy sources and lower carbon fuels, such as natural gas, are expected to help reduce by half the carbon intensity of the global economy.

During the period, the world's population will increase by about 2 billion people and emerging economies will continue to expand significantly. Most growth in energy demand will occur in developing nations that are not part of the Organization for Economic Co-operation and Development (OECD). Per capita income in those countries is likely to increase by 135 percent.

Natural gas is expected to meet about 40 percent of the growth in global energy needs and demand for the fuel will increase by 50 percent. Nuclear and renewable energy sources – including bio-energy, hydro, geothermal, wind, and solar – are also likely to account for nearly 40 percent of the growth in global energy

demand by 2040. By then, they are expected to make up nearly 25 percent of supplies of which nuclear alone represents about one third.

"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," said Rex W. Tillerson, chairman and chief executive officer of Exxon Mobil Corporation. "The Outlook for Energy is a useful resource to help understand future energy supply and demand, which can aid decisions by individuals, businesses and governments that together will affect the future of energy."

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.

The Outlook for Energy is ExxonMobil's long-range forecast developed by its economists, engineers and scientists through data-driven analysis. It examines energy supply and demand trends for approximately 100 countries, 15 demand sectors and 20 different energy types.

"Our forecast is used as a foundation for the company's business strategies and to help guide multi-billion dollar investment decisions," said William Colton, vice president of ExxonMobil Corporate Strategic Planning, which develops The Outlook for Energy. "For many years the outlook has taken into account policies established to reduce energy-related carbon dioxide emissions. The climate accord reached at the recent COP 21 conference in Paris set

many new goals, and while many related policies are still emerging, the outlook continues to anticipate that such policies will increase the cost of carbon dioxide emissions over time."

Key findings of the report include:

- 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.
- North America, which for decades had been an oil importer, is on pace to become a net exporter around 2020.
- India will surpass China as the world's most populous nation, with 1.6 billion people. The two countries are expected to account for almost half of the growth in global energy demand.
- Global demand for electricity is expected to increase by 65 percent, and 85 percent of the increase is in non-OECD nations.
- The share of the world's electricity generated by coal is expected to fall to about 30 percent in 2040 from approximately 40 percent in 2014.
- Global energy demand from transportation is projected to rise by about 30 percent, and practically all the growth will be in non-OECD countries.
- Sales of new hybrids are expected to jump from about 2 percent of new-car sales in 2014 to more than 40 percent by 2040,

when one in four cars in the world will be a hybrid. Average fuel economy will rise from 25 to about 45 miles per gallon.

- Already the world's largest oil-importing region, Asia Pacific's net imports are projected to rise by more than 50 percent by 2040 as domestic production remains steady and demand increases.

For more information about The Outlook for Energy, visit www.exxonmobil.com/energyoutlook.

Cautionary Statement: Statements in The Outlook for Energy and this release relating to future events or conditions are forward-looking statements. Actual future global or local conditions (including economic conditions and growth, population growth, energy demand growth and mix, energy supply sources, efficiency gains, the impact of technology, and carbon emissions) could differ materially due to changes in supply and demand and market conditions affecting oil, gas, and other energy prices; changes in law or government regulation and other political events; changes in technology; the occurrence and duration of economic recessions; the actions of competitors; the development of new supply sources; demographic changes; and changes in other assumptions or factors discussed in The Outlook for Energy and under the heading "Factors Affecting Future Results" on the Investors page of our website at www.exxonmobil.com. See also Item 1A of ExxonMobil's latest Form 10-K.

About ExxonMobil

ExxonMobil, the largest publicly traded international oil and gas company, uses technology and innovation to help meet the world's growing energy needs. ExxonMobil holds an industry leading inventory of resources, is the largest refiner and marketer of petroleum products, and its chemical company is one of the largest in the world. Follow ExxonMobil on Twitter at www.twitter.com/exxonmobil.

Contact:

ExxonMobil
Media Relations, 972-444-1107

EXHIBIT 9

Meeting global needs – managing climate change business risks

Energy is the foundation for modern life and the gateway to opportunity and development for developing nations.

Energy powers technology and enables progress throughout the world. It provides heat for homes and businesses; power for hospitals and clinics to run advanced, life-saving equipment; fuel for cooking and transportation; and light for schools and streets. In 2040, the energy sector will need enough supplies to sustain the lives of 9 billion people and a world economy more than double that of 2014. Expanded

economic output and roughly 2 billion additional consumers by 2040 will mean that global energy demand will likely grow by about 25 percent over 2014. To put this growth in perspective, this increase is equivalent to the total energy used in North America and Latin America today.

Given the importance of energy, it is in the interest of every government to increase access to reliable and affordable supplies for its citizens. That is why consumers should be concerned with policies that could have an adverse impact on energy production. Such restrictions could also impact the rate of economic development and the ability of nations to develop.

Growing energy demand will require diverse investment

Technology is the key to expanding supplies of energy to meet global needs.

Such innovation requires significant investments and sustained research and development, the result of which will be affordable and abundant energy production with reduced environmental impact.

It is also important to recognize that energy is a long-term, capital-intensive sector of the economy.

As a major participant in the global energy industry, ExxonMobil must anticipate and adapt to trends and changes in our industry so that we can make sound business decisions and invest our shareholders' money wisely in projects that remain attractive in the long term.

Every year, we prepare a long-range analysis of global energy trends. We call it the *Outlook for Energy* and it looks at how people use energy, how much they will use in the decades ahead, and what our industry must do to meet the needs of billions of people.

Our current *Outlook for Energy* covers the period 2014 to the year 2040. It provides a strategic framework to aid evaluation of potential business opportunities. Like all credible forecasts, we see fossil fuels continuing to shoulder the bulk of societal needs in the future. We also see a future marked by a shift to lower-carbon fuels. With this shift will come a plateau in carbon dioxide (CO_2) emissions, and we project that new technologies will open up new energy options, such as unconventional oil and natural gas in North America.

Risk assessment

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 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 confirm 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 ExxonMobil's senior management and the Board of Directors each year. The company's energy and environmental perspectives, including those relating to climate, are also reviewed with the Board annually to help the directors understand financial and other risks associated with the corporation's investments.

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 business cycles. We apply prudent and substantial safety margins in our planning assumptions to help ensure robust returns.

The company also stress tests its oil and natural gas capital investment opportunities, providing a further margin of safety against uncertainties, such as those related to technologies, costs, geopolitics, availability of required materials, services, and labor, etc. Stress testing provides us an opportunity to fully consider different economic scenarios in our planning an investment process. The *Outlook for Energy* is reviewed annually, and updated to reflect changes in views and circumstances, including advances in technology and changes in government policies.

Financial risk

We use a simple cost of carbon as a proxy mechanism to help model the potential impacts of a broad mosaic of future GHG policies. For example, in most OECD nations, we assume an implied cost of CO2 emissions that

will reach about $80 per metric ton in 2040. Developing nations will have a wide range of policy costs with the wealthiest ones reaching about $35 per metric ton.

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 2040. Such policies are also likely to accelerate the growth of lower carbon sources of energy like natural gas and renewables, while suppressing the supply of coal.

A key strategy to ensure investment selectivity under a wide range of economic assumption is to maintain a diverse portfolio of oil and gas investment opportunities. This diversity in terms of resource type, corresponding development options (oil, gas, natural gas liquids, onshore, offshore, deepwater, conventional, unconventional, liquefied natural gas, etc.) and geographic dispersion is unparalleled in the industry. 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.

Physical risk

While most scientists agree climate change poses risks related to extreme weather, sea-level rise, temperature extremes, and precipitation changes, current scientific understanding provides limited guidance on the likelihood, magnitude, or time frame of these events. Anticipating the

likelihood of an event at the regional or local level in comparison to global averages is even more difficult.

Nevertheless, ExxonMobil robustly engineers its facilities and operations with extreme weather considerations in mind. 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 built in to cover a number of engineering uncertainties.

EXHIBIT 10

BUSINESS:

Document trove details links between tobacco, oil industries

Benjamin Hulac, E&E reporter

Published: Wednesday, July 20, 2016

The top executives of the seven largest American tobacco companies prepare to testify before Congress in 1994. Documents long held in university archives show a decadeslong strategic relationship between the oil and tobacco industries. Photo courtesy of C-SPAN.

This story was updated at 11 a.m. EDT.

Organizations worried about climate change have long drawn comparisons between the petroleum and tobacco industries, arguing that each has minimized public health damages of its products to operate unchecked.

Some have urged federal regulators to prosecute oil companies under racketeering charges, as the Department of Justice did in 1999 in a case against Philip Morris and other major tobacco brands.

Oil companies bristle at the comparison. But overlap between both industries existed as early as the 1950s, new research details.

Documents housed at the University of California, San Francisco, and analyzed in recent months by the Center for International Environmental Law (CIEL), a Washington, D.C.-based advocacy group, show that the oil and tobacco industries have been linked for decades. The files CIEL drew its research from have been public for years.

The unknown author of one memo, who once worked for Standard Oil Co. Inc. of New Jersey, suggested scientists for an advisory committee study the health effects of smoking.

"I am giving below the names of individuals who you might consider as potential members of the Medical Advisory Committee for the tobacco industry, as related to its current medical problem," the person wrote to a tobacco research board, alluding to building evidence that smoking caused health problems.

Both industries hired public relations company Hill & Knowlton Inc., an influential New York firm, for outreach as early as 1956.

And Theodor Sterling, a mathematics professor known for research on smoking that was favorable to the tobacco industry -- Philip Morris paid more than $200,000 in the

John Hill, founder of what is now Hill+Knowlton Strategies. Photo by Hill+Knowlton, courtesy of Wikipedia.

1990s for his work -- also **studied** lead in gasoline for Ethyl Corp. in 1962. Ethyl was a joint venture between General Motors Corp. and Standard Oil.

"From the 1950s onward, the oil and tobacco firms were using not only the same PR firms and same research institutes, but many of the same researchers," CIEL President Carroll Muffett said in a statement.

"Again and again we found both the PR firms and the researchers worked first for oil, then for tobacco," he said. "It was a pedigree the tobacco companies recognized and sought out."

CIEL alerted *ClimateWire* to the existence of the tobacco documents and has been researching for years what the oil industry knew about climate change and what it did in response.

The examination of the tobacco documents has been more recent for CIEL, which calls its project comparing the tobacco and oil industries "Smoke & Fumes."

The group's new research is part of a building debate about oil companies' knowledge over the decades about climate change. It also is part of a push from environmental groups to make the legal case that fossil energy companies have lied for decades about global warming risks, just as tobacco companies lied about the connection between smoking and cancer.

Last week, House Science, Space and Technology Chairman Lamar Smith (R-Texas) subpoenaed the attorneys general of New York and Massachusetts, who are each investigating if Exxon Mobil Corp. misled investors and the public about climate change threats, and several environmental groups (***ClimateWire***, July 14).

Smith and his colleagues maintain that the attorneys general colluded with environmentalists in their investigations. They say such probes violate First Amendment protections of free speech.

The Stanford Research Institute link

Another connection between oil and tobacco companies, according to CIEL, is the Stanford Research Institute, now known as SRI International after splitting with Stanford University in 1970.

Founded in 1946, SRI studied smog and pollution generally and received funding from tobacco and oil companies.

SRI scientists also generated climate change research for the American Petroleum Institute in the 1960s and '70s.

Spokespeople for Chevron Corp., Exxon Mobil and Royal Dutch Shell PLC said they hadn't heard of the Stanford Research Institute before, declining to comment further. And API spokesmen did not respond to request for comment.

A **blog post** from the Independent Petroleum Association of America called the document release a "desperate move" and the latest in a coordinated attempt to hurt the fossil fuel industry.

In a 1968 report prepared for API in New York City, SRI scientists Elmer Robinson and R.C. Robbins acknowledged some uncertainty concerning the relation between carbon emissions and rising temperatures, yet said carbon dioxide was the most likely cause of the "greenhouse effect."

"If the earth's temperatures increase significantly, a number of events might be expected to occur, including the melting of the Antarctic ice cap, a rise in sea levels, warming of the oceans, and an increase in photosynthesis," they wrote.

Robinson followed up in an API-commissioned study dated 1971.

"If there were a long term and significant increase in the pollutant content of the atmosphere either of particles or of carbon dioxide, the potential damage to the global environment could be severe," he said.

"Even the remote possibility of such an occurrence justifies concern," added Robinson, one of the first scientists to link the burning of fossil fuels with global warming. He died earlier this year at 91.

The documents show oil companies tested toxicity in cigarettes in the 1950s, and some, including Exxon and Shell, patented cigarette filters worldwide for decades. They also indicate that tobacco companies went to SRI for help in creating small testing kits the size of suitcases to assess smoke.

The Smoke and Fumes Committee

In 1946, API established its own body to study pollution from the oil industry. It was called the Smoke and Fumes Committee.

Wary of government regulation to slash pollution from refineries and other operations within their supply chain, as well as public concern about smog in cities such as Los Angeles, petroleum officials at API and member firms offered alternative theories of how smog was created.

"The worst thing that can happen, in many instances, is the hasty passage of a law or laws for the control of a given air pollution situation," Vance Jenkins, executive secretary of the Smoke and Fumes Committee, said in a 1954 trade journal article about smog pollution.

The corporate predecessors to Chevron Corp., Exxon Corp. and Royal Dutch Shell PLC were each involved in the Smoke and Fumes Committee through former companies and subsidiaries, often broken-off units of the Standard Oil corporate empire.

While the documents show API learned of potential climate change risks as early as 1968 and had formed committees to examine smog pollution in the 1940s, Exxon CEO Lee Raymond said in November 1996 that climate science was unsettled.

"Scientific evidence remains inconclusive as to whether human activities affect the global climate," Raymond said at a press conference.

The University of California, San Francisco, documents were cached there starting in 2002 after tobacco industry litigation. Hill & Knowlton references are heavily featured.

An internal Hill & Knowlton memo from 1954 describes a booklet that employees circulated to doctors nationwide on the "cigarette-lung cancer theory." They also show company founder John Hill, as well as colleagues Bert Goss, Richard Darrow and others, sat in on meetings of the Tobacco Industry Research Committee, an industry panel.

Hill also appears in meeting minutes in the 1950s for the Manufacturing Chemists' Association Inc. And a flyer from 1963 indicates Goss, president of Hill & Knowlton at the time, hosted an event that November about the future of public relations.

An executive of Socony Mobil Oil Co. Inc., a predecessor of Mobil Oil, coordinated that talk, held at the New School in New York City.

Twitter: @benhulac | Email: bhulac@eenews.net

EXHIBIT 11

The Official Website of the Attorney General of Massachusetts

Attorney General Maura Healey

Home > News and Updates > Press Releases > 2015 > Chase Bank to Pay $136 Million in Nationwide Settlement

MAURA HEALEY
ATTORNEY GENERAL

Media Contact

Jillian Fennimore
(617) 727-2543

For Immediate Release - July 08, 2015

Chase Bank to Pay $136 Million in Nationwide Settlement Over Unlawful Credit Card Debt Collection Practices

Agreement Prevents Collections on More Than 528,000 Consumer Accounts and Prohibits Buyers from Reselling Unpaid Credit Card Debt; Massachusetts to Receive $2.8 Million

BOSTON – Chase Bank USA, N.A. and Chase Bankcard Services, Inc. will pay $136 million and significantly reform its credit card debt collection practices through a joint state-federal settlement, Attorney General Maura Healey announced today. Massachusetts will receive more than $2.8 million from the agreement.

"Chase's unlawful debt collection practices harmed credit card holders in Massachusetts and across the country," AG Healey said. "This agreement holds Chase accountable for its past practices and provides immediate debt relief for consumers. It also puts needed reforms in place to ensure that information gathered to collect unpaid debt is fair, accurate, and verified."

The joint state-federal investigation uncovered various unlawful debt collection practices by Chase, including:

- Attempting to collect debts from and seeking judgments against consumers for accounts that did not belong to the consumers;
- Selling certain accounts to debt buyers that contained inaccurate information or concerned debts that were settled, discharged in bankruptcy, not actually owed by the consumer, or otherwise uncollectable;
- Using false and deceptive affidavits that were prepared without following required procedures, a practice referred to as "robo-signing;"
- Making calculation errors when filing debt collection lawsuits that sometimes resulted in judgments against consumers for incorrect amounts; and
- Because of the unlawful debt collection practices mentioned above, reporting inaccurate information to credit reporting agencies about consumers that may have affected their ability to obtain credit, employment, housing, and insurance in the future.

Following an investigation by the AG's Office, along with attorneys general from 47 states plus the District of Columbia, Chase entered into an assurance of discontinuance filed with the Suffolk Superior Court today. As part of the nationwide resolution, Chase also entered into a separate order with the Consumer Financial Protection Bureau (CFPB).

The agreement requires Chase to cease all collection efforts on more than 528,000 consumers, including an estimated 9,000 in Massachusetts. Chase will notify affected borrowers of the required changes and will request all three major credit reporting agencies to not report any judgments obtained relating to these accounts.

Chase has also agreed to implement new safeguards to help ensure debt information is accurate and inaccurate data is corrected, to provide additional information to consumers who owe debts, and to prohibit Chase's debt buyers from reselling consumer debts to other purchasers. Previously, initial buyers of Chase's consumer credit card debt could resell the debt, the subsequent buyers could flip the debt to another buyer and the process could repeat itself many times over, even if the information was incorrect, resulting in harm to the consumer.

Chase will pay $106 million to the 47 participating states and the District of Columbia, and $30 million to the CFPB. Today's agreement also ensures that Chase will fulfill its obligation to provide $50 million in consumer restitution by July 1, 2016, as provided under a separate 2013 agreement with the Office of the Comptroller of the Currency. Chase estimates that so far it has provided $325,000 in restitution to 275 Massachusetts consumers through the separate settlement.

Debt collectors are bound by state and federal laws, which prohibit the use of unfair or deceptive practices to collect from consumers. Consumers with questions or concerns can call (617) 727-8400 or visit the AG's website for more information.

This matter was handled by Assistant Attorneys General Aaron Lamb and Tim Hoitink and Division Chief Glenn Kaplan of Attorney General Healey's Insurance and Financial Services Division.

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EXHIBIT 12

For Immediate Release - December 19, 2013

Media Contact

Jillian Fennimore
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Ocwen to Provide $2.1 Billion in Relief to Homeowners in State-Federal Settlement Over Loan Servicing Misconduct

Mortgage Servicer to Provide Massachusetts Homeowners Relief Totaling $80 Million; Agreement Includes Principal Reduction, New Servicing Standards

BOSTON – The nation's fourth largest mortgage servicer has agreed to provide Massachusetts homeowners with an estimated $80 million in principal reduction and cash payments to homeowners as part of a national settlement to resolve claims of loan servicing misconduct and unlawful foreclosures, Attorney General Martha Coakley announced today.

A $2.1 billion joint state and federal settlement with Ocwen Financial Corporation of Atlanta, Georgia, and its subsidiary, Ocwen Loan Servicing, was reached today with a total of 49 states and the District of Columbia, and the Consumer Financial Protection Bureau (CFPB).

"After initiating thousands of illegal foreclosures nationwide, this settlement will ensure that future fraud and abuse from this mortgage servicer will be prohibited," AG Coakley said. "We are pleased that Massachusetts homeowners who were foreclosed upon will receive relief under this agreement."

The national settlement, filed today along with the complaint in the U.S. District Court for the District of Columbia, addresses servicing misconduct by Ocwen, and two companies later acquired by Ocwen, Homeward Residential Inc. and Litton Home Servicing Limited Partnership (Litton). Ocwen specializes in servicing high-risk mortgage loans. The settlement is the result of a massive civil law enforcement investigation and initiative that includes state attorneys general, state mortgage regulators, and the CFPB.

According to the complaint filed by AG Coakley and other regulators, the misconduct resulted in premature and unauthorized foreclosures, violations of homeowners' rights and protections, and the use of false and deceptive documents and affidavits, including "robo-signing."

Under the national settlement, Ocwen has agreed to provide $2 billion in first-lien principal reduction on loans serviced by Ocwen in Massachusetts and 48 other states, and $125 million for cash payments to borrowers nationwide on nearly 185,000 foreclosed loans.

In Massachusetts, Ocwen will provide troubled borrowers with an estimated $79 million in first lien principal reductions, and about 2,600 loans will be eligible to receive a cash payment. The payment amount, which is contingent on the number of consumers who submit valid claims, is projected to exceed $1,000.

An independent monitor will oversee implementation of the settlement to ensure compliance. Other highlights of the agreement include providing homeowners with comprehensive new protections from new mortgage loan servicing and foreclosure standards.

The final agreement, through a consent judgment, will be filed in U.S. District Court in Washington, D.C. If approved by a judge, it will have the authority of a court order.

The National Mortgage Settlement, an agreement announced in February 2012, involving the nation's five largest mortgage servicers and their connection with unlawful foreclosures and loan servicing has so far provided more than $51 billion in relief to distressed homeowners and created significant new servicing standards. The servicers in that settlement indicate that they have provided more than $620 million in relief to Massachusetts borrowers in addition to making a direct payment of more than $44.5 million to the Commonwealth, used in part to establish the AG's HomeCorps program and offer grants aimed at helping to mitigate the impact of the foreclosure crisis.

The case is being handled for Massachusetts by Assistant Attorneys General Glenn Kaplan and Peter Leight, and paralegal Erica Harmon of Attorney General Martha Coakley's Insurance and Financial Services Division, with Assistant Attorneys General Amber Villa, Justin Lowe and Stephanie Kahn of AG Coakley's Consumer Protection Division.

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EXHIBIT 13

MAURA HEALEY
ATTORNEY GENERAL

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For Immediate Release - February 05, 2016

$470 Million State-Federal Settlement Reached with HSBC Over Unlawful Foreclosures, Loan Servicing

AG's Office Reaches Separate Agreement with HSBC that Provides Direct Relief to Massachusetts Borrowers

BOSTON – A $470 million joint state-federal settlement has been reached with national mortgage lender and servicer HSBC to address mortgage origination, servicing, and foreclosure abuses, Attorney General Maura Healey today announced.

AG Healey joins 49 other states, the District of Columbia, U.S. Department of Justice (DOJ), U.S. Department of Housing and Urban Development (HUD), and the Consumer Financial Protection Bureau (CFPB) in the consent judgment, filed today in the U.S. District Court for the District of Columbia.

The settlement will provide direct payments to hundreds of borrowers in Massachusetts, along with rigorous mortgage servicing standards and compliance oversight from an independent monitor.

The AG's Office has also reached a separate assurance of discontinuance, filed today in Suffolk Superior Court, which addresses allegations that HBSC offered teaser interest rate reductions to Massachusetts borrowers that ultimately increased the likelihood that they would lose their homes, violating HSBC's obligation to make a good faith effort to avoid foreclosure. Under the terms of the agreement, HSBC will pay an additional $750,000 and provide relief to Massachusetts homeowners for violation of the state's foreclosure law.

"Today's settlements hold HSBC accountable for its unlawful practices and provide immediate relief to struggling Massachusetts borrowers who lost their homes or face foreclosure," AG Healey said. "With strict servicing standards in place, HSBC will be required to ensure fairness and take critical steps to prevent past foreclosure abuses."

State-Federal Settlement

The mortgage servicing terms under today's multistate settlement largely mirror the 2012 historic national settlement involving the nation's five largest mortgage servicers, which addressed unlawful foreclosures and unfair loan servicing practices.

Of the $470 million, HSBC will pay $40.5 million to the federal agencies, and close to $60 million will be paid to the states to be distributed to HSBC borrowers who lost their homes to foreclosure from Jan. 1, 2008 through Dec. 31, 2012. The settlement also includes $370 million in consumer relief by HSBC nationwide, including items such as principal reduction and refinancing for underwater mortgages.

It is estimated that nearly 1,000 Massachusetts borrowers who lost their homes to foreclosure will be eligible for monetary payments. Borrowers will be contacted about how to apply for payments.

The settlement also includes new consumer protections that require HSBC to substantially change how it services mortgage loans and handles foreclosures. The terms will prevent past abuses, such as robo-signing, improper documentation and lost paperwork. An independent monitor will ensure mortgage servicer compliance.

Massachusetts Settlement

In a separate assurance of discontinuance reached with HSBC, the AG's Office alleges that HSBC violated a Massachusetts foreclosure law, Section 35B of G.L. Chapter 244. This landmark law, passed in 2012, requires creditors to make a good faith effort to avoid foreclosure for mortgage loans that were made with abusive subprime terms.

According to the AG's Office, HSBC violated this law by offering borrowers facing foreclosure temporary modifications that did not consider the borrower's ability to repay the mortgage debt over the life of the loan. Borrowers often defaulted after the temporary modification expired.

The settlement also resolves claims that HSBC unlawfully foreclosed on properties when they did not own the mortgages. The AG's Office alleges that HSBC's unlawful conduct resulted in numerous void foreclosures affecting the marketability and insurability of the titles.

Under the terms of the settlement, HSBC will pay a total of $750,000 to the Commonwealth, provide permanent loan modification relief as required by state law to eligible borrowers, and facilitate cures of title issues resulting from unlawful foreclosures.

Consumers who need assistance or have questions can call the AG's HomeCorps Division at (617) 573-5333 or visit www.mass.gov/ago/homecorps.

Today's settlement with the AG's Office was handled by Assistant Attorneys General Lisa Dyen and Justin Lowe of the Consumer Protection Division, and Claire Masinton of the Insurance and Financial Services Division, with assistance from Assistant Attorney General Michael Lecaroz and Legal Analyst Maja Kazmierczak of AG Healey's HomeCorps Division.

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EXHIBIT 14

MARTHA COAKLEY
ATTORNEY GENERAL

Media Contact

Brad Puffer
Jillian Fennimore
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For Immediate Release - July 14, 2014

CitiGroup to Pay $7 Billion in Federal-State Deal Over Mortgage Backed Securities

Includes $45.7 Million Cash Payment to Commonwealth; Seventh Settlement in AG Coakley's Investigation of Banks Involved in Securitizing Unfair Loans

BOSTON – CitiGroup, Inc. will pay $7 billion in a joint federal-state settlement over its mortgage-backed security activities, Attorney General Martha Coakley announced today. This is the seventh settlement resulting from AG Coakley's ongoing investigation into the role of Wall Street investment banks in funding, purchasing and securitizing unfair residential mortgage loans.

The Massachusetts Attorney General's Office, the Department of Justice (DOJ) and four other states entered into the agreement today. As part of the $7 billion settlement, an expected $2.5 billion will be set aside for consumer relief such as loan modifications, $500 million used to compensate investors and other state relief, and $4 billion in civil penalties. Of the $2.5 billion made available for consumer relief, $10 million will be made available for only Massachusetts borrowers, with additional relief available as needed.

As part of this agreement, the Commonwealth will receive a direct cash payment of $45.7 million to settle the AG's own investigation of CitiGroup's securitization practices, including around $6.5 million to the Pension Reserves Investment Management Board (PRIM), more than $15 million in direct consumer relief, and the rest to the Commonwealth.

"Since 2009 our office has led the way in holding Wall Street securitizers accountable, and this cooperative federal-state enforcement action uses that blueprint to recover billions across the country," AG Coakley said. "This is the seventh case that Massachusetts has resolved around the securitization of unfair mortgage loans, providing significant relief to homeowners and taxpayers in the Commonwealth."

The settlement is the result of lengthy investigations by the Massachusetts AG's Office, the Department of Justice, and other enforcers regarding unfair and deceptive practices committed by CitiGroup. The settlement also resolves the separate state investigations by Massachusetts, Delaware, New York, Illinois, and California.

CitiGroup and its subsidiaries played a significant role in the securitization of residential home mortgages. Many of these mortgages were subprime loans that were sold to consumers with cheap short term teaser rates. CitiGroup and its subsidiaries bundled the loans into investment pools and sold notes to investors backed by these unfair loans. Investors, including government investors, suffered significant losses when the market crashed and the nature of these mortgage securitizations became clear.

The AG's Office was the first in the nation to investigate and hold Wall Street securitization firms accountable for their role in the subprime mortgage crisis. Today's settlement with CitiGroup is the most recent settlement resulting from the AG's ongoing investigation into the role of Wall Street investment banks in funding, purchasing and securitizing unfair residential mortgage loans. It follows the resolution of these other securitization cases:

- In May 2009, Goldman Sachs agrees to pay $60 million in relief for the Commonwealth and affected homeowners as part of a settlement with the AG's Office.
- In June 2010, Morgan Stanley agrees to pay $102 million in relief for the Commonwealth and affected homeowners as part of a settlement with the AG's Office.
- In November 2011, RBS agrees to pay $52 million in relief for the Commonwealth and affected homeowners pursuant to a settlement with the AG's Office.
- In September 2013, Barclays Bank PLC agrees to pay $36 million to the Commonwealth and affected homeowners as part of a settlement with the AG's Office.
- In November 2013, JPMorgan-Chase agrees to pay $34 million to the Commonwealth and affected homeowners as part of a settlement with the AG's Office.
- In December 2013, Countrywide Securities Corporation makes $17.3 million payment to the state pension fund and the Commonwealth as part of a settlement with the AG's Office.

AG Coakley's office has been a national leader in holding banks and investment giants accountable for their role in the economic crisis. In addition to recoveries involving the securitization of loans, AG Coakley has also obtained settlements with Countrywide, Fremont Investment and Loan, Option One and others on behalf of Massachusetts homeowners. In

2012, AG Coakley's office joined a $25 billion nationwide settlement with the five major lenders over unlawful foreclosure practices.

AG Coakley's first-in-the-nation HomeCorps program, established with funds from that $25 billion settlement, continues to provide assistance to borrowers across the state with dedicated loan modification specialists and through a series of grants. As a result of all these actions, her office has recovered more than $700 million in relief for investors and borrowers, helped keep more than 30,000 people in their homes, and returned more than $70 million in taxpayer funds back to the Commonwealth.

More information about AG Coakley's work during the lending crisis can be found here, along with a report that offers a transparent record of actions taken by the AG's Office since 2007. More information on the $7 billion Citigroup settlement can be found on the DOJ's website here.

The Commonwealth's investigation of CitiGroup's securitization practices was handled by Attorney General Martha Coakley's Insurance and Financial Services Division.

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EXHIBIT 15

The Official Website of the Attorney General of Massachusetts

Attorney General
Maura Healey

MARTHA COAKLEY
ATTORNEY GENERAL

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For Immediate Release - November 19, 2013

JPMorgan to Pay $13 Billion in Federal-State Deal Over Mortgage Backed Securities

Fifth Settlement in AG Coakley's Investigation of Banks Involved in Securitizing Unfair Loans

BOSTON – JPMorgan Chase and Co. will pay $13 billion in a joint federal-state settlement over the practices of its mortgage-backed security activities, Attorney General Martha Coakley announced today. This is the fifth settlement resulting from AG Coakley's ongoing investigation into the role of Wall Street investment banks in funding, purchasing and securitizing unfair residential mortgage loans.

The Massachusetts Attorney General's Office, the Department of Justice and four other states entered into the agreement today. As part of the $13 billion settlement, an expected $4 billion will be set aside for consumer relief, $7 billion used to compensate investors, and $2 billion for fines. The Commonwealth will directly receive $34.4 million to settle the AG's own investigation of JPMorgan's securitization practices.

"This settlement today is part of our ongoing effort to hold Wall Street accountable for its role in the financial crisis," said AG Coakley. "This is the fifth case that Massachusetts has resolved since 2009 around the securitization of unfair mortgage loans. We are pleased that other enforcement agencies are coming together in a cooperative effort to clean up this mess and help prevent a repeat of the foreclosure crisis."

The settlement is the result of lengthy investigations by the Commonwealth working jointly with the State of Delaware, the Department of Justice, and other enforcers regarding unfair and deceptive practices committed by JPMorgan investment units Bear Stearns and Washington Mutual.

JPMorgan and its subsidiaries played a significant role in the securitization of residential home mortgages. Many of these mortgages were subprime loans that were sold to consumers with cheap short term teaser rates. JPMorgan and its subsidiaries bundled the loans into investment pools and sold notes to investors backed by these unfair loans. Investors, including government investors, suffered significant losses when the market crashed and the nature of these mortgage securitizations became clear.

Attorney General Coakley's Office was the first in the nation to investigate and hold Wall Street securitization firms accountable for their role in the subprime mortgage crisis. Today's settlement with JPMorgan is the most recent settlement resulting from AG's ongoing investigation into the role of Wall Street investment banks in funding, purchasing and securitizing unfair residential mortgage loans. It follows the resolution of these similar matters:

- In May 2009, Goldman Sachs paid $60 million in relief for the Commonwealth and affected homeowners as part of a settlement with the AG's Office.
- In June 2010, Morgan Stanley paid $102 million in relief for the Commonwealth and affected homeowners as part of a settlement with the AG's Office.
- In November 2011, RBS paid $52 million in relief for the Commonwealth and affected homeowners pursuant to a settlement with the AG's Office.
- In September 2013, Barclays Bank PLC paid $36 million to the Commonwealth and affected homeowners as part of a settlement with the AG's Office.

AG Coakley's office has been a national leader in holding banks and investment giants accountable for their role in the economic crisis. In addition to recoveries involving the securitization of loans, AG Coakley has also obtained settlements with Countrywide, Fremont Investment and Loan, Option One and others on behalf of Massachusetts homeowners. In 2012, AG Coakley's office joined a $25 billion nationwide settlement with the five major lenders over unlawful foreclosure practices.

AG Coakley's first-in-the-nation HomeCorps program, established with funds from that $25 billion settlement, continues to provide assistance to borrowers across the state with dedicated loan modification specialists and through a series of grants. As a result of all these actions, her office has recovered more than $700 million in relief for investors and borrowers, helped keep more than 30,000 people in their homes, and returned more than $70 million in taxpayer funds back to the Commonwealth.

More information about AG Coakley's work during the lending crisis can be found here.

More information on the $13 billion settlement can be found on the DOJ's website here.

The investigation of JPMorgan's securitization practices was handled by Assistant Attorneys General Aaron Lamb, Tim Hoitink, Peter Leight, Glenn Kaplan, and Lydia French, as well as Mathematician Burt Feinberg and paralegal Erica Harmon, of Attorney General Martha Coakley's Insurance and Financial Services Division.

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EXHIBIT 16

MARTHA COAKLEY
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For Immediate Release - March 11, 2013

Oppenheimer to Pay $2.8 Million to Settle Allegations of Misrepresenting Performance of Fund to Investors

Joint Investigation with the SEC Leads to Nationwide Payments to Investors, New Conduct Standards

BOSTON – Oppenheimer Asset Management Inc. and Oppenheimer Alternative Investment Management, LLC (Oppenheimer) have agreed to pay $2.8 million, resolving allegations that Oppenheimer misled investors about the valuation policies and performance of a private equity fund, Attorney General Martha Coakley announced today.

As a result of a joint investigation with the Securities and Exchange Commission's New York Regional Office (SEC), the AG's Office filed an Assurance of Discontinuance today in Suffolk Superior Court alleging that Oppenheimer disseminated misleading quarterly reports and misleading marketing materials. Those reports allegedly stated that the private equity fund was valued "based on the underlying managers' estimated values." In fact, Oppenheimer's portfolio manager actually valued the fund's largest investment significantly higher than the underlying manager's estimated value, inflating a key fund performance metric from 3.8 percent to nearly 40 percent.

Under the terms of the settlement, Oppenheimer will pay investors nationwide more than $2 million, including approximately $150,000 to the City of Brockton's pension fund, $200,000 to Quincy's pension fund, and a statutory penalty of more than $130,000 to Massachusetts. In addition, Oppenheimer must make changes to its valuation policies and internal controls.

"Our office is pleased to be able to recover this money for investors, especially for the Massachusetts cities that were affected," AG Coakley said. "We appreciate the cooperation of the SEC in this investigation and will continue to ensure that investors' rights are protected from unfair and fraudulent practices."

The investigation found that from October 2009 to June 2010, Oppenheimer advisers marketed the Oppenheimer Global Resource Private Equity Fund I (OGR) to investors, disseminating material misrepresentations and omissions concerning their valuation policies and performance. OGR is a fund that invests in other private equity funds, and it was marketed primarily to state entities and endowments as well as high net worth individuals.

According to the materials filed in Suffolk Superior Court, OGR's largest investment – Cartesian Investors-A LLC – was not valued based on the underlying managers' estimated values. Instead, an Oppenheimer employee valued Cartesian at a significant markup to the underlying manager's estimated value. The change in valuation methodology resulted in an increase in OGR's performance as measured by its internal rate of return, which is a metric commonly used to compare the profitability of various investments. The portfolio manager's markup of OGR's Cartesian investment increased the internal rate of return, raising it from 3.8 percent to almost 40 percent.

In addition, Oppenheimer allegedly told its investors that the yields it was reporting had been vetted by an independent third party valuation firm, and said that OGR's underlying funds were audited by independent third party auditors, both of which were not the case.

Oppenheimer's written policies and procedures were not reasonably designed to ensure that valuations provided to prospective and existing investors were presented in a manner consistent with written representations to investors and prospective investors. Under the terms of the Assurance of Discontinuance, Oppenheimer is required to appoint an independent compliance consultant who will review Oppenheimer's internal policies and make changes to ensure that Oppenheimer's system better prevents the dissemination of deceptive information and misrepresentations in the future.

This case was handled by Legal Analyst Tiffany Bartz, Division Chief Glenn Kaplan, and staff members Sabrina Maynard and Leslie Rogers, all of Attorney General Coakley's Insurance and Financial Services Division.

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EXHIBIT 17

MAURA HEALEY
ATTORNEY GENERAL

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For Immediate Release - September 23, 2015

Boston Firm to Pay $1.8 Million for Selling Unsuitable Investments to Consumers

BOSTON – An investment firm located in Boston has agreed to pay $1.8 million for placing approximately 200 Massachusetts clients into unsuitable investments, Attorney General Maura Healey announced today.

The assurance of discontinuance, filed Tuesday in Suffolk Superior Court against LPL Financial LLC, a major broker-dealer and investment adviser, alleges violations arising from LPL's sales, marketing, training, and oversight relating to risky leveraged Exchange Traded Funds (ETFs).

"Massachusetts families shouldn't have their hard-earned savings put at risk by unsuitable investments," AG Healey said. "Consumers must be able to place their trust in their financial advisors and feel confident that their money will be invested appropriately."

The leveraged ETFs at issue are complex investment funds that try to perform at a multiple of the daily returns of an index like the Standard & Poor's (S&P) 500. For reasons normally not known to casual investors, holding investments in these funds for long periods of time can produce unexpected outcomes. Even an investor who bets correctly on the direction of the index can lose money when holding a leveraged ETF.

Leveraged ETFs are risky investments that have become notorious for their instability, and are unsuitable for retail investors in most cases. The AG's Office alleges certain LPL clients in Massachusetts experienced losses as a result of holding Leveraged ETFs for long periods of time.

According to the AG's investigation, LPL also failed to supervise its financial advisors who caused clients to hold these investments for extended periods of time, and did not consistently adhere to its policy of imposing fines on financial advisors who exceeded concentration limits.

Under the terms of the settlement, reached jointly with the Delaware Department of Justice, the $1.8 million LPL will pay covers a $200,000 penalty, as well as $1.6 million to compensate investors and for investor education. The state of Delaware will also receive a total of $200,000 under a parallel agreement with the Delaware Department of Justice.

Consumers with questions can call AG Coakley's Insurance & Financial Services Division hotline at 1-888-830-6277.

This case was handled by Assistant Attorney General Aaron Lamb, Division Chief Glenn Kaplan, Legal Analyst Brook Kellerman, and Mathematician Burt Feinberg, all of AG Healey's Insurance and Financial Services Division.

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EXHIBIT 18

MAURA HEALEY
ATTORNEY GENERAL

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For Immediate Release - February 11, 2016

MoneyGram to Pay $13 Million in Multistate Settlement Over Wire Transfer Scams, AG Healey Offers Tips for Consumers

Settlement Funds Provide Restitution to Massachusetts Consumers; Company to Improve Anti-Fraud Program

BOSTON – A national wire transfer service has agreed to pay $13 million to resolve a multistate investigation into fraudulent money transfer scams, Attorney General Maura Healey announced today. The settlement funds will provide restitution to eligible consumers and a payment to the states that participated in the multistate investigation. The settlement will also require the company to improve its anti-fraud program.

AG Healey's Office, along with 48 other states and the District of Columbia, participated in the multistate settlement with Dallas-based MoneyGram Payment Systems, Inc. (MoneyGram). Today's settlement resolves a multistate investigation into complaints from consumers who used MoneyGram's wire transfer service to send money to third parties in foreign countries that turned out to be fraudulent.

"Consumers should always be wary of any requests for an immediate transfer of money through a non-bank money transfer service or reloadable payment card," said AG Healey. "These types of scams range from 'grandparent' scams to lottery and contest scams and rely on money transfer services because there is often no way to trace the money, reverse the transaction, or recover the money once it reaches the hands of the scammer."

Under the terms of the settlement, MoneyGram has agreed to pay a total of $13 million, of which approximately $9 million will fund a nationwide consumer restitution program. The remainder of the settlement funds will go to the participating states for costs and fees, including $210,000 to Massachusetts.

Consumers eligible for the nationwide restitution program will be contacted by a settlement administrator.

As part of the settlement, MoneyGram has also agreed to improve its anti-fraud programs to better prevent fraud-induced wire transfers. MoneyGram will be required to provide additional compliance training for agents, maintain guidelines regarding when an agent's conduct warrants suspension or termination, operate a hotline system where employees and agents can report noncompliance with anti-fraud measures, and continually enhance its technology solutions to protect consumers.

AG Healey warns consumers to be extremely suspicious if they receive a telephone call from someone asking for money or personal information, including when:

- The caller is a stranger — in this country or anywhere else;
- The caller says he or she is a grandchild or relative in a crisis;
- The caller is in another country or a far-away location;
- The caller says he or she is in trouble and urgently needs money;
- The caller requests secrecy;
- The caller asks for the funds to be sent by wire transfer.

More information about this settlement is available at the Settlement Administrator's website: www.MoneyGramSettlement.com.

Additional information and resources pertaining to consumer scams are available on the Attorney General's website. Consumers with concerns can call Attorney General Healey's Consumer Hotline at (617) 727-8400. The FTC also provides information about money wire scams on their website, www.ftc.gov.

In Massachusetts, this matter was handled by Deputy Division Chief Monica Brookman and Legal Analyst Emily Garvey, both of AG Healey's Insurance and Financial Services Division.

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EXHIBIT 19

MAURA HEALEY
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For Immediate Release - June 28, 2016

AG Healey Announces Major Award For More Than 12,500 Massachusetts Consumers Under Settlements with Volkswagen Over Emissions Fraud

VW Settlements Total $15 Billion, Company Required to Repurchase or Modify Falsely-Marketed Diesel Vehicles, Provide Restitution and Address Environmental Harms; AG Healey Leads Multistate Coalition in Obtaining More than $570 Million for States

BOSTON – In the wake of admissions that Volkswagen installed software to cheat emissions tests performed on its diesel vehicles, Attorney General Maura Healey today announced a multistate settlement requiring Volkswagen to pay more than $570 million for violating state laws prohibiting unfair or deceptive trade practices by marketing, selling and leasing diesel vehicles equipped with illegal and undisclosed defeat device software. This is part of $15 billion in total obligations Volkswagen has to consumers and government.

The multistate agreement is part of a series of state and federal settlements that will provide cash payments to affected consumers, require Volkswagen to buy back or modify certain VW and Audi 2.0-liter diesel vehicles, and prohibit Volkswagen from engaging in future unfair or deceptive acts and practices in connection with its dealings with consumers and regulators.

"Volkswagen's contempt for the law and fraud on thousands of consumers in Massachusetts and across the country were startling in their scope and brazenness," AG Healey said. "Today's settlements mark the beginning of our efforts to hold Volkswagen accountable for the harm it caused, with a robust consumer compensation program, critical funding for environmental mitigation projects, and a serious civil penalty for Volkswagen's widespread false advertising of so-called clean diesel."

Today's coordinated settlements resolve consumer protection claims raised by a multistate coalition co-led by AG Healey and attorneys general in Connecticut, New York, Oregon, Tennessee, and Washington, and joined by 37 other states against Volkswagen AG, Audi AG, and Volkswagen Group of America, Inc., Porsche AG and Porsche Cars, North America, Inc. – collectively referred to as Volkswagen. They also resolve actions against Volkswagen brought by the United States Environmental Protection Agency (EPA) and Department of Justice (DOJ), the Federal Trade Commission (FTC), California and car owners in private class action suits.

The attorneys generals' investigation confirmed that Volkswagen sold more than 570,000 2.0- and 3.0-liter diesel vehicles in the United States equipped with "defeat device" software intended to circumvent applicable emissions standards for certain air pollutants, and actively concealed the existence of the defeat device from regulators and the public. Volkswagen made false statements to consumers in their marketing and advertising, misrepresenting the cars as environmentally friendly or "green" and that the cars were compliant with federal and state emissions standards, when, in fact, Volkswagen knew the vehicles emitted harmful nitrogen oxides (NO_x) at rates many times higher than the law permitted.

"With the Environmental Mitigation Fund, the Commonwealth will be able to reduce NO_x emissions that contribute to ozone exceedances or 'smog' by addressing diesel vehicles and engines to be replaced or repowered with clean technologies," said Commissioner Martin Suuberg of the Massachusetts Department of Environmental Protection. "The ZEV commitment will also fund electric vehicle charging infrastructure, which is critical to meeting our goals under the Global Warming Solutions Act."

Under the settlements, Volkswagen is required to implement a restitution and recall program for more than 475,000 owners and lessees of 2.0-liter diesel vehicles, of the model year 2009 through 2015 at a maximum cost of just over $10 billion. This includes more than 12,500 vehicles registered in Massachusetts.

Once the consumer program is approved by the court, affected Volkswagen owners will receive restitution payment ranging from at least $5,100 to a potential maximum of $10,000 and a choice between:

- A **buy back** of the vehicle (based on their value in September 2015 before the emissions-cheating scandal was disclosed); or
- A **modification** to the vehicle developed by Volkswagen to reduce NO_x emissions that is acceptable to regulators. Owners will still be eligible to choose a buyback in the event regulators do not approve an appropriate modification. Owners who choose the modification option would also receive an Extended Emission Warranty and a Lemon Law-type remedy to protect against the possibility that the modification causes subsequent problems.

The consumer program also provides benefits and restitution for lessees (restitution and a no-penalty lease termination option) and prior owners who sold their Volkswagen (50 percent of the restitution available to owners). Additional components of today's settlements include:

- **Environmental Mitigation Fund**: Volkswagen will pay $2.7 billion into a trust to support environmental programs throughout the country to reduce emissions of NO_x. This fund, also subject to court approval, is intended to mitigate the total, lifetime excess NO_x emissions from the 2.0-liter diesel vehicles identified below. Under the terms of the mitigation trust, Massachusetts is eligible to receive nearly $70 million to fund eligible mitigation projects.
- **Additional Payment to the States**: In addition to consumer restitution, Volkswagen will pay to the states more than $1,000 per car for repeated violations of state consumer protection laws, amounting to more than $570 million nationwide. This amount includes more than $20 million for Massachusetts.
- **Zero Emission Vehicles**: Volkswagen has committed to investing $2 billion over the next 10 years for the development of non-polluting cars, or Zero Emission Vehicles (ZEV), and supporting infrastructure.
- **Preservation of Environmental Claims**: Today's settlement by state attorneys general preserves all claims under state environmental laws, and Massachusetts maintains the right to seek additional penalties from Volkswagen for its violations of environmental and emissions testing laws and regulations.

Volkswagen will also pay $20 million to the states for their costs in investigating this matter and to establish a fund that state attorneys general can utilize for future training and initiatives, including investigations concerning emissions violations, automobile compliance, and consumer protection.

The full details of the consumer restitution and recall program will be available online at VWCourtSettlement.com and through the Federal Trade Commission's website, www.ftc.gov/VWSettlement. Consumers can also call 1-844-98-CLAIM or visit the Attorney General's website at www.mass.gov/ago/vw for more information.

Since the Volkswagen defeat device scandal was disclosed in September 2015, a group of state attorneys general has conducted a detailed investigation into Volkswagen's wrongdoing. That multistate investigation was led for Massachusetts by Gillian Feiner, Chief of AG Healey's False Claims Division, First Assistant Attorney General Christopher Barry-Smith, Christophe Courchesne, Chief of AG Healey's Environmental Protection Division, Peter Mulcahy, Assistant Attorney General in AG Healey's Environmental Protection Division, and former Assistant Attorney General Fred Augenstern of Environmental Protection Division, with critical assistance from Assistant Attorneys General Diane Barry and Gary Klein, along with Attorney Meghan Mackenzie, and Paralegal Krista Roche.

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EXHIBIT 20

NY A.G. Schneiderman, Massachusetts A.G. Healey, Maryland A.G. Frosh Announce Suits Against Volkswagen, Audi And Porsche Alleging They Knowingly Sold Over 53,000 Illegally Polluting Cars And Suvs, Violating State Environmental Laws

Cover-Up Of "Defeat Devices" Was Allegedly Orchestrated And Approved At The Highest Levels Of The Company, Up To And Including Former CEO Martin Winterkorn; German Parent Companies Volkswagen AG And Audi AG Directed US Subsidiaries To Submit False Documents, Make False Claims To New York, Massachusetts And Maryland Authorities

Numerous Employees, Tipped Off By A Senior In-House Lawyer In Germany, Also Destroyed Incriminating Documents, Lawsuits Allege

NEW YORK – New York Attorney General Eric T. Schneiderman, Massachusetts Attorney General Maura Healey and Maryland Attorney General Brian Frosh announced lawsuits today against Volkswagen AG and its affiliates Audi AG and Porsche AG, as well as their American subsidiaries, for the automakers' sale of diesel automobiles (including over 25,000 in New York, 15,000 in Massachusetts and 12,935 in Maryland) that were fitted with illegal "defeat devices" that concealed illegal amounts of harmful emissions these cars spewed– and then allegedly attempting to cover-up their behavior.

"The allegations against Volkswagen, Audi and Porsche reveal a culture of deeply-rooted corporate arrogance, combined with a conscious disregard for the rule of law and the protection of public health and the environment," **Attorney General Schneiderman** said. "These suits should serve as a siren in every corporate board room, that if any company engages in this type of calculated and systematic illegality, we will bring the full force of the law—and seek the stiffest possible sanctions—to protect our citizens."

"Volkswagen, Audi and Porsche defrauded thousands of Massachusetts consumers, polluted our air, and damaged our environment and then, to make matters worse, plotted a massive cover-up to mislead environmental regulators," **Attorney General Healey** said. "With today's action, we want to make clear to all auto manufacturers that violating laws designed to protect our environment and our public health is unacceptable and will be punished with significant penalties."

"Maryland has worked tirelessly, through Maryland's Healthy Air Act and Clean Cars Act, as well as stringent regulations adopted by the Department of the Environment, to clean our air," said **Attorney General Frosh**. "As our complaint sets out, Volkswagen, Audi and Porsche installed defeat devices in their cars to trick regulators and to deceive the public; they did so knowing that their conduct was illegal and their misconduct has hindered our efforts to clean the air and to clean the Chesapeake Bay. Their disregard for the health of our citizens and their disregard for our environment must be punished."

"These automobile manufacturers deliberately deceived the public into believing their cars met emissions standards when in fact they were excessively polluting New York's air," said **New York DEC Commissioner Basil Seggos**. "This corrupt behavior is unacceptable and it undermines our efforts to protect public health and

combat climate change. I applaud Attorney Generals Schneiderman and Healy for their important efforts to uphold the integrity of our clean air regulations."

"The emission rules are in place to protect public health and the environment," said **Martin Suuberg, Commisisoner at the Massachusetts Department of Environmental Protection (MassDEP)**. "This action underscores the serious nature of the violations."

"The air Marylanders now breathe is the cleanest it's been in decades, and we will not stand for Volkswagen's dirty tactics that undercut our environmental progress," said **Maryland Secretary of the Environment Ben Grumbles**. "The Hogan Administration is committed to reducing pollution from tailpipes and power plants and holding accountable those who threaten the health and well being of our communities and watersheds. Volkswagen must get its act in gear and pay the price for breaking some of the most stringent laws in the country protecting the waters, lands and lungs of Marylanders in the Chesapeake Bay region."

These lawsuits by the New York, Massachusetts and Maryland Attorneys General offices follow a nine-month long investigation by a multistate coalition of over 40 states and other jurisdictions, led by New York, Massachusetts, and four other states. New York State's Department of Environmental Conservation, Massachusetts's Department of Environmental Protection and Maryland's Department of the Environment provided important assistance with the investigation.

The complaints allege, in detail, a cover-up that Volkswagen and Audi allegedly managed for nearly a year-and-a-half. The cover-up followed a study by researchers at West Virginia University that alerted authorities in this country that these diesel cars emitted much more nitrogen oxides (NOx) when driven on the road than they did when undergoing emissions testing on test equipment used by the U.S. Environmental Protection Agency (EPA) and the California Air Resource Board (CARB) to test the amount of air pollutants emitted by automobiles.

These suits follow the car companies' partial settlements of claims for consumer relief and consumer deception penalties, as well as their agreement to establish a fund to mitigate the environmental damage caused by their admitted misconduct. Those earlier settlements did not resolve any of the claims for civil penalties that New York, Massachusetts and other states, as well as the EPA, may bring for the companies' flagrant violations of state and federal environmental laws and regulations, nor did the settlements cover all of the vehicles equipped with emission control defeat devices.

The lawsuits allege that, after the EPA and CARB contacted Volkswagen and Audi about the discrepancies revealed by the West Virginia University study -- which the companies fully knew were caused by their defeat devices – Audi and Volkswagen:

- Tried to cover up the problem through sham recalls that they knew would not meet the required standards;
- Repeatedly failed to disclose to regulators the true reason – the defeat devices – for the discrepancies; and
- Only confessed to the defeat devices when they knew the regulators had them pinned to the facts.

The lawsuits allege this cover-up was orchestrated and approved at the highest levels of the company, up to and including the former CEO, Martin Winterkorn.

Throughout this entire course of alleged illegal conduct, in which dozens of employees, officers and senior executives were involved, the investigation found no evidence that a single Volkswagen, Audi or Porsche employee came forward to blow the whistle.

As alleged in the complaints, Volkswagen's response to the scandal shows that the company has not reformed its corporate behavior. When the investigation was getting under way in late 2015, numerous employees, tipped off by a senior in-house lawyer in Germany, allegedly destroyed incriminating documents. Just last month, the Volkswagen Supervisory Board recommended a package of bonuses for the Management Board that presided over the cover-up totaling over $70 million, including generous severance pay to Mr. Winterkorn himself. That recommendation was overwhelmingly approved by the company's shareholders.

The Attorneys Generals' investigation also found evidence that the misconduct of Volkswagen and its Audi and Porsche subsidiaries in the production and sale of these automobiles has few parallels in corporate history.

Specifically, the complaint alleges, that:

- These three affiliated brands made a knowing decision to violate the laws of New York, Massachusetts, Maryland, and other states not just once, but over and over again. There was not just one defeat device that cheated on emissions tests, but six, with the first going back to Audi's European-market cars in the mid-2000's.

- Starting in 2008, Volkswagen and Audi, and later Porsche, began installing these defeat devices in several generations of US-market Volkswagen and Audi diesel engines that equipped over a dozen models, including flagship Audi luxury sedans and high-performance Porsche SUVs, with sales eventually totaling over 25,000 vehicles in New York State, 15,000 in Massachusetts, and 13,000 in Maryland before being pulled from sale last year.

- The defeat devices took the form of computer software designed to ensure that a vehicle's emissions system performed properly *only* during emissions testing. On the road, the defeat device switched off or scaled back the vehicles' emissions systems, with the result that the cars and SUVs emitted NOx – a harmful pollutant linked to numerous respiratory diseases – far above allowable limits, indeed up to 40 times those limits.

- Despite their reputations for engineering excellence, Volkswagen, Audi and Porsche resorted to the illegal defeat devices to enable them to equip their cars with shoddy emissions systems that in many cases would have broken down, without the defeat devices, in less than 50,000 miles, contrary to the durability assurances the automakers had falsely given to regulators.

- In other cases – for example, on the high-end V6 diesel engines that equipped the Porsche, Volkswagen and Audi SUVs and Audi luxury sedans, vehicles that use a urea-based liquid as part of the emissions control system – the automakers installed defeat devices to compensate for the companies' unwillingness either to make the tanks that hold urea large enough to properly serve the cars' emissions system, or to reduce the intervals

between urea refills in a manner they believed would turn off diesel car owners. In these vehicles, the defeat devices limited dosing of the urea-based liquid into the emissions system, again driving up harmful NOx emissions far past their legal limits.

- Volkswagen and Audi researched the laws in this country and previous enforcement cases before embarking on this course. They knew what they were going to do was illegal, and if caught they would face government enforcement and sanctions. They went ahead and did it anyway.

- As a result, the complaints allege that consumers in New York, Massachusetts, Maryland and around the country did not receive what they were sold – a "clean" "green" diesel car that the Volkswagen companies aggressively touted. Indeed, Volkswagen, Audi and Porsche expressly and repeatedly promised consumers that they could have the best of all worlds by purchasing a car or SUV with both outstanding power and excellent environmental performance – and charged high mark-ups on the bases of these claims – claims that Audi and Volkswagen knew to be blatantly false.

- As a further result, the complaints allege that thousands of excess tons of NOx were illegally spewed onto city and rural streets around the country, leaving many of residents at greater risk of asthma and other respiratory diseases, and driving up the formation of harmful ozone in the atmosphere. New York—in particular the New York City metropolitan area—has harmful levels of smog pollution, one of the main reasons the State adopted strict car emission standards to combat this problem. New York's complaint alleges that the companies' conduct has made it more difficult to clean up New York's air to levels that are adequate to protect public health. Massachusetts also experiences the harmful effects of smog: every year, the Department of Environmental Protection issues air quality alerts on numerous days because ozone levels make the air unhealthy to breathe. Maryland has recorded some of the highest ozone levels in the Eastern United States, and is subject to the perfect storm for ozone air pollution, where unique meteorology and geography line up with transported pollution from power plants in the west and local pollution from the south, primarily cars along the I-95 corridor.

Today's lawsuits make clear that substantial penalties must be imposed on the Volkswagen companies, above and beyond the amount they have to pay to make American consumers whole and redress the environmental harm they have caused.

The strongest message possible has to be sent: you cannot deliberately flout the laws of New York, Massachusetts, Maryland, and every other state, and not be severely penalized. Neither Volkswagen, nor any other car manufacturer, should ever again conclude that it can engage in this behavior as part of the cost of doing business.

New York Attorney General Schneiderman thanks the New York State Department of Environmental Conservation for its help in this matter. Massachusetts Attorney General Healey thanks the Massachusetts Department of Environmental Protection for its assistance. Maryland Attorney General Frosh thanks the Department of Environment for its assistance.

A copy of the New York complaint can be found here.

The New York case is being handled by Senior Enforcement Counsel David Nachman; Deputy Bureau Chief Lisa Burianek, Affirmative Litigation Section Chief Michael Myers, and Assistant Attorneys General John Turrettini, Brian Lusignan and Morgan Costello, Environmental Policy Advisor Peter Washburn and Chief Scientist Alan Belensz of the Environmental Protection Bureau; Assistant Attorney General Noah Popp of the Consumer Protection Bureau; Senior Trial Counsel David Ellenhorn; and with the assistance of Laura Sarli of the Investor Protection Bureau. The Environmental Protection Bureau is led by Bureau Chief Lemuel Srolovic and the Social Justice Division is led by Alvin Bragg.

The case is being handled in Massachusetts by Gillian Feiner, Chief of AG Healey's False Claims Division, First Assistant Attorney General Christopher Barry-Smith, Christophe Courchesne, Chief of AG Healey's Environmental Protection Division, Peter Mulcahy, Assistant Attorney General in AG Healey's Environmental Protection Division, with critical assistance from Assistant Attorneys General Diane Barry and Gary Klein, along with Attorney Meghan Mackenzie, and Paralegal Krista Roche.

The Maryland lawsuit is being handled by Assistant Attorney General Roberta James.

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A.G. Schneiderman Announces Indictment Of Political Consultant Steven Pigeon And Guilty Plea Of State Supreme Court Justice John A. Michalek

A.G. Schneiderman Announces Partial Multistate And Federal Settlements Of Up To $15 Billion With Volkswagen, Audi And Porsche, Including Unprecedented Relief For Defrauded New Yorkers

EXHIBIT 21

The New York Times | http://nyti.ms/29wlGka

U.S.

At a Cape Cod Landmark, a Strategic Retreat From the Ocean

By JESS BIDGOOD JULY 6, 2016

PROVINCETOWN, Mass. — It is a simple pleasure in a classic summertime locale: Pull a car between the stripes on the parking lot here, a ribbon of asphalt parallel to the water atop a sloped wall in the sand, and look right out over the beach, where one can see Cape Cod Bay meeting the Atlantic Ocean.

Here amid the unearthly dunes, Herring Cove Beach — and especially its north parking lot — draws locals from just down the road and travelers from hundreds of miles away, who might arrive in camper vans studded with American flags. Some come for a quick swim, others to watch the sublime sunsets, famous in New England because the beach faces west, not east.

But there is a problem, evident in the chunks of asphalt lying on the sand and the deep fissures in the lot, parts of which are so damaged that they are off limits to parking: The beach is eroding, and parts of this beloved spot, built in front of the dunes, not behind them, are slowly crumbling into the ocean.

"It's a nightmare," said Mary-Jo Avellar, 70, the town moderator and a pastry chef, who was sitting on the sand with a crossword puzzle on a recent sunny afternoon, gesturing to several feet of exposed revetment between the flat surface of the parking lot and the sand below. "This beach used to be pretty flat. It's been scoured out."

The result here at the Cape Cod National Seashore raises a practical dilemma in a setting meant to be a place to escape: how to react to rising seas and eroding coastlines as climate change looms for coastal communities across the nation. The decision here was to demolish the parking lot and construct a new one 125 feet behind it, allowing for a restored shoreline in front of it.

"We're retreating," said George E. Price Jr., the superintendent of the Cape Cod National Seashore, which is run by the National Park Service. Other facilities at the beach have already been rebuilt farther back from the water.

In many parts of the country, like New York, New Jersey and New Orleans, property-damaging storms, tidal surges and floods have been met with the urge to shore up and rebuild. Experts say the project at Herring Cove is a fairly rare example of the opposite approach, called "managed retreat," which involves moving away from the coastline. Mr. Price and many who use the beach here do not want to fight coastal change; they simply want to adapt to it.

"It reflects a sound planning approach that is regrettably uncommon so far," said Michael B. Gerrard, a professor at Columbia Law School and the director of the Sabin Center for Climate Change Law there.

"As sea-level rise advances," Mr. Gerrard added, the concept of managed retreat is "going to become increasingly important in large parts of the country."

Managed retreat comes in many forms, in addition to the physical movement of infrastructure: buyback programs, in which a government purchases vulnerable properties from private owners, or bans on new construction or hard armoring of the coast in areas susceptible to flooding or storm damage. But it is a wrenching decision, especially when private property is involved, and is politically difficult to carry out, or even to suggest. That makes the project at Herring Cove, and others on Cape Cod and around the country, all the more unusual.

"I think that could well serve as a model for what could happen elsewhere," Mr. Gerrard said. "However, it's easier in this circumstance, where privately owned property is not endangered or diminished in value. It becomes much more difficult when private property is at risk."

The majority of the nation's coasts are retreating, said Rob Thieler, a coastal geologist for the United States Geological Survey who is based in Woods Hole, Mass., and Cape Cod is home to vexing areas of erosion like Herring Cove. It is difficult, Mr. Thieler said, to know whether individual problems with coastal erosion result from sea-level rise due to climate change, natural environmental fluctuations or a series of damaging storms over the last few years, but this much is known:

"Given the forecast of future sea level rise over the next century and beyond, every problem that we have along the coast right now will only increase," Mr. Thieler said. "That, I think, ties back to why managed retreat, in places where you can employ it, is a good option."

Some New England towns have used state grant money to support resilience plans, like the relocation of a parking lot and retaining wall on Squibnocket Beach, in Chilmark on Martha's Vineyard. And, one day last week, a new parking lot, farther away from the water, was drying at Breakwater Beach, in Brewster, farther south on the Cape, part of a retreat project that had drawn passionate objections from neighbors who did not want to see it take away from an open park space near the water.

"Change is very difficult, especially when it's your favorite place in the world," said Chris Miller, the director of the town's department of natural resources.

At the moment, the Herring Cove parking lot is in a kind of limbo. The Park Service is in the midst of a $300,000 repair that will allow the lot to operate at about half capacity until officials get $3 million to move the lot back, which they hope to do in 2018.

For Don Robitaille, 84, a retired soda machine repairman who had driven his camper here from Maine for the contentment of sitting on a beach chair with a book of puzzles and an open view of the ocean, it was still a perfect getaway.

Some beachgoers worried the eventual relocation of the lot would change the experience of being there. But others in town, like Ms. Avellar, are merely frustrated that the big move is not happening sooner, and that tourists have flocked here only to find a mess.

"This is Provincetown's most important beach," Ms. Avellar said. "People just want to have them build something that's going to last for a while."

A version of this article appears in print on July 7, 2016, on page A9 of the New York edition with the headline: A Strategic Retreat From the Ocean at a Cape Cod Landmark.

Climate change could be even worse for Boston than previously thought

By David Abel | GLOBE STAFF JUNE 22, 2016

The consequences of climate change on Boston are expected to be far more calamitous than previous studies have suggested, a new report commissioned by the city says.

In the worst-case scenario, sea levels could rise more than 10 feet by the end of the century — nearly twice what was previously predicted — plunging about 30 percent of Boston under water. Temperatures in 2070 could exceed 90 degrees for 90 days a year, compared with an average of 11 days now.

And changes in precipitation could mean a 50 percent decline in annual snowfall, punctuated by more frequent heavy storms such as nor'easters.

The report, by scientists from the University of Massachusetts and other local universities, has raised concerns in City Hall just two weeks after Mayor Martin J. Walsh attended a climate summit in Beijing.

"The updated climate projections confirm that we must work together to take bold approaches to prepare Boston for the impacts of climate change," Walsh said in a statement.

The report, he said, is part of the city's effort to assess its vulnerability and to seek solutions. Next year, Boston will host the same climate conference that Walsh attended, with leaders from some 60 US and Chinese cities.

"We take climate change seriously, because we take the health and resilience of our city seriously," Walsh said. "We will continue to focus on using the best data to inform decisions and understand future investments."

The updated projections for Boston take into account new research that suggests the accelerating melt of the ice sheets covering Antarctica will have a disproportionate impact on cities along the East Coast.

As ice melts on the South Pole, the resulting gravitational pull on the ocean, as well as the gradual sinking of land in the Northeast, means that Boston and other nearby communities are likely to experience about 25 percent higher increase of sea levels than other parts of the planet, according to the new research.

"Boston is a bull's-eye for more sea level damage," said Rob DeConto, a climate scientist at UMass Amherst who helped develop the new Antarctica research and who co-wrote the new Boston report. "We have a lot to fear from Antarctica."

If high levels of greenhouse gases continue to be released into the atmosphere, the seas around Boston could rise as much as 10.5 feet by 2100 and 37 feet by 2200, according to the report.

Even under optimistic forecasts that factor in significant cuts to carbon emissions, sea levels are projected to rise as much as 6 feet by 2100 and nearly 12 feet by 2200.

Such a dramatic rise would be devastating to Boston. Faneuil Hall, for example, now floods at 5 feet and Copley Square at 7.5 feet above today's high tides, city officials say.

"If seas rise that much, the New England coastline would look very different from space," said DeConto, referring to the worst-case scenarios. "There would be huge impacts on our ecosystems, and we would be talking about a managed retreat from the coastline rather than engineering a way to harden our coastline."

The most comprehensive previous projection of the impact of climate change on Boston was released two years ago in a report by the federal government called the National Climate Assessment.

That report found that the Northeast was already bearing the brunt of climate change, with prolonged heat waves, torrential rains, and increased flooding, which it attributed to the burning of fossil fuels and other human activity.

It noted that over the past century average temperatures in Northeastern states have risen by 2 degrees Fahrenheit. It also found that the region's precipitation has risen by more than 10 percent, while the worst storms have brought significantly more precipitation.

But the federal report forecast that seas would rise, under the worst case, between 3 and 6 feet by 2100 and projected that the southern states in the Northeast, by midcentury, would experience about 60 additional days per year of temperatures above 90 degrees.

The new report, submitted to city officials this month, raises the stakes for policymakers to curb emissions, said Julie Wormser, vice president for policy and planning at Boston Harbor Now, a local advocacy group.

"In a word, this is awful," she said of the new projections. "It's so stark it's hard to wrap one's head around."

She noted that the increased storm surge and high tides could bring significant damage and flooding to the city far sooner than the end of the century, just as Tropical Storm Sandy devastated parts of coastal New Jersey and New York in 2012.

Comments

"We will need to come together to prevent Boston's people and places from flooding where we can, and learn to live with more water where we can't," she said.

On the bright side, Carl Spector, commissioner of the city's Environment Department, said the worst scenarios remain unlikely and a historic agreement reached last year in Paris offered hope that nations around the world could work together to reduce emissions.

But he said the new data about Boston underscore why the city has to consider taking action in the coming years to build barriers and other defenses against the rising seas, revise its building codes, and find other ways to adapt to the changing climate.

"We know even relatively small amounts of sea level rise affect us," he said. "All the models we're seeing are concerning."

David Abel can be reached at dabel@globe.com. Follow him on Twitter @davabel.

EXHIBIT 22

Climate Change 2014
Synthesis Report
Summary for Policymakers

SPM

Introduction

This Synthesis Report is based on the reports of the three Working Groups of the Intergovernmental Panel on Climate Change (IPCC), including relevant Special Reports. It provides an integrated view of climate change as the final part of the IPCC's Fifth Assessment Report (AR5).

This summary follows the structure of the longer report which addresses the following topics: Observed changes and their causes; Future climate change, risks and impacts; Future pathways for adaptation, mitigation and sustainable development; Adaptation and mitigation.

In the Synthesis Report, the certainty in key assessment findings is communicated as in the Working Group Reports and Special Reports. It is based on the author teams' evaluations of underlying scientific understanding and is expressed as a qualitative level of confidence (from *very low* to *very high*) and, when possible, probabilistically with a quantified likelihood (from *exceptionally unlikely* to *virtually certain*)[1]. Where appropriate, findings are also formulated as statements of fact without using uncertainty qualifiers.

This report includes information relevant to Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC).

SPM 1. Observed Changes and their Causes

Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems. *{1}*

SPM 1.1 Observed changes in the climate system

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen. *{1.1}*

Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was *likely* the warmest 30-year period of the last 1400 years in the Northern Hemisphere, where such assessment is possible (*medium confidence*). The globally averaged combined land and ocean surface temperature data as calculated by a linear trend show a warming of 0.85 [0.65 to 1.06] °C[2] over the period 1880 to 2012, when multiple independently produced datasets exist (Figure SPM.1a). *{1.1.1, Figure 1.1}*

In addition to robust multi-decadal warming, the globally averaged surface temperature exhibits substantial decadal and interannual variability (Figure SPM.1a). Due to this natural variability, trends based on short records are very sensitive to the beginning and end dates and do not in general reflect long-term climate trends. As one example, the rate of warming over

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[1] Each finding is grounded in an evaluation of underlying evidence and agreement. In many cases, a synthesis of evidence and agreement supports an assignment of confidence. The summary terms for evidence are: limited, medium or robust. For agreement, they are low, medium or high. A level of confidence is expressed using five qualifiers: very low, low, medium, high and very high, and typeset in italics, e.g., *medium confidence*. The following terms have been used to indicate the assessed likelihood of an outcome or a result: virtually certain 99–100% probability, very likely 90–100%, likely 66–100%, about as likely as not 33–66%, unlikely 0–33%, very unlikely 0–10%, exceptionally unlikely 0–1%. Additional terms (extremely likely 95–100%, more likely than not >50–100%, more unlikely than likely 0–<50%, extremely unlikely 0–5%) may also be used when appropriate. Assessed likelihood is typeset in italics, e.g., *very likely*. See for more details: Mastrandrea, M.D., C.B. Field, T.F. Stocker, O. Edenhofer, K.L. Ebi, D.J. Frame, H. Held, E. Kriegler, K.J. Mach, P.R. Matschoss, G.-K. Plattner, G.W. Yohe and F.W. Zwiers, 2010: Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties, Intergovernmental Panel on Climate Change (IPCC), Geneva, Switzerland, 4 pp.

[2] Ranges in square brackets or following '±' are expected to have a 90% likelihood of including the value that is being estimated, unless otherwise stated.

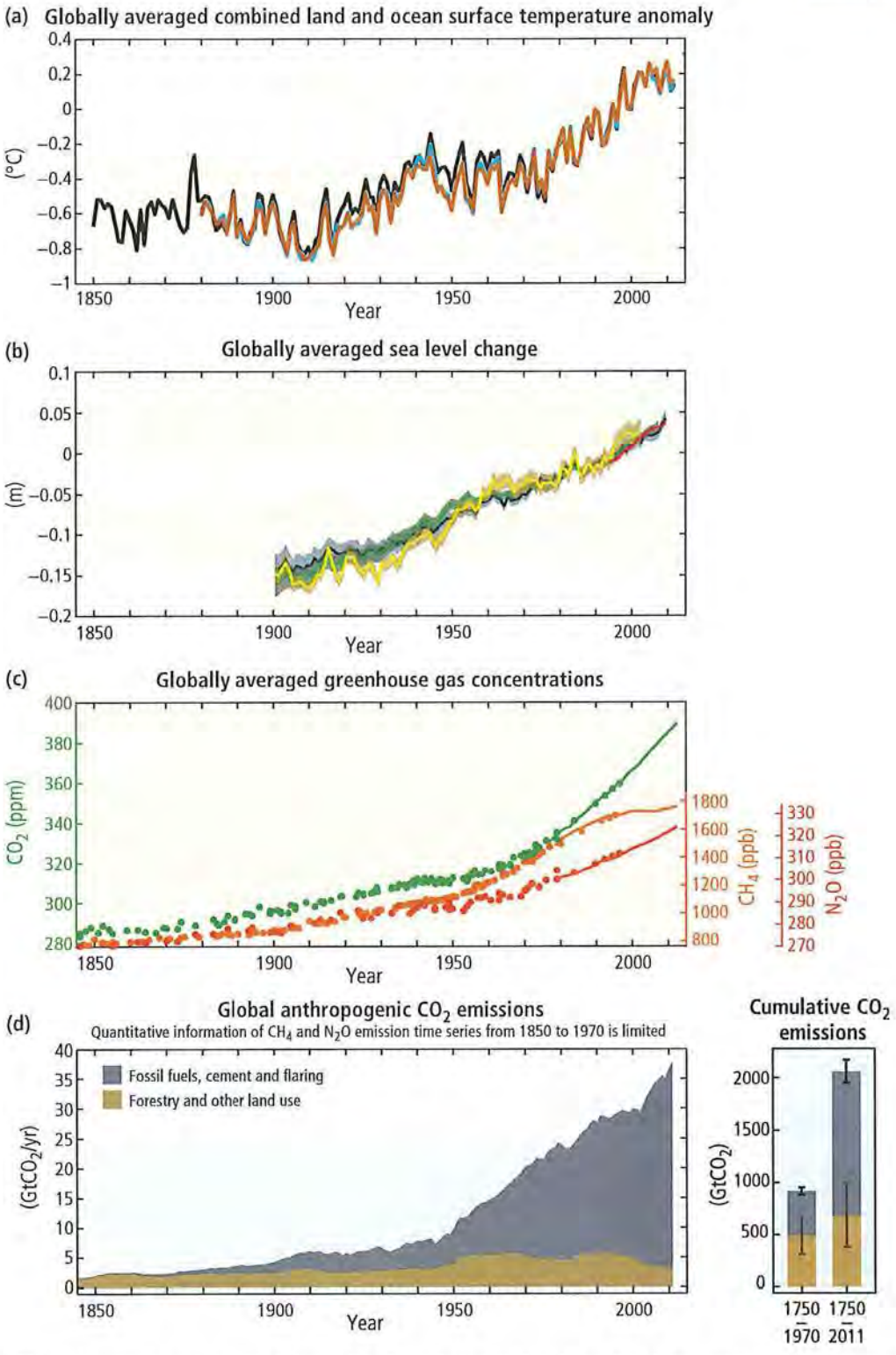

Figure SPM.1 | The complex relationship between the observations (panels a, b, c, yellow background) and the emissions (panel d, light blue background) is addressed in Section 1.2 and Topic 1. Observations and other indicators of a changing global climate system. Observations: **(a)** Annually and globally averaged combined land and ocean surface temperature anomalies relative to the average over the period 1986 to 2005. Colours indicate different data sets. **(b)** Annually and globally averaged sea level change relative to the average over the period 1986 to 2005 in the longest-running dataset. Colours indicate different data sets. All datasets are aligned to have the same value in 1993, the first year of satellite altimetry data (red). Where assessed, uncertainties are indicated by coloured shading. **(c)** Atmospheric concentrations of the greenhouse gases carbon dioxide (CO_2, green), methane (CH_4, orange) and nitrous oxide (N_2O, red) determined from ice core data (dots) and from direct atmospheric measurements (lines). Indicators: **(d)** Global anthropogenic CO_2 emissions from forestry and other land use as well as from burning of fossil fuel, cement production and flaring. Cumulative emissions of CO_2 from these sources and their uncertainties are shown as bars and whiskers, respectively, on the right hand side. The global effects of the accumulation of CH_4 and N_2O emissions are shown in panel c. Greenhouse gas emission data from 1970 to 2010 are shown in Figure SPM.2. *[Figures 1.1, 1.3, 1.5]*

the past 15 years (1998–2012; 0.05 [–0.05 to 0.15] °C per decade), which begins with a strong El Niño, is smaller than the rate calculated since 1951 (1951–2012; 0.12 [0.08 to 0.14] °C per decade). *{1.1.1, Box 1.1}*

Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (*high confidence*), with only about 1% stored in the atmosphere. On a global scale, the ocean warming is largest near the surface, and the upper 75 m warmed by 0.11 [0.09 to 0.13] °C per decade over the period 1971 to 2010. It is *virtually certain* that the upper ocean (0–700 m) warmed from 1971 to 2010, and it *likely* warmed between the 1870s and 1971. *{1.1.2, Figure 1.2}*

Averaged over the mid-latitude land areas of the Northern Hemisphere, precipitation has increased since 1901 (*medium confidence* before and *high confidence* after 1951). For other latitudes, area-averaged long-term positive or negative trends have *low confidence*. Observations of changes in ocean surface salinity also provide indirect evidence for changes in the global water cycle over the ocean (*medium confidence*). It is *very likely* that regions of high salinity, where evaporation dominates, have become more saline, while regions of low salinity, where precipitation dominates, have become fresher since the 1950s. *{1.1.1, 1.1.2}*

Since the beginning of the industrial era, oceanic uptake of CO_2 has resulted in acidification of the ocean; the pH of ocean surface water has decreased by 0.1 (*high confidence*), corresponding to a 26% increase in acidity, measured as hydrogen ion concentration. *{1.1.2}*

Over the period 1992 to 2011, the Greenland and Antarctic ice sheets have been losing mass (*high confidence*), *likely* at a larger rate over 2002 to 2011. Glaciers have continued to shrink almost worldwide (*high confidence*). Northern Hemisphere spring snow cover has continued to decrease in extent (*high confidence*). There is *high confidence* that permafrost temperatures have increased in most regions since the early 1980s in response to increased surface temperature and changing snow cover. *{1.1.3}*

The annual mean Arctic sea-ice extent decreased over the period 1979 to 2012, with a rate that was *very likely* in the range 3.5 to 4.1% per decade. Arctic sea-ice extent has decreased in every season and in every successive decade since 1979, with the most rapid decrease in decadal mean extent in summer (*high confidence*). It is *very likely* that the annual mean Antarctic sea-ice extent increased in the range of 1.2 to 1.8% per decade between 1979 and 2012. However, there is *high confidence* that there are strong regional differences in Antarctica, with extent increasing in some regions and decreasing in others. *{1.1.3, Figure 1.1}*

Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] m (Figure SPM.1b). The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (*high confidence*). *{1.1.4, Figure 1.1}*

SPM 1.2 Causes of climate change

Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century. *{1.2, 1.3.1}*

Anthropogenic greenhouse gas (GHG) emissions since the pre-industrial era have driven large increases in the atmospheric concentrations of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) (Figure SPM.1c). Between 1750 and 2011, cumulative anthropogenic CO_2 emissions to the atmosphere were 2040 ± 310 $GtCO_2$. About 40% of these emissions have remained in the atmosphere (880 ± 35 $GtCO_2$); the rest was removed from the atmosphere and stored on land (in plants and soils) and in the ocean. The ocean has absorbed about 30% of the emitted anthropogenic CO_2, causing ocean acidification. About half of the anthropogenic CO_2 emissions between 1750 and 2011 have occurred in the last 40 years (*high confidence*) (Figure SPM.1d). *{1.2.1, 1.2.2}*

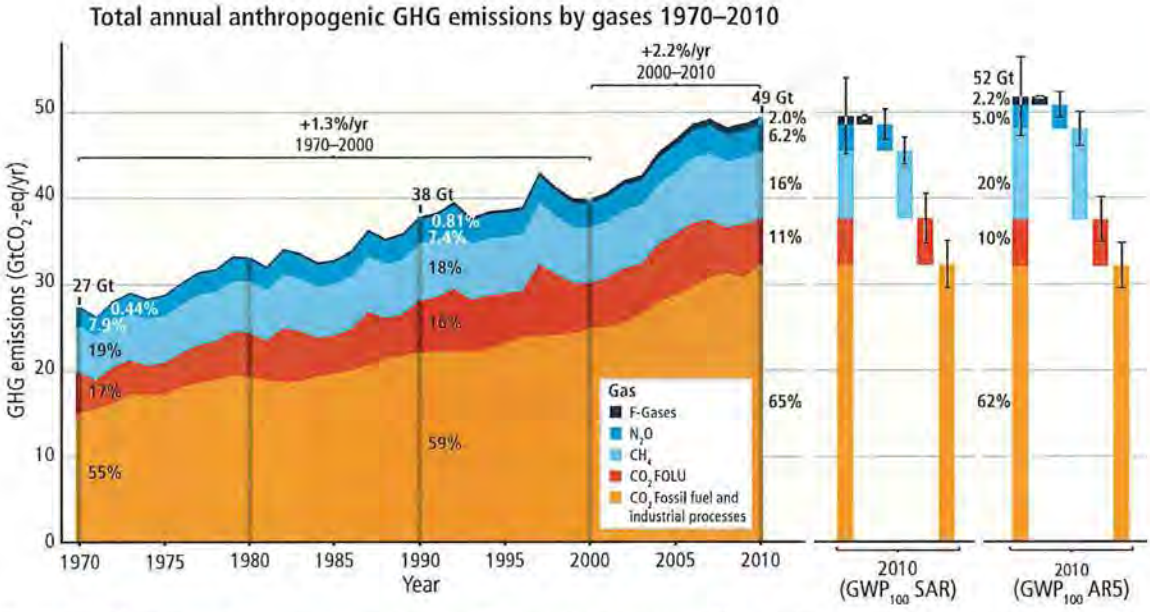

Figure SPM.2 | Total annual anthropogenic greenhouse gas (GHG) emissions (gigatonne of CO_2-equivalent per year, $GtCO_2$-eq/yr) for the period 1970 to 2010 by gases: CO_2 from fossil fuel combustion and industrial processes; CO_2 from Forestry and Other Land Use (FOLU); methane (CH_4); nitrous oxide (N_2O); fluorinated gases covered under the Kyoto Protocol (F-gases). Right hand side shows 2010 emissions, using alternatively CO_2-equivalent emission weightings based on IPCC Second Assessment Report (SAR) and AR5 values. Unless otherwise stated, CO_2-equivalent emissions in this report include the basket of Kyoto gases (CO_2, CH_4, N_2O as well as F-gases) calculated based on 100-year Global Warming Potential (GWP_{100}) values from the SAR (see Glossary). Using the most recent GWP_{100} values from the AR5 (right-hand bars) would result in higher total annual GHG emissions (52 $GtCO_2$-eq/yr) from an increased contribution of methane, but does not change the long-term trend significantly. *{Figure 1.6, Box 3.2}*

Total anthropogenic GHG emissions have continued to increase over 1970 to 2010 with larger absolute increases between 2000 and 2010, despite a growing number of climate change mitigation policies. Anthropogenic GHG emissions in 2010 have reached 49 ± 4.5 $GtCO_2$-eq/yr [3]. Emissions of CO_2 from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emissions increase from 1970 to 2010, with a similar percentage contribution for the increase during the period 2000 to 2010 (*high confidence*) (Figure SPM.2). Globally, economic and population growth continued to be the most important drivers of increases in CO_2 emissions from fossil fuel combustion. The contribution of population growth between 2000 and 2010 remained roughly identical to the previous three decades, while the contribution of economic growth has risen sharply. Increased use of coal has reversed the long-standing trend of gradual decarbonization (i.e., reducing the carbon intensity of energy) of the world's energy supply (*high confidence*). *{1.2.2}*

The evidence for human influence on the climate system has grown since the IPCC Fourth Assessment Report (AR4). It is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcings together. The best estimate of the human-induced contribution to warming is similar to the observed warming over this period (Figure SPM.3). Anthropogenic forcings have *likely* made a substantial contribution to surface temperature increases since the mid-20th century over every continental region except Antarctica[4]. Anthropogenic influences have *likely* affected the global water cycle since 1960 and contributed to the retreat of glaciers since the 1960s and to the increased surface melting of the Greenland ice sheet since 1993. Anthropogenic influences have *very likely* contributed to Arctic sea-ice loss since 1979 and have *very likely* made a substantial contribution to increases in global upper ocean heat content (0–700 m) and to global mean sea level rise observed since the 1970s. *{1.3, Figure 1.10}*

[3] Greenhouse gas emissions are quantified as CO_2-equivalent ($GtCO_2$-eq) emissions using weightings based on the 100-year Global Warming Potentials, using IPCC Second Assessment Report values unless otherwise stated. *{Box 3.2}*

[4] For Antarctica, large observational uncertainties result in *low confidence* that anthropogenic forcings have contributed to the observed warming averaged over available stations.

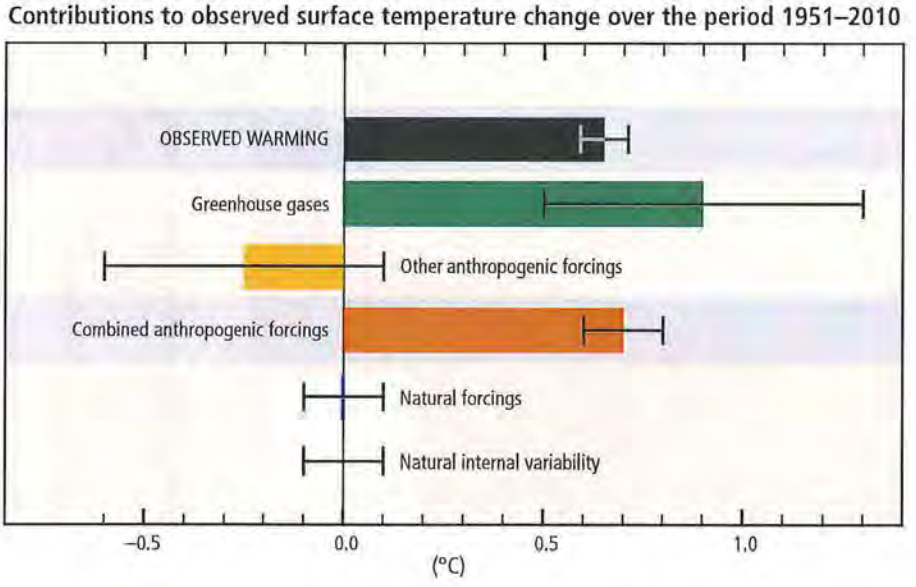

Figure SPM.3 | Assessed *likely* ranges (whiskers) and their mid-points (bars) for warming trends over the 1951–2010 period from well-mixed greenhouse gases, other anthropogenic forcings (including the cooling effect of aerosols and the effect of land use change), combined anthropogenic forcings, natural forcings and natural internal climate variability (which is the element of climate variability that arises spontaneously within the climate system even in the absence of forcings). The observed surface temperature change is shown in black, with the 5 to 95% uncertainty range due to observational uncertainty. The attributed warming ranges (colours) are based on observations combined with climate model simulations, in order to estimate the contribution of an individual external forcing to the observed warming. The contribution from the combined anthropogenic forcings can be estimated with less uncertainty than the contributions from greenhouse gases and from other anthropogenic forcings separately. This is because these two contributions partially compensate, resulting in a combined signal that is better constrained by observations. *{Figure 1.9}*

SPM 1.3 Impacts of climate change

In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to changing climate. *{1.3.2}*

Evidence of observed climate change impacts is strongest and most comprehensive for natural systems. In many regions, changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality (*medium confidence*). Many terrestrial, freshwater and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances and species interactions in response to ongoing climate change (*high confidence*). Some impacts on human systems have also been attributed to climate change, with a major or minor contribution of climate change distinguishable from other influences (Figure SPM.4). Assessment of many studies covering a wide range of regions and crops shows that negative impacts of climate change on crop yields have been more common than positive impacts (*high confidence*). Some impacts of ocean acidification on marine organisms have been attributed to human influence (*medium confidence*). *{1.3.2}*

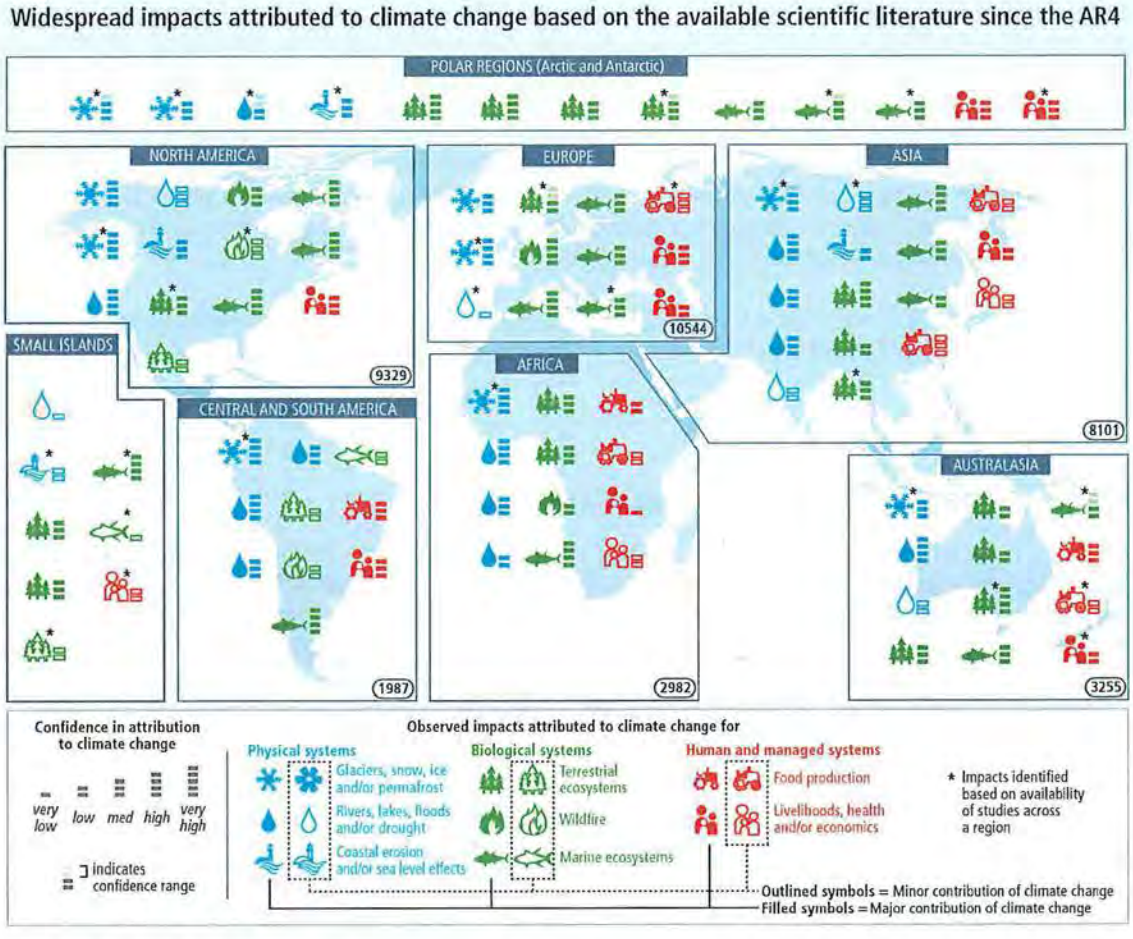

Figure SPM.4 | Based on the available scientific literature since the IPCC Fourth Assessment Report (AR4), there are substantially more impacts in recent decades now attributed to climate change. Attribution requires defined scientific evidence on the role of climate change. Absence from the map of additional impacts attributed to climate change does not imply that such impacts have not occurred. The publications supporting attributed impacts reflect a growing knowledge base, but publications are still limited for many regions, systems and processes, highlighting gaps in data and studies. Symbols indicate categories of attributed impacts, the relative contribution of climate change (major or minor) to the observed impact and confidence in attribution. Each symbol refers to one or more entries in WGII Table SPM.A1, grouping related regional-scale impacts. Numbers in ovals indicate regional totals of climate change publications from 2001 to 2010, based on the Scopus bibliographic database for publications in English with individual countries mentioned in title, abstract or key words (as of July 2011). These numbers provide an overall measure of the available scientific literature on climate change across regions; they do not indicate the number of publications supporting attribution of climate change impacts in each region. Studies for polar regions and small islands are grouped with neighbouring continental regions. The inclusion of publications for assessment of attribution followed IPCC scientific evidence criteria defined in WGII Chapter 18. Publications considered in the attribution analyses come from a broader range of literature assessed in the WGII AR5. See WGII Table SPM.A1 for descriptions of the attributed impacts. *{Figure 1.11}*

SPM 1.4 Extreme events

Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions. *{1.4}*

It is *very likely* that the number of cold days and nights has decreased and the number of warm days and nights has increased on the global scale. It is *likely* that the frequency of heat waves has increased in large parts of Europe, Asia and Australia. It is

very likely that human influence has contributed to the observed global scale changes in the frequency and intensity of daily temperature extremes since the mid-20th century. It is *likely* that human influence has more than doubled the probability of occurrence of heat waves in some locations. There is *medium confidence* that the observed warming has increased heat-related human mortality and decreased cold-related human mortality in some regions. *{1.4}*

There are *likely* more land regions where the number of heavy precipitation events has increased than where it has decreased. Recent detection of increasing trends in extreme precipitation and discharge in some catchments implies greater risks of flooding at regional scale (*medium confidence*). It is *likely* that extreme sea levels (for example, as experienced in storm surges) have increased since 1970, being mainly a result of rising mean sea level. *{1.4}*

Impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability (*very high confidence*). *{1.4}*

SPM 2. Future Climate Changes, Risks and Impacts

Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks. *{2}*

SPM 2.1 Key drivers of future climate

Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond. Projections of greenhouse gas emissions vary over a wide range, depending on both socio-economic development and climate policy. *{2.1}*

Anthropogenic GHG emissions are mainly driven by population size, economic activity, lifestyle, energy use, land use patterns, technology and climate policy. The Representative Concentration Pathways (RCPs), which are used for making projections based on these factors, describe four different 21st century pathways of GHG emissions and atmospheric concentrations, air pollutant emissions and land use. The RCPs include a stringent mitigation scenario (RCP2.6), two intermediate scenarios (RCP4.5 and RCP6.0) and one scenario with very high GHG emissions (RCP8.5). Scenarios without additional efforts to constrain emissions ('baseline scenarios') lead to pathways ranging between RCP6.0 and RCP8.5 (Figure SPM.5a). RCP2.6 is representative of a scenario that aims to keep global warming *likely* below 2°C above pre-industrial temperatures. The RCPs are consistent with the wide range of scenarios in the literature as assessed by WGIII[5]. *{2.1, Box 2.2, 4.3}*

Multiple lines of evidence indicate a strong, consistent, almost linear relationship between cumulative CO_2 emissions and projected global temperature change to the year 2100 in both the RCPs and the wider set of mitigation scenarios analysed in WGIII (Figure SPM.5b). Any given level of warming is associated with a range of cumulative CO_2 emissions[6], and therefore, e.g., higher emissions in earlier decades imply lower emissions later. *{2.2.5, Table 2.2}*

[5] Roughly 300 baseline scenarios and 900 mitigation scenarios are categorized by CO_2-equivalent concentration (CO_2-eq) by 2100. The CO_2-eq includes the forcing due to all GHGs (including halogenated gases and tropospheric ozone), aerosols and albedo change.

[6] Quantification of this range of CO_2 emissions requires taking into account non-CO_2 drivers.

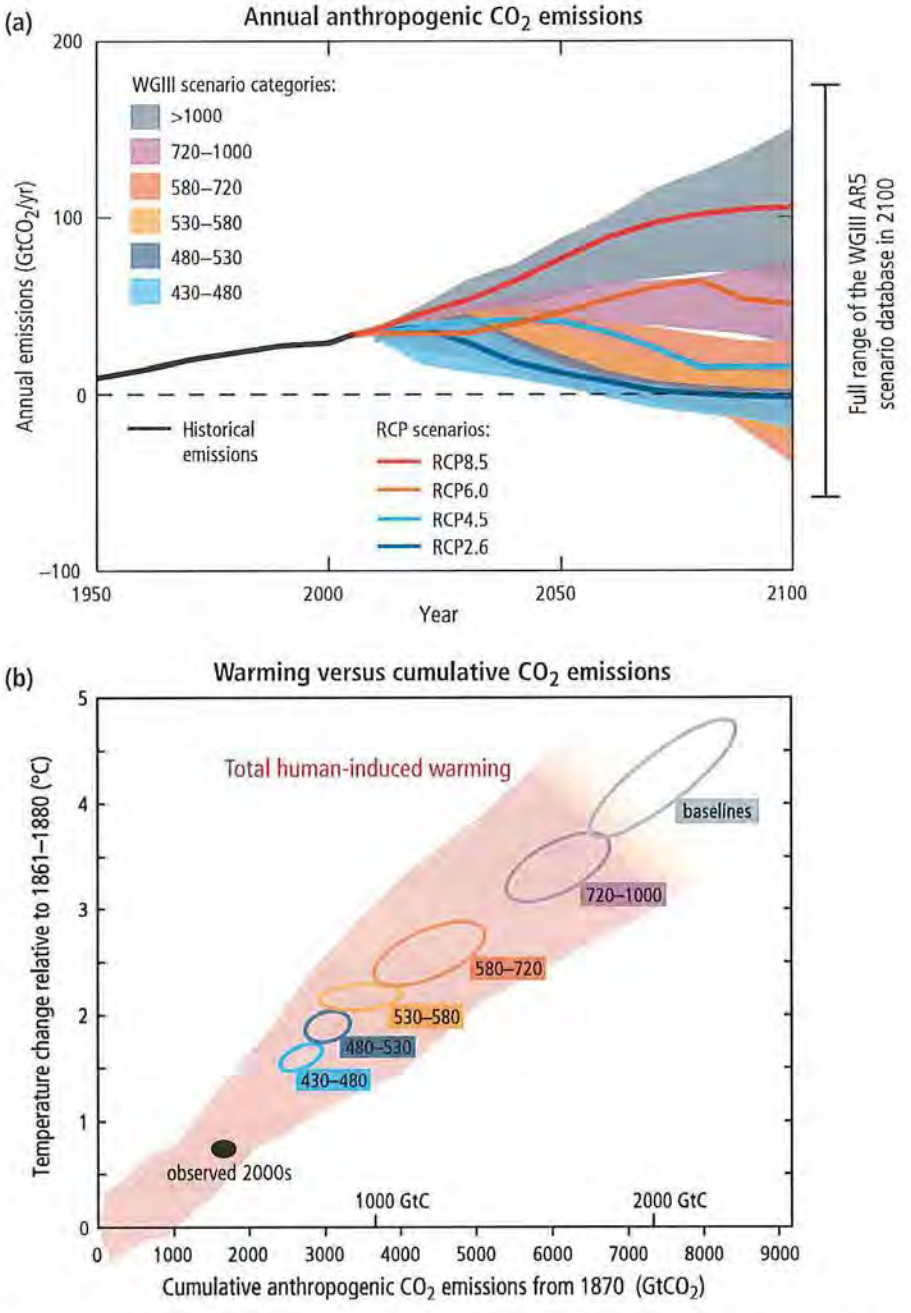

Figure SPM.5 | **(a)** Emissions of carbon dioxide (CO_2) alone in the Representative Concentration Pathways (RCPs) (lines) and the associated scenario categories used in WGIII (coloured areas show 5 to 95% range). The WGIII scenario categories summarize the wide range of emission scenarios published in the scientific literature and are defined on the basis of CO_2-eq concentration levels (in ppm) in 2100. The time series of other greenhouse gas emissions are shown in Box 2.2, Figure 1. **(b)** Global mean surface temperature increase at the time global CO_2 emissions reach a given net cumulative total, plotted as a function of that total, from various lines of evidence. Coloured plume shows the spread of past and future projections from a hierarchy of climate-carbon cycle models driven by historical emissions and the four RCPs over all times out to 2100, and fades with the decreasing number of available models. Ellipses show total anthropogenic warming in 2100 versus cumulative CO_2 emissions from 1870 to 2100 from a simple climate model (median climate response) under the scenario categories used in WGIII. The width of the ellipses in terms of temperature is caused by the impact of different scenarios for non-CO_2 climate drivers. The filled black ellipse shows observed emissions to 2005 and observed temperatures in the decade 2000–2009 with associated uncertainties. *{Box 2.2, Figure 1; Figure 2.3}*

Multi-model results show that limiting total human-induced warming to less than 2°C relative to the period 1861–1880 with a probability of >66%[7] would require cumulative CO_2 emissions from all anthropogenic sources since 1870 to remain below about 2900 $GtCO_2$ (with a range of 2550 to 3150 $GtCO_2$ depending on non-CO_2 drivers). About 1900 $GtCO_2$[8] had already been emitted by 2011. For additional context see Table 2.2. *{2.2.5}*

SPM 2.2 Projected changes in the climate system

Surface temperature is projected to rise over the 21st century under all assessed emission scenarios. It is *very likely* that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions. The ocean will continue to warm and acidify, and global mean sea level to rise. *{2.2}*

The projected changes in Section SPM 2.2 are for 2081–2100 relative to 1986–2005, unless otherwise indicated.

Future climate will depend on committed warming caused by past anthropogenic emissions, as well as future anthropogenic emissions and natural climate variability. The global mean surface temperature change for the period 2016–2035 relative to 1986–2005 is similar for the four RCPs and will *likely* be in the range 0.3°C to 0.7°C (*medium confidence*). This assumes that there will be no major volcanic eruptions or changes in some natural sources (e.g., CH_4 and N_2O), or unexpected changes in total solar irradiance. By mid-21st century, the magnitude of the projected climate change is substantially affected by the choice of emissions scenario. *{2.2.1, Table 2.1}*

Relative to 1850–1900, global surface temperature change for the end of the 21st century (2081–2100) is projected to *likely* exceed 1.5°C for RCP4.5, RCP6.0 and RCP8.5 (*high confidence*). Warming is *likely* to exceed 2°C for RCP6.0 and RCP8.5 (*high confidence*), *more likely than not* to exceed 2°C for RCP4.5 (*medium confidence*), but *unlikely* to exceed 2°C for RCP2.6 (*medium confidence*). *{2.2.1}*

The increase of global mean surface temperature by the end of the 21st century (2081–2100) relative to 1986–2005 is *likely* to be 0.3°C to 1.7°C under RCP2.6, 1.1°C to 2.6°C under RCP4.5, 1.4°C to 3.1°C under RCP6.0 and 2.6°C to 4.8°C under RCP8.5[9]. The Arctic region will continue to warm more rapidly than the global mean (Figure SPM.6a, Figure SPM.7a). *{2.2.1, Figure 2.1, Figure 2.2, Table 2.1}*

It is *virtually certain* that there will be more frequent hot and fewer cold temperature extremes over most land areas on daily and seasonal timescales, as global mean surface temperature increases. It is *very likely* that heat waves will occur with a higher frequency and longer duration. Occasional cold winter extremes will continue to occur. *{2.2.1}*

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7 Corresponding figures for limiting warming to 2°C with a probability of >50% and >33% are 3000 $GtCO_2$ (range of 2900 to 3200 $GtCO_2$) and 3300 $GtCO_2$ (range of 2950 to 3800 $GtCO_2$) respectively. Higher or lower temperature limits would imply larger or lower cumulative emissions respectively.

8 This corresponds to about two thirds of the 2900 $GtCO_2$ that would limit warming to less than 2°C with a probability of >66%; to about 63% of the total amount of 3000 $GtCO_2$ that would limit warming to less than 2°C with a probability of >50%; and to about 58% of the total amount of 3300 $GtCO_2$ that would limit warming to less than 2°C with a probability of >33%.

9 The period 1986–2005 is approximately 0.61 [0.55 to 0.67] °C warmer than 1850–1900. *{2.2.1}*

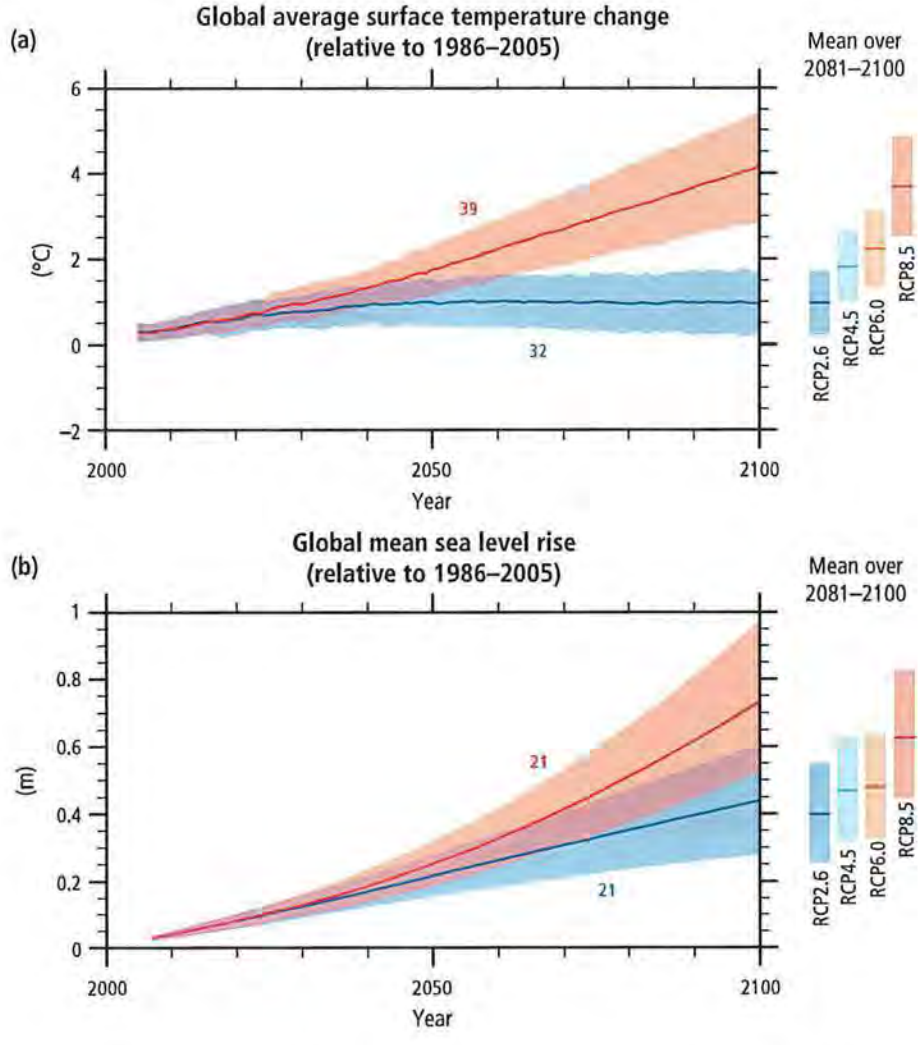

Figure SPM.6 | Global average surface temperature change **(a)** and global mean sea level rise[10] **(b)** from 2006 to 2100 as determined by multi-model simulations. All changes are relative to 1986–2005. Time series of projections and a measure of uncertainty (shading) are shown for scenarios RCP2.6 (blue) and RCP8.5 (red). The mean and associated uncertainties averaged over 2081–2100 are given for all RCP scenarios as coloured vertical bars at the right hand side of each panel. The number of Coupled Model Intercomparison Project Phase 5 (CMIP5) models used to calculate the multi-model mean is indicated. *{2.2, Figure 2.1}*

Changes in precipitation will not be uniform. The high latitudes and the equatorial Pacific are *likely* to experience an increase in annual mean precipitation under the RCP8.5 scenario. In many mid-latitude and subtropical dry regions, mean precipitation will *likely* decrease, while in many mid-latitude wet regions, mean precipitation will *likely* increase under the RCP8.5 scenario (Figure SPM.7b). Extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will *very likely* become more intense and more frequent. *{2.2.2, Figure 2.2}*

The global ocean will continue to warm during the 21st century, with the strongest warming projected for the surface in tropical and Northern Hemisphere subtropical regions (Figure SPM.7a). *{2.2.3, Figure 2.2}*

[10] Based on current understanding (from observations, physical understanding and modelling), only the collapse of marine-based sectors of the Antarctic ice sheet, if initiated, could cause global mean sea level to rise substantially above the *likely* range during the 21st century. There is *medium confidence* that this additional contribution would not exceed several tenths of a meter of sea level rise during the 21st century.

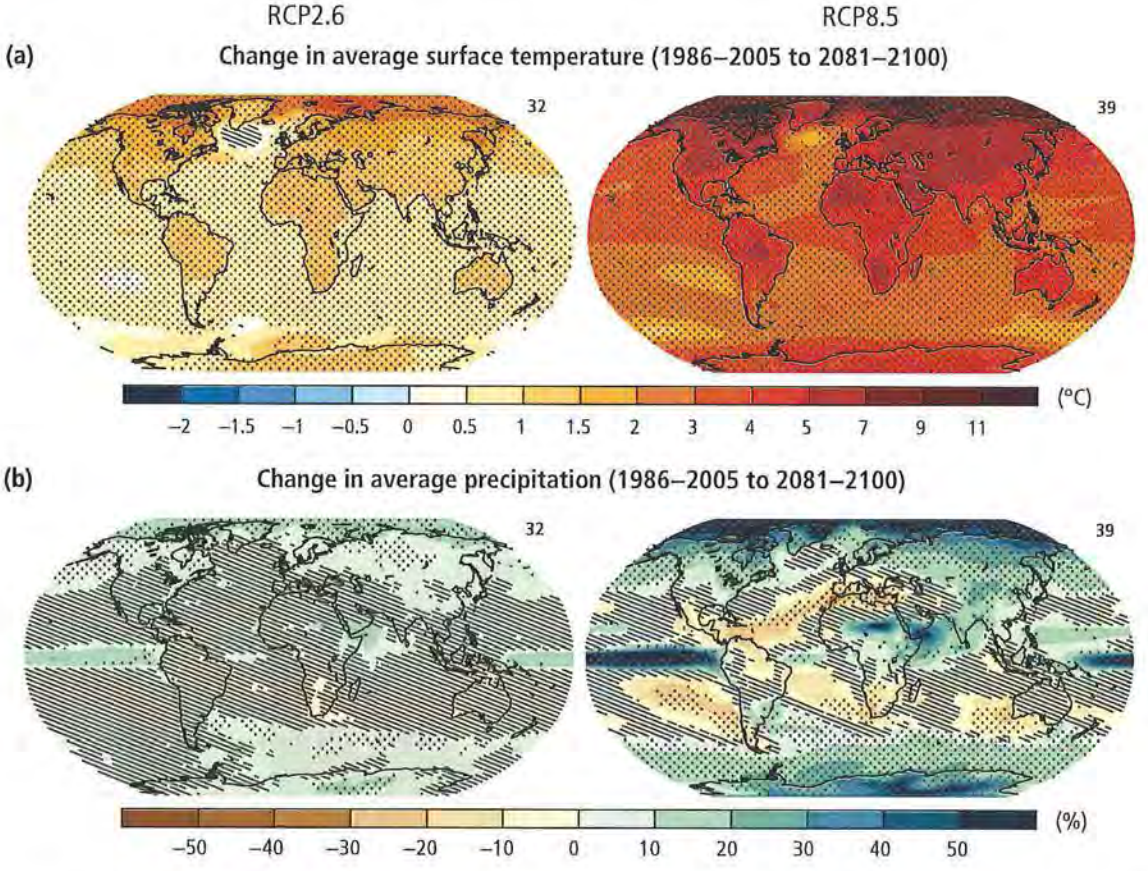

Figure SPM.7 | Change in average surface temperature **(a)** and change in average precipitation **(b)** based on multi-model mean projections for 2081–2100 relative to 1986–2005 under the RCP2.6 (left) and RCP8.5 (right) scenarios. The number of models used to calculate the multi-model mean is indicated in the upper right corner of each panel. Stippling (i.e., dots) shows regions where the projected change is large compared to natural internal variability and where at least 90% of models agree on the sign of change. Hatching (i.e., diagonal lines) shows regions where the projected change is less than one standard deviation of the natural internal variability. *{2.2, Figure 2.2}*

Earth System Models project a global increase in ocean acidification for all RCP scenarios by the end of the 21st century, with a slow recovery after mid-century under RCP2.6. The decrease in surface ocean pH is in the range of 0.06 to 0.07 (15 to 17% increase in acidity) for RCP2.6, 0.14 to 0.15 (38 to 41%) for RCP4.5, 0.20 to 0.21 (58 to 62%) for RCP6.0 and 0.30 to 0.32 (100 to 109%) for RCP8.5. *{2.2.4, Figure 2.1}*

Year-round reductions in Arctic sea ice are projected for all RCP scenarios. A nearly ice-free[11] Arctic Ocean in the summer sea-ice minimum in September before mid-century is *likely* for RCP8.5[12] (*medium confidence*). *{2.2.3, Figure 2.1}*

It is *virtually certain* that near-surface permafrost extent at high northern latitudes will be reduced as global mean surface temperature increases, with the area of permafrost near the surface (upper 3.5 m) projected to decrease by 37% (RCP2.6) to 81% (RCP8.5) for the multi-model average (*medium confidence*). *{2.2.3}*

The global glacier volume, excluding glaciers on the periphery of Antarctica (and excluding the Greenland and Antarctic ice sheets), is projected to decrease by 15 to 55% for RCP2.6 and by 35 to 85% for RCP8.5 (*medium confidence*). *{2.2.3}*

[11] When sea-ice extent is less than one million km² for at least five consecutive years.

[12] Based on an assessment of the subset of models that most closely reproduce the climatological mean state and 1979–2012 trend of the Arctic sea-ice extent.

There has been significant improvement in understanding and projection of sea level change since the AR4. Global mean sea level rise will continue during the 21st century, *very likely* at a faster rate than observed from 1971 to 2010. For the period 2081–2100 relative to 1986–2005, the rise will *likely* be in the ranges of 0.26 to 0.55 m for RCP2.6, and of 0.45 to 0.82 m for RCP8.5 (*medium confidence*)[10] (Figure SPM.6b). Sea level rise will not be uniform across regions. By the end of the 21st century, it is *very likely* that sea level will rise in more than about 95% of the ocean area. About 70% of the coastlines worldwide are projected to experience a sea level change within ±20% of the global mean. *{2.2.3}*

SPM 2.3 Future risks and impacts caused by a changing climate

Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development. *{2.3}*

Risk of climate-related impacts results from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems, including their ability to adapt. Rising rates and magnitudes of warming and other changes in the climate system, accompanied by ocean acidification, increase the risk of severe, pervasive and in some cases irreversible detrimental impacts. Some risks are particularly relevant for individual regions (Figure SPM.8), while others are global. The overall risks of future climate change impacts can be reduced by limiting the rate and magnitude of climate change, including ocean acidification. The precise levels of climate change sufficient to trigger abrupt and irreversible change remain uncertain, but the risk associated with crossing such thresholds increases with rising temperature (*medium confidence*). For risk assessment, it is important to evaluate the widest possible range of impacts, including low-probability outcomes with large consequences. *{1.5, 2.3, 2.4, 3.3, Box Introduction.1, Box 2.3, Box 2.4}*

A large fraction of species faces increased extinction risk due to climate change during and beyond the 21st century, especially as climate change interacts with other stressors (*high confidence*). Most plant species cannot naturally shift their geographical ranges sufficiently fast to keep up with current and high projected rates of climate change in most landscapes; most small mammals and freshwater molluscs will not be able to keep up at the rates projected under RCP4.5 and above in flat landscapes in this century (*high confidence*). Future risk is indicated to be high by the observation that natural global climate change at rates lower than current anthropogenic climate change caused significant ecosystem shifts and species extinctions during the past millions of years. Marine organisms will face progressively lower oxygen levels and high rates and magnitudes of ocean acidification (*high confidence*), with associated risks exacerbated by rising ocean temperature extremes (*medium confidence*). Coral reefs and polar ecosystems are highly vulnerable. Coastal systems and low-lying areas are at risk from sea level rise, which will continue for centuries even if the global mean temperature is stabilized (*high confidence*). *{2.3, 2.4, Figure 2.5}*

Climate change is projected to undermine food security (Figure SPM.9). Due to projected climate change by the mid-21st century and beyond, global marine species redistribution and marine biodiversity reduction in sensitive regions will challenge the sustained provision of fisheries productivity and other ecosystem services (*high confidence*). For wheat, rice and maize in tropical and temperate regions, climate change without adaptation is projected to negatively impact production for local temperature increases of 2°C or more above late 20th century levels, although individual locations may benefit (*medium confidence*). Global temperature increases of ~4°C or more[13] above late 20th century levels, combined with increasing food demand, would pose large risks to food security globally (*high confidence*). Climate change is projected to reduce renewable surface water and groundwater resources in most dry subtropical regions (*robust evidence, high agreement*), intensifying competition for water among sectors (*limited evidence, medium agreement*). *{2.3.1, 2.3.2}*

[13] Projected warming averaged over land is larger than global average warming for all RCP scenarios for the period 2081–2100 relative to 1986–2005. For regional projections, see Figure SPM.7. *{2.2}*

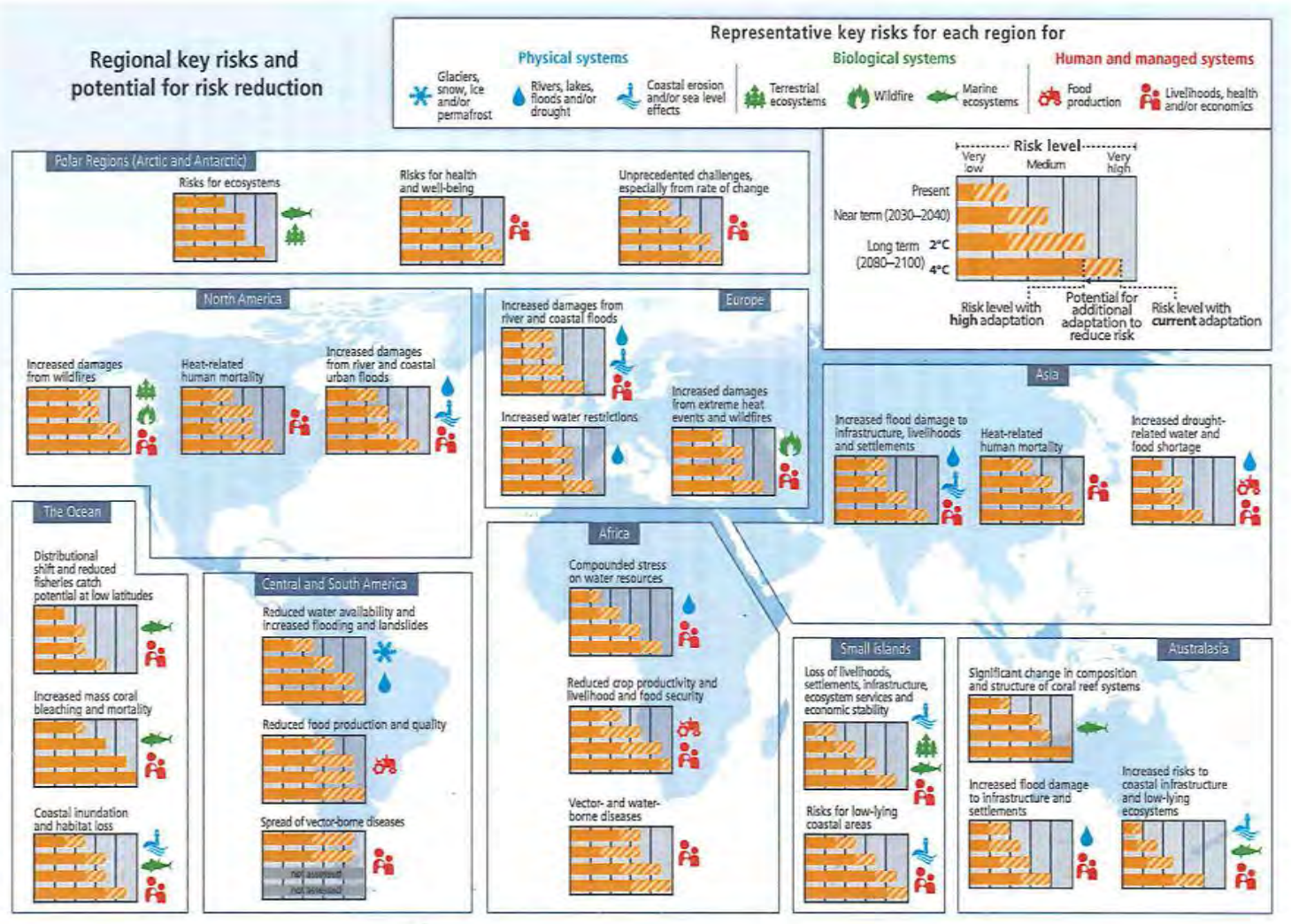

Figure SPM.8 | Representative key risks[14] for each region, including the potential for risk reduction through adaptation and mitigation, as well as limits to adaptation. Each key risk is assessed as very low, low, medium, high or very high. Risk levels are presented for three time frames: present, near term (here, for 2030–2040) and long term (here, for 2080–2100). In the near term, projected levels of global mean temperature increase do not diverge substantially across different emission scenarios. For the long term, risk levels are presented for two possible futures (2°C and 4°C global mean temperature increase above pre-industrial levels). For each timeframe, risk levels are indicated for a continuation of current adaptation and assuming high levels of current or future adaptation. Risk levels are not necessarily comparable, especially across regions. *{Figure 2.4}*

[14] Identification of key risks was based on expert judgment using the following specific criteria: large magnitude, high probability or irreversibility of impacts; timing of impacts; persistent vulnerability or exposure contributing to risks; or limited potential to reduce risks through adaptation or mitigation.

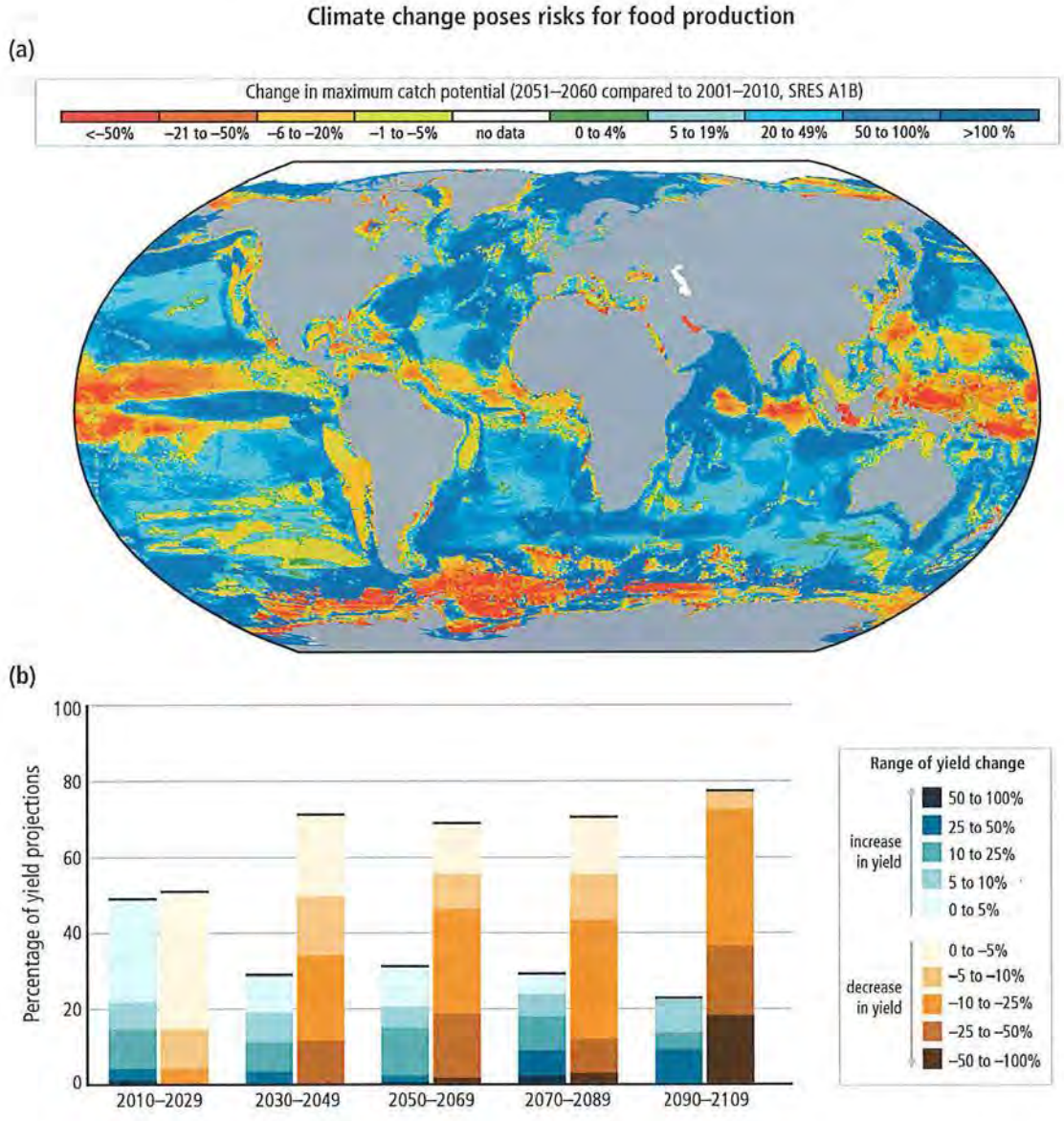

Figure SPM.9 | **(a)** Projected global redistribution of maximum catch potential of ~1000 exploited marine fish and invertebrate species. Projections compare the 10-year averages 2001–2010 and 2051–2060 using ocean conditions based on a single climate model under a moderate to high warming scenario, without analysis of potential impacts of overfishing or ocean acidification. **(b)** Summary of projected changes in crop yields (mostly wheat, maize, rice and soy), due to climate change over the 21st century. Data for each timeframe sum to 100%, indicating the percentage of projections showing yield increases versus decreases. The figure includes projections (based on 1090 data points) for different emission scenarios, for tropical and temperate regions and for adaptation and no-adaptation cases combined. Changes in crop yields are relative to late 20th century levels. *{Figure 2.6a, Figure 2.7}*

Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist (*very high confidence*). Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change (*high confidence*). By 2100 for RCP8.5, the combination of high temperature and humidity in some areas for parts of the year is expected to compromise common human activities, including growing food and working outdoors (*high confidence*). *{2.3.2}*

In urban areas climate change is projected to increase risks for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges (*very high confidence*). These risks are amplified for those lacking essential infrastructure and services or living in exposed areas. *{2.3.2}*

Rural areas are expected to experience major impacts on water availability and supply, food security, infrastructure and agricultural incomes, including shifts in the production areas of food and non-food crops around the world (*high confidence*). *{2.3.2}*

Aggregate economic losses accelerate with increasing temperature (*limited evidence, high agreement*), but global economic impacts from climate change are currently difficult to estimate. From a poverty perspective, climate change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger (*medium confidence*). International dimensions such as trade and relations among states are also important for understanding the risks of climate change at regional scales. *{2.3.2}*

Climate change is projected to increase displacement of people (*medium evidence, high agreement*). Populations that lack the resources for planned migration experience higher exposure to extreme weather events, particularly in developing countries with low income. Climate change can indirectly increase risks of violent conflicts by amplifying well-documented drivers of these conflicts such as poverty and economic shocks (*medium confidence*). *{2.3.2}*

SPM 2.4 Climate change beyond 2100, irreversibility and abrupt changes

Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of greenhouse gases are stopped. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases. *{2.4}*

Warming will continue beyond 2100 under all RCP scenarios except RCP2.6. Surface temperatures will remain approximately constant at elevated levels for many centuries after a complete cessation of net anthropogenic CO_2 emissions. A large fraction of anthropogenic climate change resulting from CO_2 emissions is irreversible on a multi-century to millennial timescale, except in the case of a large net removal of CO_2 from the atmosphere over a sustained period. *{2.4, Figure 2.8}*

Stabilization of global average surface temperature does not imply stabilization for all aspects of the climate system. Shifting biomes, soil carbon, ice sheets, ocean temperatures and associated sea level rise all have their own intrinsic long timescales which will result in changes lasting hundreds to thousands of years after global surface temperature is stabilized. *{2.1, 2.4}*

There is *high confidence* that ocean acidification will increase for centuries if CO_2 emissions continue, and will strongly affect marine ecosystems. *{2.4}*

It is *virtually certain* that global mean sea level rise will continue for many centuries beyond 2100, with the amount of rise dependent on future emissions. The threshold for the loss of the Greenland ice sheet over a millennium or more, and an associated sea level rise of up to 7 m, is greater than about 1°C (*low confidence*) but less than about 4°C (*medium confidence*) of global warming with respect to pre-industrial temperatures. Abrupt and irreversible ice loss from the Antarctic ice sheet is possible, but current evidence and understanding is insufficient to make a quantitative assessment. *{2.4}*

Magnitudes and rates of climate change associated with medium- to high-emission scenarios pose an increased risk of abrupt and irreversible regional-scale change in the composition, structure and function of marine, terrestrial and freshwater ecosystems, including wetlands (*medium confidence*). A reduction in permafrost extent is *virtually certain* with continued rise in global temperatures. *{2.4}*

SPM 3. Future Pathways for Adaptation, Mitigation and Sustainable Development

Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change. Substantial emissions reductions over the next few decades can reduce climate risks in the 21st century and beyond, increase prospects for effective adaptation, reduce the costs and challenges of mitigation in the longer term and contribute to climate-resilient pathways for sustainable development. *{3.2, 3.3, 3.4}*

SPM 3.1 Foundations of decision-making about climate change

Effective decision-making to limit climate change and its effects can be informed by a wide range of analytical approaches for evaluating expected risks and benefits, recognizing the importance of governance, ethical dimensions, equity, value judgments, economic assessments and diverse perceptions and responses to risk and uncertainty. *{3.1}*

Sustainable development and equity provide a basis for assessing climate policies. Limiting the effects of climate change is necessary to achieve sustainable development and equity, including poverty eradication. Countries' past and future contributions to the accumulation of GHGs in the atmosphere are different, and countries also face varying challenges and circumstances and have different capacities to address mitigation and adaptation. Mitigation and adaptation raise issues of equity, justice and fairness. Many of those most vulnerable to climate change have contributed and contribute little to GHG emissions. Delaying mitigation shifts burdens from the present to the future, and insufficient adaptation responses to emerging impacts are already eroding the basis for sustainable development. Comprehensive strategies in response to climate change that are consistent with sustainable development take into account the co-benefits, adverse side effects and risks that may arise from both adaptation and mitigation options. *{3.1, 3.5, Box 3.4}*

The design of climate policy is influenced by how individuals and organizations perceive risks and uncertainties and take them into account. Methods of valuation from economic, social and ethical analysis are available to assist decision-making. These methods can take account of a wide range of possible impacts, including low-probability outcomes with large consequences. But they cannot identify a single best balance between mitigation, adaptation and residual climate impacts. *{3.1}*

Climate change has the characteristics of a collective action problem at the global scale, because most GHGs accumulate over time and mix globally, and emissions by any agent (e.g., individual, community, company, country) affect other agents. Effective mitigation will not be achieved if individual agents advance their own interests independently. Cooperative responses, including international cooperation, are therefore required to effectively mitigate GHG emissions and address other climate change issues. The effectiveness of adaptation can be enhanced through complementary actions across levels, including international cooperation. The evidence suggests that outcomes seen as equitable can lead to more effective cooperation. *{3.1}*

SPM 3.2 Climate change risks reduced by mitigation and adaptation

Without additional mitigation efforts beyond those in place today, and even with adaptation, warming by the end of the 21st century will lead to high to very high risk of severe, widespread and irreversible impacts globally (*high confidence*). Mitigation involves some level of co-benefits and of risks due to adverse side effects, but these risks do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change, increasing the benefits from near-term mitigation efforts. *{3.2, 3.4}*

Mitigation and adaptation are complementary approaches for reducing risks of climate change impacts over different timescales (*high confidence*). Mitigation, in the near term and through the century, can substantially reduce climate change

impacts in the latter decades of the 21st century and beyond. Benefits from adaptation can already be realized in addressing current risks, and can be realized in the future for addressing emerging risks. *{3.2, 4.5}*

Five Reasons For Concern (RFCs) aggregate climate change risks and illustrate the implications of warming and of adaptation limits for people, economies and ecosystems across sectors and regions. The five RFCs are associated with: (1) Unique and threatened systems, (2) Extreme weather events, (3) Distribution of impacts, (4) Global aggregate impacts, and (5) Large-scale singular events. In this report, the RFCs provide information relevant to Article 2 of UNFCCC. *{Box 2.4}*

Without additional mitigation efforts beyond those in place today, and even with adaptation, warming by the end of the 21st century will lead to high to very high risk of severe, widespread and irreversible impacts globally (*high confidence*) (Figure SPM.10). In most scenarios without additional mitigation efforts (those with 2100 atmospheric concentrations

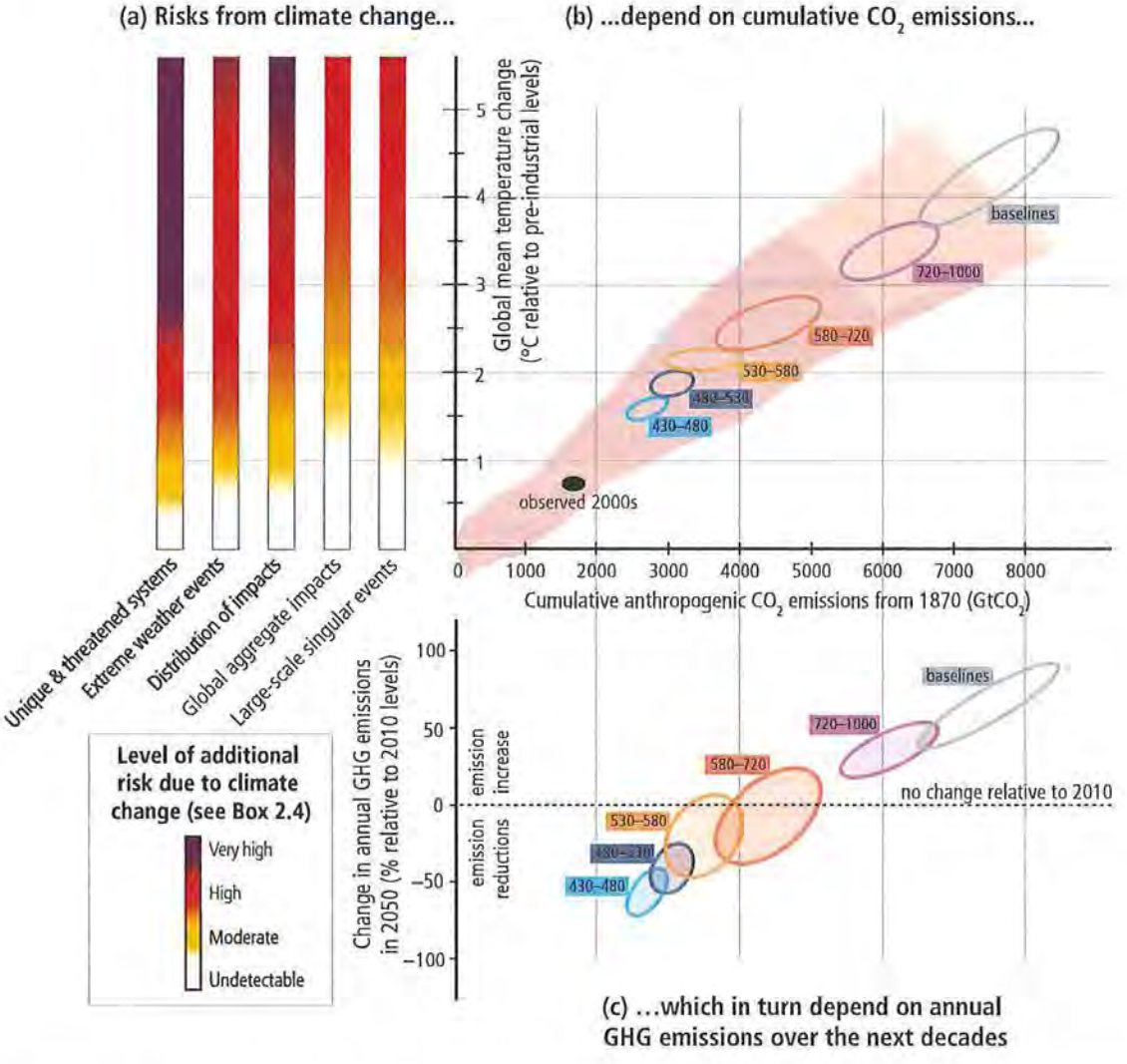

Figure SPM.10 | The relationship between risks from climate change, temperature change, cumulative carbon dioxide (CO_2) emissions and changes in annual greenhouse gas (GHG) emissions by 2050. Limiting risks across Reasons For Concern **(a)** would imply a limit for cumulative emissions of CO_2 **(b)** which would constrain annual GHG emissions over the next few decades **(c)**. **Panel a** reproduces the five Reasons For Concern *{Box 2.4}*. **Panel b** links temperature changes to cumulative CO_2 emissions (in $GtCO_2$) from 1870. They are based on Coupled Model Intercomparison Project Phase 5 (CMIP5) simulations (pink plume) and on a simple climate model (median climate response in 2100), for the baselines and five mitigation scenario categories (six ellipses). Details are provided in Figure SPM.5. **Panel c** shows the relationship between the cumulative CO_2 emissions (in $GtCO_2$) of the scenario categories and their associated change in annual GHG emissions by 2050, expressed in percentage change (in percent $GtCO_2$-eq per year) relative to 2010. The ellipses correspond to the same scenario categories as in Panel b, and are built with a similar method (see details in Figure SPM.5). *{Figure 3.1}*

>1000 ppm CO_2-eq), warming is *more likely than not* to exceed 4°C above pre-industrial levels by 2100 (Table SPM.1). The risks associated with temperatures at or above 4°C include substantial species extinction, global and regional food insecurity, consequential constraints on common human activities and limited potential for adaptation in some cases (*high confidence*). Some risks of climate change, such as risks to unique and threatened systems and risks associated with extreme weather events, are moderate to high at temperatures 1°C to 2°C above pre-industrial levels. *{2.3, Figure 2.5, 3.2, 3.4, Box 2.4, Table SPM.1}*

Substantial cuts in GHG emissions over the next few decades can substantially reduce risks of climate change by limiting warming in the second half of the 21st century and beyond. Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond. Limiting risks across RFCs would imply a limit for cumulative emissions of CO_2. Such a limit would require that global net emissions of CO_2 eventually decrease to zero and would constrain annual emissions over the next few decades (Figure SPM.10) (*high confidence*). But some risks from climate damages are unavoidable, even with mitigation and adaptation. *{2.2.5, 3.2, 3.4}*

Mitigation involves some level of co-benefits and risks, but these risks do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change. Inertia in the economic and climate system and the possibility of irreversible impacts from climate change increase the benefits from near-term mitigation efforts (*high confidence*). Delays in additional mitigation or constraints on technological options increase the longer-term mitigation costs to hold climate change risks at a given level (Table SPM.2). *{3.2, 3.4}*

SPM 3.3 Characteristics of adaptation pathways

Adaptation can reduce the risks of climate change impacts, but there are limits to its effectiveness, especially with greater magnitudes and rates of climate change. Taking a longer-term perspective, in the context of sustainable development, increases the likelihood that more immediate adaptation actions will also enhance future options and preparedness. *{3.3}*

Adaptation can contribute to the well-being of populations, the security of assets and the maintenance of ecosystem goods, functions and services now and in the future. Adaptation is place- and context-specific (*high confidence*). A first step towards adaptation to future climate change is reducing vulnerability and exposure to present climate variability (*high confidence*). Integration of adaptation into planning, including policy design, and decision-making can promote synergies with development and disaster risk reduction. Building adaptive capacity is crucial for effective selection and implementation of adaptation options (*robust evidence, high agreement*). *{3.3}*

Adaptation planning and implementation can be enhanced through complementary actions across levels, from individuals to governments (*high confidence*). National governments can coordinate adaptation efforts of local and sub-national governments, for example by protecting vulnerable groups, by supporting economic diversification and by providing information, policy and legal frameworks and financial support (*robust evidence, high agreement*). Local government and the private sector are increasingly recognized as critical to progress in adaptation, given their roles in scaling up adaptation of communities, households and civil society and in managing risk information and financing (*medium evidence, high agreement*). *{3.3}*

Adaptation planning and implementation at all levels of governance are contingent on societal values, objectives and risk perceptions (*high confidence*). Recognition of diverse interests, circumstances, social-cultural contexts and expectations can benefit decision-making processes. Indigenous, local and traditional knowledge systems and practices, including indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts. Integrating such forms of knowledge with existing practices increases the effectiveness of adaptation. *{3.3}*

Constraints can interact to impede adaptation planning and implementation (*high confidence*). Common constraints on implementation arise from the following: limited financial and human resources; limited integration or coordination of governance; uncertainties about projected impacts; different perceptions of risks; competing values; absence of key adaptation leaders and advocates; and limited tools to monitor adaptation effectiveness. Another constraint includes insufficient research, monitoring, and observation and the finance to maintain them. *{3.3}*

Greater rates and magnitude of climate change increase the likelihood of exceeding adaptation limits (*high confidence*). Limits to adaptation emerge from the interaction among climate change and biophysical and/or socio-economic constraints. Further, poor planning or implementation, overemphasizing short-term outcomes or failing to sufficiently anticipate consequences can result in maladaptation, increasing the vulnerability or exposure of the target group in the future or the vulnerability of other people, places or sectors (*medium evidence, high agreement*). Underestimating the complexity of adaptation as a social process can create unrealistic expectations about achieving intended adaptation outcomes. *{3.3}*

Significant co-benefits, synergies and trade-offs exist between mitigation and adaptation and among different adaptation responses; interactions occur both within and across regions (*very high confidence*). Increasing efforts to mitigate and adapt to climate change imply an increasing complexity of interactions, particularly at the intersections among water, energy, land use and biodiversity, but tools to understand and manage these interactions remain limited. Examples of actions with co-benefits include (i) improved energy efficiency and cleaner energy sources, leading to reduced emissions of health-damaging, climate-altering air pollutants; (ii) reduced energy and water consumption in urban areas through greening cities and recycling water; (iii) sustainable agriculture and forestry; and (iv) protection of ecosystems for carbon storage and other ecosystem services. *{3.3}*

Transformations in economic, social, technological and political decisions and actions can enhance adaptation and promote sustainable development (*high confidence*). At the national level, transformation is considered most effective when it reflects a country's own visions and approaches to achieving sustainable development in accordance with its national circumstances and priorities. Restricting adaptation responses to incremental changes to existing systems and structures, without considering transformational change, may increase costs and losses and miss opportunities. Planning and implementation of transformational adaptation could reflect strengthened, altered or aligned paradigms and may place new and increased demands on governance structures to reconcile different goals and visions for the future and to address possible equity and ethical implications. Adaptation pathways are enhanced by iterative learning, deliberative processes and innovation. *{3.3}*

SPM 3.4 Characteristics of mitigation pathways

There are multiple mitigation pathways that are *likely* to limit warming to below 2°C relative to pre-industrial levels. These pathways would require substantial emissions reductions over the next few decades and near zero emissions of CO_2 and other long-lived greenhouse gases by the end of the century. Implementing such reductions poses substantial technological, economic, social and institutional challenges, which increase with delays in additional mitigation and if key technologies are not available. Limiting warming to lower or higher levels involves similar challenges but on different timescales. *{3.4}*

Without additional efforts to reduce GHG emissions beyond those in place today, global emissions growth is expected to persist, driven by growth in global population and economic activities. Global mean surface temperature increases in 2100 in baseline scenarios—those without additional mitigation—range from 3.7°C to 4.8°C above the average for 1850–1900 for a median climate response. They range from 2.5°C to 7.8°C when including climate uncertainty (5th to 95th percentile range) (*high confidence*). *{3.4}*

Emissions scenarios leading to CO_2-equivalent concentrations in 2100 of about 450 ppm or lower are *likely* to maintain warming below 2°C over the 21st century relative to pre-industrial levels[15]. These scenarios are characterized by 40 to 70% global anthropogenic GHG emissions reductions by 2050 compared to 2010[16], and emissions levels near zero or below in 2100. Mitigation scenarios reaching concentration levels of about 500 ppm CO_2-eq by 2100 are *more likely than not* to limit temperature change to less than 2°C, unless they temporarily overshoot concentration levels of roughly 530 ppm CO_2-eq

[15] For comparison, the CO_2-eq concentration in 2011 is estimated to be 430 ppm (uncertainty range 340 to 520 ppm)

[16] This range differs from the range provided for a similar concentration category in the AR4 (50 to 85% lower than 2000 for CO_2 only). Reasons for this difference include that this report has assessed a substantially larger number of scenarios than in the AR4 and looks at all GHGs. In addition, a large proportion of the new scenarios include Carbon Dioxide Removal (CDR) technologies (see below). Other factors include the use of 2100 concentration levels instead of stabilization levels and the shift in reference year from 2000 to 2010.

before 2100, in which case they are *about as likely as not* to achieve that goal. In these 500 ppm CO_2-eq scenarios, global 2050 emissions levels are 25 to 55% lower than in 2010. Scenarios with higher emissions in 2050 are characterized by a greater reliance on Carbon Dioxide Removal (CDR) technologies beyond mid-century (and vice versa). Trajectories that are *likely* to limit warming to 3°C relative to pre-industrial levels reduce emissions less rapidly than those limiting warming to 2°C. A limited number of studies provide scenarios that are *more likely than not* to limit warming to 1.5°C by 2100; these scenarios are characterized by concentrations below 430 ppm CO_2-eq by 2100 and 2050 emission reduction between 70% and 95% below 2010. For a comprehensive overview of the characteristics of emissions scenarios, their CO_2-equivalent concentrations and their likelihood to keep warming to below a range of temperature levels, see Figure SPM.11 and Table SPM.1. *{3.4}*

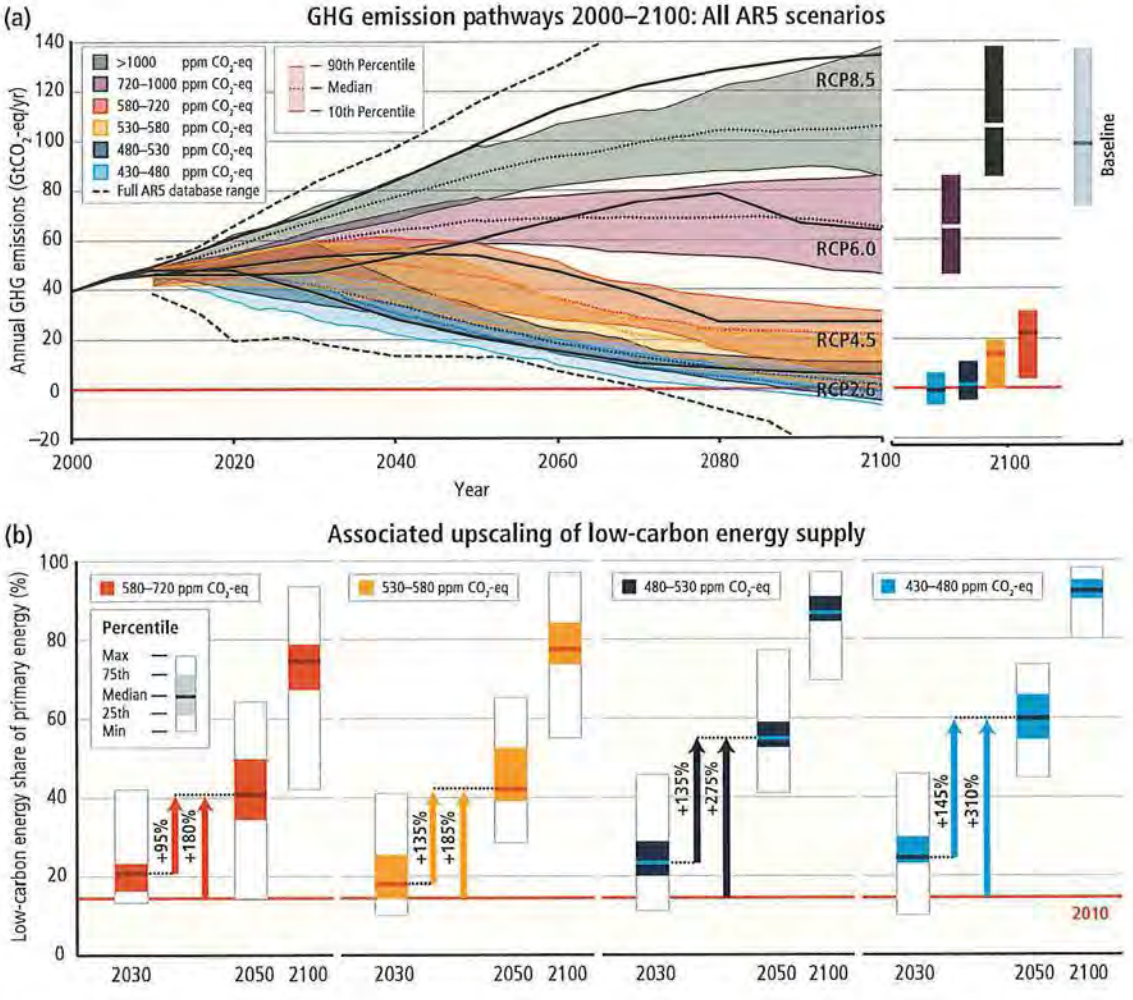

Figure SPM.11 | Global greenhouse gas emissions (gigatonne of CO_2-equivalent per year, $GtCO_2$-eq/yr) in baseline and mitigation scenarios for different long-term concentration levels **(a)** and associated upscaling requirements of low-carbon energy (% of primary energy) for 2030, 2050 and 2100 compared to 2010 levels in mitigation scenarios **(b)**. *{Figure 3.2}*

Table SPM.1 | Key characteristics of the scenarios collected and assessed for WGIII AR5. For all parameters the 10th to 90th percentile of the scenarios is shown[a]. *(Table 3.1)*

CO_2-eq Concentrations in 2100 ($ppm CO_2$-eq)[f] Category label (conc. range)	Subcategories	Relative position of the RCPs[d]	Change in CO_2-eq emissions compared to 2010 (in %)[c]		Likelihood of staying below a specific temperature level over the 21st century (relative to 1850–1900)[d,e]			
			2050	2100	1.5°C	2°C	3°C	4°C
<430	Only a limited number of individual model studies have explored levels below 430 ppm CO_2-eq[i]							
450 (430 to 480)	Total range[a,g]	RCP2.6	–72 to –41	–118 to –78	*More unlikely than likely*	*Likely*	*Likely*	*Likely*
500 (480 to 530)	No overshoot of 530 ppm CO_2-eq		–57 to –42	–107 to –73	*Unlikely*	*More likely than not*		
	Overshoot of 530 ppm CO_2-eq		–55 to –25	–114 to –90		*About as likely as not*		
550 (530 to 580)	No overshoot of 580 ppm CO_2-eq		–47 to –19	–81 to –59		*More unlikely than likely*[i]		
	Overshoot of 580 ppm CO_2-eq		–16 to 7	–183 to –86				
(580 to 650)	Total range	RCP4.5	–38 to 24	–134 to –50				
(650 to 720)	Total range		–11 to 17	–54 to –21		*Unlikely*	*More likely than not*	
(720 to 1000)[b]	Total range	RCP6.0	18 to 54	–7 to 72	*Unlikely*[h]		*More unlikely than likely*	
>1000[b]	Total range	RCP8.5	52 to 95	74 to 178		*Unlikely*[h]	*Unlikely*	*More unlikely than likely*

Notes:

[a] The 'total range' for the 430 to 480 ppm CO_2-eq concentrations scenarios corresponds to the range of the 10th to 90th percentile of the subcategory of these scenarios shown in Table 6.3 of the Working Group III Report.

[b] Baseline scenarios fall into the >1000 and 720 to 1000 ppm CO_2-eq categories. The latter category also includes mitigation scenarios. The baseline scenarios in the latter category reach a temperature change of 2.5°C to 5.8°C above the average for 1850–1900 in 2100. Together with the baseline scenarios in the >1000 ppm CO_2-eq category, this leads to an overall 2100 temperature range of 2.5°C to 7.8°C (range based on median climate response: 3.7°C to 4.8°C) for baseline scenarios across both concentration categories.

[c] The global 2010 emissions are 31% above the 1990 emissions (consistent with the historic greenhouse gas emission estimates presented in this report). CO_2-eq emissions include the basket of Kyoto gases (carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) as well as fluorinated gases).

[d] The assessment here involves a large number of scenarios published in the scientific literature and is thus not limited to the Representative Concentration Pathways (RCPs). To evaluate the CO_2-eq concentration and climate implications of these scenarios, the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC) was used in a probabilistic mode. For a comparison between MAGICC model results and the outcomes of the models used in WGI, see WGI 12.4.1.2, 12.4.8 and WGIII 6.3.2.6.

[e] The assessment in this table is based on the probabilities calculated for the full ensemble of scenarios in WGIII AR5 using MAGICC and the assessment in WGI of the uncertainty of the temperature projections not covered by climate models. The statements are therefore consistent with the statements in WGI, which are based on the Coupled Model Intercomparison Project Phase 5 (CMIP5) runs of the RCPs and the assessed uncertainties. Hence, the likelihood statements reflect different lines of evidence from both WGs. This WGI method was also applied for scenarios with intermediate concentration levels where no CMIP5 runs are available. The likelihood statements are indicative only *(WGIII 6.3)* and follow broadly the terms used by the WGI SPM for temperature projections: likely 66–100%, more likely than not >50–100%, about as likely as not 33–66%, and unlikely 0–33%. In addition the term more unlikely than likely 0–<50% is used.

[f] The CO_2-equivalent concentration (see Glossary) is calculated on the basis of the total forcing from a simple carbon cycle/climate model, MAGICC. The CO_2-equivalent concentration in 2011 is estimated to be 430 ppm (uncertainty range 340 to 520 ppm). This is based on the assessment of total anthropogenic radiative forcing for 2011 relative to 1750 in WGI, i.e., 2.3 W/m^2, uncertainty range 1.1 to 3.3 W/m^2.

[g] The vast majority of scenarios in this category overshoot the category boundary of 480 ppm CO_2-eq concentration.

[h] For scenarios in this category, no CMIP5 run or MAGICC realization stays below the respective temperature level. Still, an *unlikely* assignment is given to reflect uncertainties that may not be reflected by the current climate models.

[i] Scenarios in the 580 to 650 ppm CO_2-eq category include both overshoot scenarios and scenarios that do not exceed the concentration level at the high end of the category (e.g., RCP4.5). The latter type of scenarios, in general, have an assessed probability of *more unlikely than likely* to stay below the 2°C temperature level, while the former are mostly assessed to have an *unlikely* probability of staying below this level.

[j] In these scenarios, global CO_2-eq emissions in 2050 are between 70 to 95% below 2010 emissions, and they are between 110 to 120% below 2010 emissions in 2100.

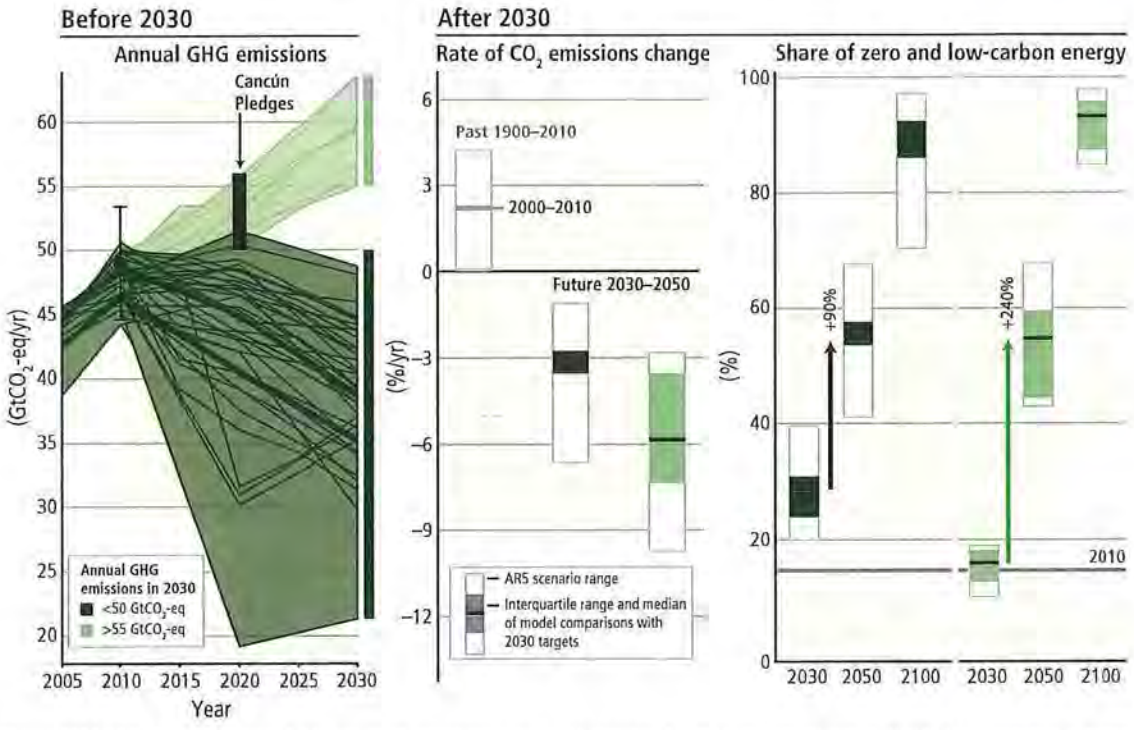

Figure SPM.12 | The implications of different 2030 greenhouse gas (GHG) emissions levels for the rate of carbon dioxide (CO_2) emissions reductions and low-carbon energy upscaling in mitigation scenarios that are at least *about as likely as not* to keep warming throughout the 21st century below 2°C relative to pre-industrial levels (2100 CO_2-equivalent concentrations of 430 to 530 ppm). The scenarios are grouped according to different emissions levels by 2030 (coloured in different shades of green). The left panel shows the pathways of GHG emissions (gigatonne of CO_2-equivalent per year, $GtCO_2$-eq/yr) leading to these 2030 levels. The black dot with whiskers gives historic GHG emission levels and associated uncertainties in 2010 as reported in Figure SPM.2. The black bar shows the estimated uncertainty range of GHG emissions implied by the Cancún Pledges. The middle panel denotes the average annual CO_2 emissions reduction rates for the period 2030–2050. It compares the median and interquartile range across scenarios from recent inter-model comparisons with explicit 2030 interim goals to the range of scenarios in the Scenario Database for WGIII AR5. Annual rates of historical emissions change (sustained over a period of 20 years) and the average annual CO_2 emission change between 2000 and 2010 are shown as well. The arrows in the right panel show the magnitude of zero and low-carbon energy supply upscaling from 2030 to 2050 subject to different 2030 GHG emissions levels. Zero- and low-carbon energy supply includes renewables, nuclear energy and fossil energy with carbon dioxide capture and storage (CCS) or bioenergy with CCS (BECCS). [Note: Only scenarios that apply the full, unconstrained mitigation technology portfolio of the underlying models (default technology assumption) are shown. Scenarios with large net negative global emissions (>20 $GtCO_2$-eq/yr), scenarios with exogenous carbon price assumptions and scenarios with 2010 emissions significantly outside the historical range are excluded.] *{Figure 3.3}*

Mitigation scenarios reaching about 450 ppm CO_2-eq in 2100 (consistent with a *likely* chance to keep warming below 2°C relative to pre-industrial levels) typically involve temporary overshoot[17] of atmospheric concentrations, as do many scenarios reaching about 500 ppm CO_2-eq to about 550 ppm CO_2-eq in 2100 (Table SPM.1). Depending on the level of overshoot, overshoot scenarios typically rely on the availability and widespread deployment of bioenergy with carbon dioxide capture and storage (BECCS) and afforestation in the second half of the century. The availability and scale of these and other CDR technologies and methods are uncertain and CDR technologies are, to varying degrees, associated with challenges and risks[18]. CDR is also prevalent in many scenarios without overshoot to compensate for residual emissions from sectors where mitigation is more expensive (*high confidence*). *{3.4, Box 3.3}*

Reducing emissions of non-CO_2 agents can be an important element of mitigation strategies. All current GHG emissions and other forcing agents affect the rate and magnitude of climate change over the next few decades, although long-term warming is mainly driven by CO_2 emissions. Emissions of non-CO_2 forcers are often expressed as 'CO_2-equivalent emissions', but the choice of metric to calculate these emissions, and the implications for the emphasis and timing of abatement of the various climate forcers, depends on application and policy context and contains value judgments. *{3.4, Box 3.2}*

[17] In concentration 'overshoot' scenarios, concentrations peak during the century and then decline.

[18] CDR methods have biogeochemical and technological limitations to their potential on the global scale. There is insufficient knowledge to quantify how much CO_2 emissions could be partially offset by CDR on a century timescale. CDR methods may carry side effects and long-term consequences on a global scale.

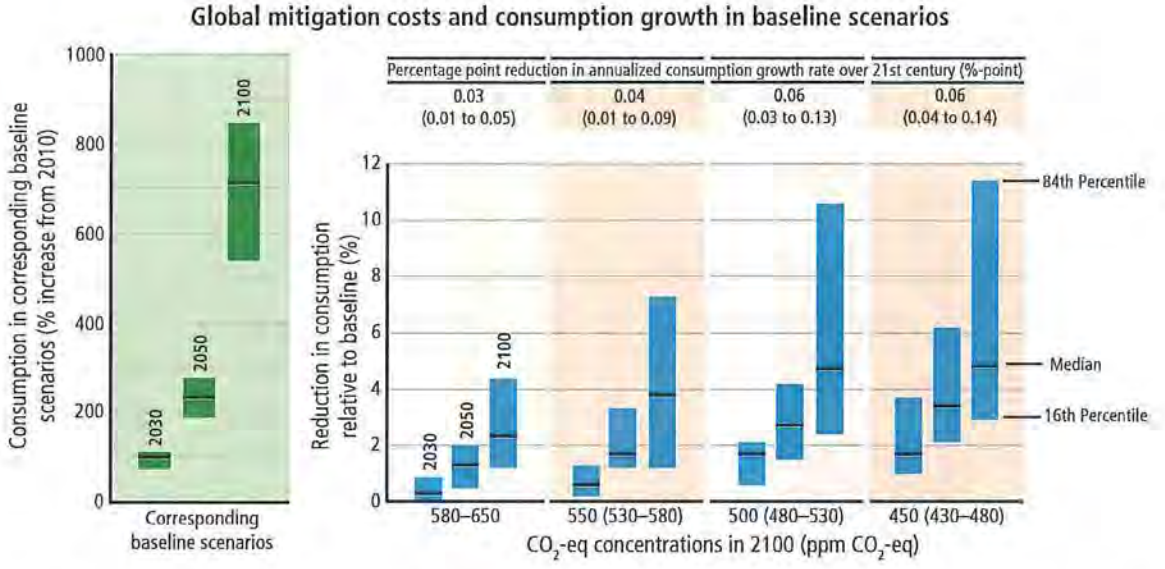

Figure SPM.13 | Global mitigation costs in cost-effective scenarios at different atmospheric concentrations levels in 2100. Cost-effective scenarios assume immediate mitigation in all countries and a single global carbon price, and impose no additional limitations on technology relative to the models' default technology assumptions. Consumption losses are shown relative to a baseline development without climate policy (left panel). The table at the top shows percentage points of annualized consumption growth reductions relative to consumption growth in the baseline of 1.6 to 3% per year (e.g., if the reduction is 0.06 percentage points per year due to mitigation, and baseline growth is 2.0% per year, then the growth rate with mitigation would be 1.94% per year). Cost estimates shown in this table do not consider the benefits of reduced climate change or co-benefits and adverse side effects of mitigation. Estimates at the high end of these cost ranges are from models that are relatively inflexible to achieve the deep emissions reductions required in the long run to meet these goals and/or include assumptions about market imperfections that would raise costs. *(Figure 3.4)*

Delaying additional mitigation to 2030 will substantially increase the challenges associated with limiting warming over the 21st century to below 2°C relative to pre-industrial levels. It will require substantially higher rates of emissions reductions from 2030 to 2050; a much more rapid scale-up of low-carbon energy over this period; a larger reliance on CDR in the long term; and higher transitional and long-term economic impacts. Estimated global emissions levels in 2020 based on the Cancún Pledges are not consistent with cost-effective mitigation trajectories that are at least *about as likely as not* to limit warming to below 2°C relative to pre-industrial levels, but they do not preclude the option to meet this goal (*high confidence*) (Figure SPM.12, Table SPM.2). *{3.4}*

Estimates of the aggregate economic costs of mitigation vary widely depending on methodologies and assumptions, but increase with the stringency of mitigation. Scenarios in which all countries of the world begin mitigation immediately, in which there is a single global carbon price, and in which all key technologies are available have been used as a cost-effective benchmark for estimating macro-economic mitigation costs (Figure SPM.13). Under these assumptions mitigation scenarios that are *likely* to limit warming to below 2°C through the 21st century relative to pre-industrial levels entail losses in global consumption—not including benefits of reduced climate change as well as co-benefits and adverse side effects of mitigation—of 1 to 4% (median: 1.7%) in 2030, 2 to 6% (median: 3.4%) in 2050 and 3 to 11% (median: 4.8%) in 2100 relative to consumption in baseline scenarios that grows anywhere from 300% to more than 900% over the century (Figure SPM.13). These numbers correspond to an annualized reduction of consumption growth by 0.04 to 0.14 (median: 0.06) percentage points over the century relative to annualized consumption growth in the baseline that is between 1.6 and 3% per year (*high confidence*). *{3.4}*

In the absence or under limited availability of mitigation technologies (such as bioenergy, CCS and their combination BECCS, nuclear, wind/solar), mitigation costs can increase substantially depending on the technology considered. Delaying additional mitigation increases mitigation costs in the medium to long term. Many models could not limit *likely* warming to below 2°C over the 21st century relative to pre-industrial levels if additional mitigation is considerably delayed. Many models could not limit *likely* warming to below 2°C if bioenergy, CCS and their combination (BECCS) are limited (*high confidence*) (Table SPM.2). *{3.4}*

Table SPM.2 | Increase in global mitigation costs due to either limited availability of specific technologies or delays in additional mitigation [a] relative to cost-effective scenarios [b]. The increase in costs is given for the median estimate and the 16th to 84th percentile range of the scenarios (in parentheses) [c]. In addition, the sample size of each scenario set is provided in the coloured symbols. The colours of the symbols indicate the fraction of models from systematic model comparison exercises that could successfully reach the targeted concentration level. *[Table 3.2]*

	Mitigation cost increases in scenarios with limited availability of technologies [d] *[% increase in total discounted [e] mitigation costs (2015–2100) relative to default technology assumptions]*				Mitigation cost increases due to delayed additional mitigation until 2030 *[% increase in mitigation costs relative to immediate mitigation]*	
2100 concentrations (ppm CO_2-eq)	no CCS	nuclear phase out	limited solar/wind	limited bioenergy	medium term costs (2030–2050)	long term costs (2050–2100)
450 (430 to 480)	138% (29 to 297%) 4	7% (4 to 18%) 8	6% (2 to 29%) 8	64% (44 to 78%) 8	44% (2 to 78%) 29	37% (16 to 82%) 29
500 (480 to 530)	not available (n.a.)	n.a.	n.a.	n.a.		
550 (530 to 580)	39% (18 to 78%) 11	13% (2 to 23%) 10	8% (5 to 15%) 10	18% (4 to 66%) 12	15% (3 to 32%)	16% (5 to 24%)
580 to 650	n.a.	n.a.	n.a.	n.a.		

Symbol legend—fraction of models successful in producing scenarios (numbers indicate the number of successful models)

: all models successful

: between 80 and 100% of models successful

: between 50 and 80% of models successful

: less than 50% of models successful

Notes:

[a] Delayed mitigation scenarios are associated with greenhouse gas emission of more than 55 $GtCO_2$-eq in 2030, and the increase in mitigation costs is measured relative to cost-effective mitigation scenarios for the same long-term concentration level.

[b] Cost-effective scenarios assume immediate mitigation in all countries and a single global carbon price, and impose no additional limitations on technology relative to the models' default technology assumptions.

[c] The range is determined by the central scenarios encompassing the 16th to 84th percentile range of the scenario set. Only scenarios with a time horizon until 2100 are included. Some models that are included in the cost ranges for concentration levels above 530 ppm CO_2-eq in 2100 could not produce associated scenarios for concentration levels below 530 ppm CO_2-eq in 2100 with assumptions about limited availability of technologies and/or delayed additional mitigation.

[d] No CCS: carbon dioxide capture and storage is not included in these scenarios. Nuclear phase out: no addition of nuclear power plants beyond those under construction, and operation of existing plants until the end of their lifetime. Limited Solar/Wind: a maximum of 20% global electricity generation from solar and wind power in any year of these scenarios. Limited Bioenergy: a maximum of 100 EJ/yr modern bioenergy supply globally (modern bioenergy used for heat, power, combinations and industry was around 18 EJ/yr in 2008). EJ = Exajoule = 10^{18} Joule.

[e] Percentage increase of net present value of consumption losses in percent of baseline consumption (for scenarios from general equilibrium models) and abatement costs in percent of baseline gross domestic product (GDP, for scenarios from partial equilibrium models) for the period 2015–2100, discounted at 5% per year.

Mitigation scenarios reaching about 450 or 500 ppm CO_2-eq by 2100 show reduced costs for achieving air quality and energy security objectives, with significant co-benefits for human health, ecosystem impacts and sufficiency of resources and resilience of the energy system. *{4.4.2.2}*

Mitigation policy could devalue fossil fuel assets and reduce revenues for fossil fuel exporters, but differences between regions and fuels exist (*high confidence*). Most mitigation scenarios are associated with reduced revenues from coal and oil trade for major exporters (*high confidence*). The availability of CCS would reduce the adverse effects of mitigation on the value of fossil fuel assets (*medium confidence*). *{4.4.2.2}*

Solar Radiation Management (SRM) involves large-scale methods that seek to reduce the amount of absorbed solar energy in the climate system. SRM is untested and is not included in any of the mitigation scenarios. If it were deployed, SRM would

entail numerous uncertainties, side effects, risks and shortcomings and has particular governance and ethical implications. SRM would not reduce ocean acidification. If it were terminated, there is *high confidence* that surface temperatures would rise very rapidly impacting ecosystems susceptible to rapid rates of change. *{Box 3.3}*

SPM 4. Adaptation and Mitigation

Many adaptation and mitigation options can help address climate change, but no single option is sufficient by itself. Effective implementation depends on policies and cooperation at all scales and can be enhanced through integrated responses that link adaptation and mitigation with other societal objectives. *{4}*

SPM 4.1 Common enabling factors and constraints for adaptation and mitigation responses

Adaptation and mitigation responses are underpinned by common enabling factors. These include effective institutions and governance, innovation and investments in environmentally sound technologies and infrastructure, sustainable livelihoods and behavioural and lifestyle choices. *{4.1}*

Inertia in many aspects of the socio-economic system constrains adaptation and mitigation options (*medium evidence, high agreement*). Innovation and investments in environmentally sound infrastructure and technologies can reduce GHG emissions and enhance resilience to climate change (*very high confidence*). *{4.1}*

Vulnerability to climate change, GHG emissions and the capacity for adaptation and mitigation are strongly influenced by livelihoods, lifestyles, behaviour and culture (*medium evidence, medium agreement*). Also, the social acceptability and/or effectiveness of climate policies are influenced by the extent to which they incentivize or depend on regionally appropriate changes in lifestyles or behaviours. *{4.1}*

For many regions and sectors, enhanced capacities to mitigate and adapt are part of the foundation essential for managing climate change risks (*high confidence*). Improving institutions as well as coordination and cooperation in governance can help overcome regional constraints associated with mitigation, adaptation and disaster risk reduction (*very high confidence*). *{4.1}*

SPM 4.2 Response options for adaptation

Adaptation options exist in all sectors, but their context for implementation and potential to reduce climate-related risks differs across sectors and regions. Some adaptation responses involve significant co-benefits, synergies and trade-offs. Increasing climate change will increase challenges for many adaptation options. *{4.2}*

Adaptation experience is accumulating across regions in the public and private sectors and within communities. There is increasing recognition of the value of social (including local and indigenous), institutional, and ecosystem-based measures and of the extent of constraints to adaptation. Adaptation is becoming embedded in some planning processes, with more limited implementation of responses (*high confidence*). *{1.6, 4.2, 4.4.2.1}*

The need for adaptation along with associated challenges is expected to increase with climate change (*very high confidence*). Adaptation options exist in all sectors and regions, with diverse potential and approaches depending on their context in vulnerability reduction, disaster risk management or proactive adaptation planning (Table SPM.3). Effective strategies and actions consider the potential for co-benefits and opportunities within wider strategic goals and development plans. *{4.2}*

Table SPM.3 | Approaches for managing the risks of climate change through adaptation. These approaches should be considered overlapping rather than discrete, and they are often pursued simultaneously. Examples are presented in no specific order and can be relevant to more than one category. *(Table 4.2)*

Overlapping Approaches	Category	Examples
Vulnerability & Exposure Reduction through development, planning & practices including many low-regrets measures	Human development	Improved access to education, nutrition, health facilities, energy, safe housing & settlement structures, & social support structures; Reduced gender inequality & marginalization in other forms.
	Poverty alleviation	Improved access to & control of local resources; Land tenure; Disaster risk reduction; Social safety nets & social protection; Insurance schemes.
	Livelihood security	Income, asset & livelihood diversification; Improved infrastructure; Access to technology & decision-making fora; Increased decision-making power; Changed cropping, livestock & aquaculture practices; Reliance on social networks.
	Disaster risk management	Early warning systems; Hazard & vulnerability mapping; Diversifying water resources; Improved drainage; Flood & cyclone shelters; Building codes & practices; Storm & wastewater management; Transport & road infrastructure improvements.
	Ecosystem management	Maintaining wetlands & urban green spaces; Coastal afforestation; Watershed & reservoir management; Reduction of other stressors on ecosystems & of habitat fragmentation; Maintenance of genetic diversity; Manipulation of disturbance regimes; Community-based natural resource management.
	Spatial or land-use planning	Provisioning of adequate housing, infrastructure & services; Managing development in flood prone & other high risk areas; Urban planning & upgrading programs; Land zoning laws; Easements; Protected areas.
Adaptation including incremental & transformational adjustments	Structural/physical	***Engineered & built-environment options***: Sea walls & coastal protection structures; Flood levees; Water storage; Improved drainage; Flood & cyclone shelters; Building codes & practices; Storm & wastewater management; Transport & road infrastructure improvements; Floating houses; Power plant & electricity grid adjustments.
		Technological options: New crop & animal varieties; Indigenous, traditional & local knowledge, technologies & methods; Efficient irrigation; Water-saving technologies; Desalinisation; Conservation agriculture; Food storage & preservation facilities; Hazard & vulnerability mapping & monitoring; Early warning systems; Building insulation; Mechanical & passive cooling; Technology development, transfer & diffusion.
		Ecosystem-based options: Ecological restoration; Soil conservation; Afforestation & reforestation; Mangrove conservation & replanting; Green infrastructure (e.g., shade trees, green roofs); Controlling overfishing; Fisheries co-management; Assisted species migration & dispersal; Ecological corridors; Seed banks, gene banks & other *ex situ* conservation; Community-based natural resource management.
		Services: Social safety nets & social protection; Food banks & distribution of food surplus; Municipal services including water & sanitation; Vaccination programs; Essential public health services; Enhanced emergency medical services.
	Institutional	***Economic options***: Financial incentives; Insurance; Catastrophe bonds; Payments for ecosystem services; Pricing water to encourage universal provision and careful use; Microfinance; Disaster contingency funds; Cash transfers; Public-private partnerships.
		Laws & regulations: Land zoning laws; Building standards & practices; Easements; Water regulations & agreements; Laws to support disaster risk reduction; Laws to encourage insurance purchasing; Defined property rights & land tenure security; Protected areas; Fishing quotas; Patent pools & technology transfer.
		National & government policies & programs: National & regional adaptation plans including mainstreaming; Sub-national & local adaptation plans; Economic diversification; Urban upgrading programs; Municipal water management programs; Disaster planning & preparedness; Integrated water resource management; Integrated coastal zone management; Ecosystem-based management; Community-based adaptation.
	Social	***Educational options***: Awareness raising & integrating into education; Gender equity in education; Extension services; Sharing indigenous, traditional & local knowledge; Participatory action research & social learning; Knowledge-sharing & learning platforms.
		Informational options: Hazard & vulnerability mapping; Early warning & response systems; Systematic monitoring & remote sensing; Climate services; Use of indigenous climate observations; Participatory scenario development; Integrated assessments.
		Behavioural options: Household preparation & evacuation planning; Migration; Soil & water conservation; Storm drain clearance; Livelihood diversification; Changed cropping, livestock & aquaculture practices; Reliance on social networks.
Transformation	Spheres of change	***Practical***: Social & technical innovations, behavioural shifts, or institutional & managerial changes that produce substantial shifts in outcomes.
		Political: Political, social, cultural & ecological decisions & actions consistent with reducing vulnerability & risk & supporting adaptation, mitigation & sustainable development.
		Personal: Individual & collective assumptions, beliefs, values & worldviews influencing climate-change responses.

SPM 4.3 Response options for mitigation

Mitigation options are available in every major sector. Mitigation can be more cost-effective if using an integrated approach that combines measures to reduce energy use and the greenhouse gas intensity of end-use sectors, decarbonize energy supply, reduce net emissions and enhance carbon sinks in land-based sectors. *{4.3}*

Well-designed systemic and cross-sectoral mitigation strategies are more cost-effective in cutting emissions than a focus on individual technologies and sectors, with efforts in one sector affecting the need for mitigation in others (*medium confidence*). Mitigation measures intersect with other societal goals, creating the possibility of co-benefits or adverse side effects. These intersections, if well-managed, can strengthen the basis for undertaking climate action. *{4.3}*

Emissions ranges for baseline scenarios and mitigation scenarios that limit CO_2-equivalent concentrations to low levels (about 450 ppm CO_2-eq, *likely* to limit warming to 2°C above pre-industrial levels) are shown for different sectors and gases in Figure SPM.14. Key measures to achieve such mitigation goals include decarbonizing (i.e., reducing the carbon intensity of) electricity generation (*medium evidence, high agreement*) as well as efficiency enhancements and behavioural changes, in order to reduce energy demand compared to baseline scenarios without compromising development (*robust evidence, high agreement*). In scenarios reaching 450 ppm CO_2-eq concentrations by 2100, global CO_2 emissions from the energy supply sector are projected to decline over the next decade and are characterized by reductions of 90% or more below 2010 levels between 2040 and 2070. In the majority of low-concentration stabilization scenarios (about 450 to about 500 ppm CO_2-eq, at least *about as likely as not* to limit warming to 2°C above pre-industrial levels), the share of low-carbon electricity supply (comprising renewable energy (RE), nuclear and carbon dioxide capture and storage (CCS) including bioenergy with carbon dioxide capture and storage (BECCS)) increases from the current share of approximately 30% to more than 80% by 2050, and fossil fuel power generation without CCS is phased out almost entirely by 2100. *{4.3}*

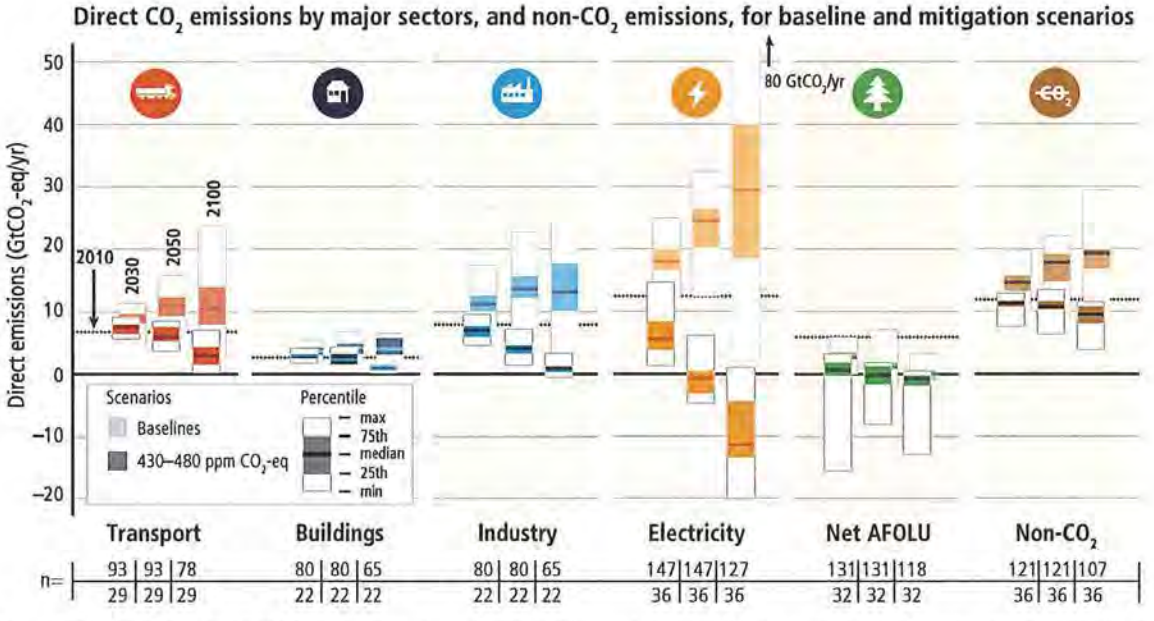

Figure SPM.14 | Carbon dioxide (CO_2) emissions by sector and total non-CO_2 greenhouse gases (Kyoto gases) across sectors in baseline (faded bars) and mitigation scenarios (solid colour bars) that reach about 450 (430 to 480) ppm CO_2-eq concentrations in 2100 (*likely* to limit warming to 2°C above pre-industrial levels). Mitigation in the end-use sectors leads also to indirect emissions reductions in the upstream energy supply sector. Direct emissions of the end-use sectors thus do not include the emission reduction potential at the supply-side due to, for example, reduced electricity demand. The numbers at the bottom of the graphs refer to the number of scenarios included in the range (upper row: baseline scenarios; lower row: mitigation scenarios), which differs across sectors and time due to different sectoral resolution and time horizon of models. Emissions ranges for mitigation scenarios include the full portfolio of mitigation options; many models cannot reach 450 ppm CO_2-eq concentration by 2100 in the absence of carbon dioxide capture and storage (CCS). Negative emissions in the electricity sector are due to the application of bioenergy with carbon dioxide capture and storage (BECCS). 'Net' agriculture, forestry and other land use (AFOLU) emissions consider afforestation, reforestation as well as deforestation activities. *{4.3, Figure 4.1}*

Near-term reductions in energy demand are an important element of cost-effective mitigation strategies, provide more flexibility for reducing carbon intensity in the energy supply sector, hedge against related supply-side risks, avoid lock-in to carbon-intensive infrastructures, and are associated with important co-benefits. The most cost-effective mitigation options in forestry are afforestation, sustainable forest management and reducing deforestation, with large differences in their relative importance across regions; and in agriculture, cropland management, grazing land management and restoration of organic soils (*medium evidence, high agreement*). *{4.3, Figures 4.1, 4.2, Table 4.3}*

Behaviour, lifestyle and culture have a considerable influence on energy use and associated emissions, with high mitigation potential in some sectors, in particular when complementing technological and structural change (*medium evidence, medium agreement*). Emissions can be substantially lowered through changes in consumption patterns, adoption of energy savings measures, dietary change and reduction in food wastes. *{4.1, 4.3}*

SPM 4.4 Policy approaches for adaptation and mitigation, technology and finance

Effective adaptation and mitigation responses will depend on policies and measures across multiple scales: international, regional, national and sub-national. Policies across all scales supporting technology development, diffusion and transfer, as well as finance for responses to climate change, can complement and enhance the effectiveness of policies that directly promote adaptation and mitigation. *{4.4}*

International cooperation is critical for effective mitigation, even though mitigation can also have local co-benefits. Adaptation focuses primarily on local to national scale outcomes, but its effectiveness can be enhanced through coordination across governance scales, including international cooperation: *{3.1, 4.4.1}*

- The United Nations Framework Convention on Climate Change (UNFCCC) is the main multilateral forum focused on addressing climate change, with nearly universal participation. Other institutions organized at different levels of governance have resulted in diversifying international climate change cooperation. *{4.4.1}*

- The Kyoto Protocol offers lessons towards achieving the ultimate objective of the UNFCCC, particularly with respect to participation, implementation, flexibility mechanisms and environmental effectiveness (*medium evidence, low agreement*). *{4.4.1}*

- Policy linkages among regional, national and sub-national climate policies offer potential climate change mitigation benefits (*medium evidence, medium agreement*). Potential advantages include lower mitigation costs, decreased emission leakage and increased market liquidity. *{4.4.1}*

- International cooperation for supporting adaptation planning and implementation has received less attention historically than mitigation but is increasing and has assisted in the creation of adaptation strategies, plans and actions at the national, sub-national and local level (*high confidence*). *{4.4.1}*

There has been a considerable increase in national and sub-national plans and strategies on both adaptation and mitigation since the AR4, with an increased focus on policies designed to integrate multiple objectives, increase co-benefits and reduce adverse side effects (*high confidence*): *{4.4.2.1, 4.4.2.2}*

- National governments play key roles in adaptation planning and implementation (*robust evidence, high agreement*) through coordinating actions and providing frameworks and support. While local government and the private sector have different functions, which vary regionally, they are increasingly recognized as critical to progress in adaptation, given their roles in scaling up adaptation of communities, households and civil society and in managing risk information and financing (*medium evidence, high agreement*). *{4.4.2.1}*

- Institutional dimensions of adaptation governance, including the integration of adaptation into planning and decision-making, play a key role in promoting the transition from planning to implementation of adaptation (*robust evidence,*

high agreement). Examples of institutional approaches to adaptation involving multiple actors include economic options (e.g., insurance, public-private partnerships), laws and regulations (e.g., land-zoning laws) and national and government policies and programmes (e.g., economic diversification). *{4.2, 4.4.2.1, Table SPM.3}*

- In principle, mechanisms that set a carbon price, including cap and trade systems and carbon taxes, can achieve mitigation in a cost-effective way but have been implemented with diverse effects due in part to national circumstances as well as policy design. The short-run effects of cap and trade systems have been limited as a result of loose caps or caps that have not proved to be constraining (*limited evidence, medium agreement*). In some countries, tax-based policies specifically aimed at reducing GHG emissions—alongside technology and other policies—have helped to weaken the link between GHG emissions and GDP (*high confidence*). In addition, in a large group of countries, fuel taxes (although not necessarily designed for the purpose of mitigation) have had effects that are akin to sectoral carbon taxes. *{4.4.2.2}*

- Regulatory approaches and information measures are widely used and are often environmentally effective (*medium evidence, medium agreement*). Examples of regulatory approaches include energy efficiency standards; examples of information programmes include labelling programmes that can help consumers make better-informed decisions. *{4.4.2.2}*

- Sector-specific mitigation policies have been more widely used than economy-wide policies (*medium evidence, high agreement*). Sector-specific policies may be better suited to address sector-specific barriers or market failures and may be bundled in packages of complementary policies. Although theoretically more cost-effective, administrative and political barriers may make economy-wide policies harder to implement. Interactions between or among mitigation policies may be synergistic or may have no additive effect on reducing emissions. *{4.4.2.2}*

- Economic instruments in the form of subsidies may be applied across sectors, and include a variety of policy designs, such as tax rebates or exemptions, grants, loans and credit lines. An increasing number and variety of renewable energy (RE) policies including subsidies—motivated by many factors—have driven escalated growth of RE technologies in recent years. At the same time, reducing subsidies for GHG-related activities in various sectors can achieve emission reductions, depending on the social and economic context (*high confidence*). *{4.4.2.2}*

Co-benefits and adverse side effects of mitigation could affect achievement of other objectives such as those related to human health, food security, biodiversity, local environmental quality, energy access, livelihoods and equitable sustainable development. The potential for co-benefits for energy end-use measures outweighs the potential for adverse side effects whereas the evidence suggests this may not be the case for all energy supply and agriculture, forestry and other land use (AFOLU) measures. Some mitigation policies raise the prices for some energy services and could hamper the ability of societies to expand access to modern energy services to underserved populations (*low confidence*). These potential adverse side effects on energy access can be avoided with the adoption of complementary policies such as income tax rebates or other benefit transfer mechanisms (*medium confidence*). Whether or not side effects materialize, and to what extent side effects materialize, will be case- and site-specific, and depend on local circumstances and the scale, scope and pace of implementation. Many co-benefits and adverse side effects have not been well-quantified. *{4.3, 4.4.2.2, Box 3.4}*

Technology policy (development, diffusion and transfer) complements other mitigation policies across all scales, from international to sub-national; many adaptation efforts also critically rely on diffusion and transfer of technologies and management practices (*high confidence*). Policies exist to address market failures in R&D, but the effective use of technologies can also depend on capacities to adopt technologies appropriate to local circumstances. *{4.4.3}*

Substantial reductions in emissions would require large changes in investment patterns (*high confidence*). For mitigation scenarios that stabilize concentrations (without overshoot) in the range of 430 to 530 ppm CO_2-eq by 2100[19], annual investments in low carbon electricity supply and energy efficiency in key sectors (transport, industry and buildings) are projected in the scenarios to rise by several hundred billion dollars per year before 2030. Within appropriate enabling environments, the private sector, along with the public sector, can play important roles in financing mitigation and adaptation (*medium evidence, high agreement*). *{4.4.4}*

[19] This range comprises scenarios that reach 430 to 480 ppm CO_2-eq by 2100 (*likely* to limit warming to 2°C above pre-industrial levels) and scenarios that reach 480 to 530 ppm CO_2-eq by 2100 (without overshoot: *more likely than* not to limit warming to 2°C above pre-industrial levels).

Financial resources for adaptation have become available more slowly than for mitigation in both developed and developing countries. Limited evidence indicates that there is a gap between global adaptation needs and the funds available for adaptation (*medium confidence*). There is a need for better assessment of global adaptation costs, funding and investment. Potential synergies between international finance for disaster risk management and adaptation have not yet been fully realized (*high confidence*). *{4.4.4}*

SPM 4.5 Trade-offs, synergies and interactions with sustainable development

Climate change is a threat to sustainable development. Nonetheless, there are many opportunities to link mitigation, adaptation and the pursuit of other societal objectives through integrated responses (*high confidence*). Successful implementation relies on relevant tools, suitable governance structures and enhanced capacity to respond (*medium confidence*). *{3.5, 4.5}*

Climate change exacerbates other threats to social and natural systems, placing additional burdens particularly on the poor (*high confidence*). Aligning climate policy with sustainable development requires attention to both adaptation and mitigation (*high confidence*). Delaying global mitigation actions may reduce options for climate-resilient pathways and adaptation in the future. Opportunities to take advantage of positive synergies between adaptation and mitigation may decrease with time, particularly if limits to adaptation are exceeded. Increasing efforts to mitigate and adapt to climate change imply an increasing complexity of interactions, encompassing connections among human health, water, energy, land use and biodiversity (*medium evidence, high agreement*). *{3.1, 3.5, 4.5}*

Strategies and actions can be pursued now which will move towards climate-resilient pathways for sustainable development, while at the same time helping to improve livelihoods, social and economic well-being and effective environmental management. In some cases, economic diversification can be an important element of such strategies. The effectiveness of integrated responses can be enhanced by relevant tools, suitable governance structures and adequate institutional and human capacity (*medium confidence*). Integrated responses are especially relevant to energy planning and implementation; interactions among water, food, energy and biological carbon sequestration; and urban planning, which provides substantial opportunities for enhanced resilience, reduced emissions and more sustainable development (*medium confidence*). *{3.5, 4.4, 4.5}*

EXHIBIT 23

Exxon Files ▼
(HTTP://WWW.LATIMES.COM/)

What Exxon knew about the Earth's melting Arctic

By SARA JERVING, KATIE JENNINGS, MASAKO MELISSA HIRSCH AND SUSANNE RUST
OCT. 9, 2015

Back in 1990, as the debate over climate change was heating up, a dissident shareholder petitioned the board of Exxon, one of the world's largest oil companies, imploring it to develop a plan to reduce carbon dioxide emissions from its production plants and facilities.

The board's response: Exxon had studied the science of global warming and concluded it was too murky to warrant action. The company's "examination of the issue supports the conclusions that the facts today and the projection of future effects are very unclear."

Yet in the far northern regions of Canada's Arctic frontier, researchers and engineers at Exxon and Imperial Oil were quietly incorporating climate change projections into the company's planning and closely studying how to adapt the company's Arctic operations to a warming planet.

Ken Croasdale, senior ice researcher for Exxon's Canadian subsidiary, was leading a Calgary-based team of researchers and engineers that was trying to determine how global warming could affect Exxon's Arctic operations and its bottom line.

Top, the loss of sea ice due to climate change has taken a toll on wildlife. (Mike Lockhart / U.S. Geological Survey, Associated Press) Bottom, rapidly thawing permafrost is changing the landscape in Canada's Northwest Territories. (Scott Zolkos / The Canadian Press)

"Certainly any major development with a life span of say 30-40 years will need to assess the impacts of potential global warming," Croasdale told an engineering conference in 1991. "This is particularly true of Arctic and offshore projects in Canada, where warming will clearly affect sea ice, icebergs, permafrost and sea levels."

Between 1986 and 1992, Croasdale's team looked at both the positive and negative effects that a warming Arctic would have on oil operations, reporting its findings to Exxon headquarters in Houston and New Jersey.

The good news for Exxon, he told an audience of academics and government researchers in 1992, was that "potential global warming can only help lower exploration and development costs" in the Beaufort Sea.

But, he added, it also posed hazards, including higher sea levels and bigger waves, which could damage the company's existing and future coastal and offshore infrastructure, including drilling platforms, artificial islands, processing plants and pump stations. And a thawing earth could be troublesome for those facilities as well as pipelines.

As Croasdale's team was closely studying the impact of climate change on the company's operations, Exxon and its worldwide affiliates were crafting a public policy position that sought to downplay the certainty of global warming.

The gulf between Exxon's internal and external approach to climate change from the 1980s through the early 2000s was evident in a review of hundreds of internal documents, decades of peer-reviewed published material and dozens of interviews conducted by Columbia University's Energy & Environmental Reporting Project and the Los Angeles Times.

Documents were obtained from the Imperial Oil collection at Calgary's Glenbow Museum and the Exxon Mobil Historical Collection at the University of Texas at Austin's Briscoe Center for American History.

"We considered climate change in a number of operational and planning issues," said Brian Flannery, who was Exxon's in-house climate science advisor from 1980 to 2011. In a recent interview, he described the company's internal effort to study the effects of global warming as a competitive necessity: "If you don't do it, and your competitors do, you're at a loss."

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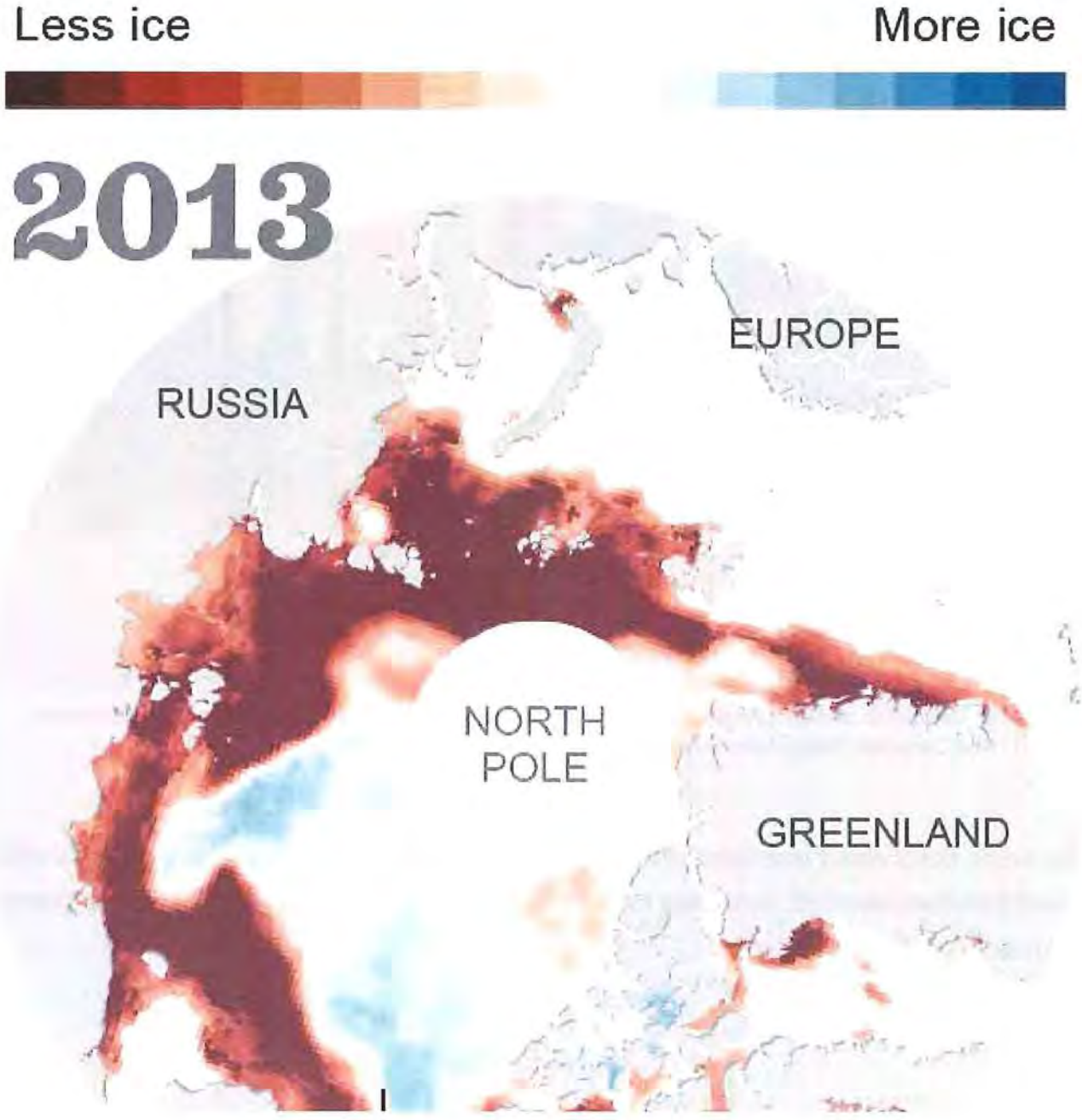
Imperial Oil's Dartmouth refinery in Halifax, Canada. Exxon Mobil owns about 70% of the company. (Andrew Vaughan / The Canadian Press, Associated Press)

The Arctic holds about one-third of the world's untapped natural gas and roughly 13% of the planet's undiscovered oil, according to the U.S. Geological Survey. More than three-quarters of Arctic deposits are offshore.

Imperial Oil, about 70% of which is owned by Exxon Mobil, began drilling in the frigid Arctic waters of the Canadian Beaufort Sea in the early 1970s. By the early 1990s, it had drilled two dozen exploratory wells.

The exploration was expensive, due to bitter temperatures, wicked winds and thick sea ice. And when a worldwide oil slump drove petroleum prices down in the late 1980s, the company began scaling back those efforts.

Changes in Arctic sea ice from 1984 to 2013



Before: Arctic ice coverage in 1984. After: Receding coverage in 2013.

But with mounting evidence the planet was warming, company scientists, including Croasdale, wondered whether climate change might alter the economic equation. Could it make Arctic oil exploration and production easier and cheaper?

"The issue of CO_2 emissions was certainly well-known at that time in the late 1980s," Croasdale said in an interview.

Since the late 1970s and into the 1980s, Exxon had been at the forefront of climate change research, funding its own internal science as well as research from outside experts at Columbia University and MIT.

With company support, Croasdale spearheaded the company's efforts to understand climate change's effects on its Arctic operations. A company such as Exxon, he said, "should be a little bit ahead of the game trying to figure out what it was all about."

Exxon Mobil describes its efforts in those years as standard operating procedure. "Our researchers considered a wide range of potential scenarios, of which potential climate change impacts such as rising sea levels was just one," said Alan Jeffers, a spokesman for Exxon Mobil.

The Arctic seemed an obvious region to study, Croasdale and other experts said, because it was likely to be most affected by global warming.

That reasoning was backed by models built by Exxon scientists, including Flannery, as well as Marty Hoffert, a New York University physicist. Their work, published in 1984, showed that global warming would be most pronounced near the poles.

Between 1986, when Croasdale took the reins of Imperial's frontier research team, until 1992, when he left the company, his team of engineers and scientists used the global circulation models developed by the Canadian Climate Centre and NASA's Goddard Institute for Space Studies to anticipate how climate change could affect a variety of operations in the Arctic.

These were the same models that — for the next two decades — Exxon's executives publicly dismissed as unreliable and based on uncertain science. As Chief Executive Lee Raymond explained at an annual meeting in 1999, future climate "projections are based on completely unproven climate models, or, more often, on sheer speculation."

One of the first areas the company looked at was how the Beaufort Sea could respond to a doubling of carbon dioxide in the atmosphere, which the models predicted would happen by 2050.

Greenhouse gases are rising "due to the burning of fossil fuels," Croasdale told an audience of engineers at a conference in 1991. "Nobody disputes this fact," he said, nor did anyone doubt those levels would double by the middle of the 21st century.

Using the models and data from a climate change report issued by Environment Canada, Canada's environmental agency, the team concluded that the Beaufort Sea's open water season — when drilling and exploration occurred — would lengthen from two months to three and possibly five months.

They were spot on.

Seismic lines are used to detect natural gas and other underground deposits on the frozen Beaufort Sea. (Tom Cohen / Associated Press)

In the years following Croasdale's conclusions, the Beaufort Sea has experienced some of the largest losses in sea ice in the Arctic and its open water season has increased significantly, according to Mark Serreze, a senior researcher at the National Snow and Ice Data Center in Boulder, Colo.

For instance, in Alaska's Chukchi Sea, west of the Beaufort, the season has been extended by 79 days since 1979, Serreze said.

An extended open water season, Croasdale said in 1992, could potentially reduce exploratory drilling and construction costs by 30% to 50%.

Members of the environmental group Greenpeace work to hang a banner protesting oil drilling at the Alyeska Pipeline Service Co.'s Valdez, Alaska terminal, on August 5, 1991. (Carey Anderson / Associated Press)

He did not recommend making investment decisions based on those scenarios, because he believed the science was still uncertain. However, he advised the company to consider and incorporate potential "negative outcomes," including a rise in the sea level, which could threaten onshore infrastructure; bigger waves, which could damage offshore drilling structures; and thawing permafrost, which could make the earth buckle and slide under buildings and pipelines.

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The most pressing concerns for the company centered on a 540-mile pipeline that crossed the Northwest Territories into Alberta, its riverside processing facilities in the remote town of Norman Wells, and a proposed natural gas facility and pipeline in the Mackenzie River Delta, on the shores of the Beaufort Sea.

The company hired Stephen Lonergan, a Canadian geographer from McMaster University, to study the effect of climate change there.

Lonergan used several climate models in his analysis, including the NASA model. They all concluded that things would get warmer and wetter and that those effects "cannot be ignored," he said in his report.

As a result, the company should expect "maintenance and repair costs to roads, pipelines and other engineering structures" to be sizable in the future, he wrote.

A warmer Arctic would threaten the stability of permafrost, he noted, potentially damaging the buildings, processing plants and pipelines that were built on the solid, frozen ground.

In addition, the company should expect more flooding along its riverside facilities, an earlier spring breakup of the ice pack, and more-severe summer storms.

But it was the increased variability and unpredictability of the weather that was going to be the company's biggest challenge, he said.

Record-breaking droughts, floods and extreme heat — the worst-case scenarios — were now events that not only were likely to happen, but could occur at any time, making planning for such scenarios difficult, Lonergan warned the company in his report. Extreme temperatures and precipitation "should be of greatest concern," he wrote, "both in terms of future design and ... expected impacts."

The fact that temperatures could rise above freezing on almost any day of the year got his superiors' attention. That "was probably one of the biggest results of the study and that shocked a lot of people," he said in a recent interview.

Lonergan recalled that his report came as somewhat of a disappointment to Imperial's management, which wanted specific advice on what action it should take to protect its operations. After presenting his findings, he remembered, one engineer said: "Look, all I want to know is: Tell me what impact this is going to have on permafrost in Norman Wells and our pipelines."

As it happened, J.F. "Derick" Nixon, a geotechnical engineer on Croasdale's team, was studying that question.

He looked at historical temperature data and concluded Norman Wells could grow about 0.2 degrees warmer every year. How would that, he wondered, affect the frozen ground underneath buildings and pipelines?

"Although future structures may incorporate some consideration of climatic warming in their design," he wrote in a technical paper delivered at a conference in Canada in 1991, "northern structures completed in the recent past do not have any allowance for climatic warming." The result, he said, could be significant settling.

Nixon said the work was done in his spare time and not commissioned by the company. However, Imperial "was certainly aware of my work and the potential effects on their buildings."

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Exxon Mobil declined to respond to requests for comment on what steps it took as a result of its scientists' warnings. According to Flannery, the company's in-house climate expert, much of the work of shoring up support for the infrastructure was done as routine maintenance.

"You build it into your ongoing system and it becomes a part of what you do," he said.

Today, as Exxon's scientists predicted 25 years ago, Canada's Northwest Territories has experienced some of the most dramatic effects of global warming. While the rest of the planet has seen an average increase of roughly 1.5 degrees in the last 100 years, the northern reaches of the province have warmed by 5.4 degrees and temperatures in central regions have increased by 3.6 degrees.

Since 2012, Exxon Mobil and Imperial have held the rights to more than 1 million acres in the Beaufort Sea, for which they bid $1.7 billion in a joint venture with BP. Although the companies have not begun drilling, they requested a lease extension until 2028 from the Canadian government a few months ago. Exxon Mobil declined to comment on its plans there.

Croasdale said the company could be "taking a gamble" the ice will break up soon, finally bringing about the day he predicted so long ago — when the costs would become low enough to make Arctic exploration economical.

Amy Lieberman and Elah Feder contributed to this report.

Coast Guard crew members at work on a mission with NASA to study changing Arctic conditions. Exxon has used such studies to help plan future operations. (NASA / Kathryn Hansen / Rex Features)

Contact the reporters (mailto:environment@latimes.com?Subject=What%20Exxon%20knew)

About this story: Over the last year, the Energy and Environmental Reporting Project at Columbia University's Graduate School of Journalism, with the Los Angeles Times, has been researching the gap between Exxon Mobil's public position and its internal planning on the issue of climate change. As part of that effort, reporters reviewed hundreds of documents housed in archives in Calgary's Glenbow Museum and at the University of Texas. They also reviewed scientific journals and interviewed dozens of experts, including former Exxon Mobil employees. This is the first in a series of occasional articles.

The Energy and Environmental Reporting Project is supported by the Energy Foundation, Open Society Foundations, Rockefeller Brothers Fund, Rockefeller Family Fund, Lorana Sullivan Foundation and the Tellus Mater Foundation. The funders have no involvement in or influence over the articles produced by project fellows in collaboration with The Times.

Get more details on the project, including its funding >> (http://bit.ly/1NjrN3M)

Additional credits: Digital producer: Evan Wagstaff (https://twitter.com/evanwagstaff). Lead photo caption: Ice in the Chukchi Sea breaks up in open water season, making oil exploration cheaper and easier.

EXHIBIT 24

EXXON: THE ROAD NOT TAKEN

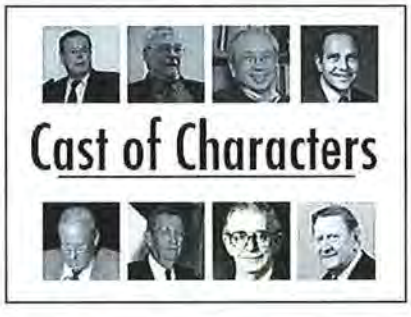
9 34

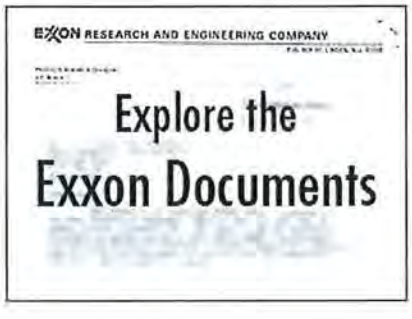
Exxon's Own Research Confirmed Fossil Fuels' Role in Global Warming Decades Ago

Top executives were warned of possible catastrophe from greenhouse effect, then led efforts to block solutions.

BY NEELA BANERJEE, LISA SONG AND DAVID HASEMYER

SEP 16, 2015





ABOUT THIS SERIES

After eight months of investigation, InsideClimate News presents this multi-part history of Exxon's

Exxon's Richard Werthamer (right) and Edward Garvey (left) are aboard the company's Esso Atlantic tanker working on a project to measure the carbon dioxide levels in the ocean and atmosphere. The project ran from 1979 to 1982. (Credit: Richard Werthamer)

At a meeting in Exxon Corporation's headquarters, a senior company scientist named James F. Black addressed an audience of powerful oilmen. Speaking without a text as he flipped through detailed slides, Black delivered a sobering message: carbon dioxide from the world's use of fossil fuels would warm the planet and could eventually endanger humanity.

"In the first place, there is general scientific agreement that the most likely manner in which mankind is influencing the global climate is through carbon dioxide release from the burning of fossil fuels," **Black** told Exxon's Management Committee, according to a written version he recorded later.

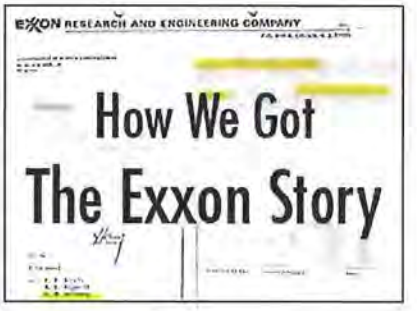
It was July 1977 when Exxon's leaders received this blunt assessment, well before most of the world had heard of the looming climate crisis.

A year later, Black, a top technical expert in Exxon's Research & Engineering division, took an updated version of his presentation to a broader audience. He warned Exxon scientists and managers that independent researchers estimated a doubling of the carbon dioxide (CO_2) concentration in the

engagement with the emerging science of climate change. The story spans four decades, and is based on primary sources including internal company files dating back to the late 1970s, interviews with former company employees, and other evidence, much of which is being published here for the first time.

It describes how Exxon conducted cutting-edge climate research decades ago and then, without revealing all that it had learned, worked at the forefront of climate denial, manufacturing doubt about the scientific consensus that its own scientists had confirmed.

Find the entire project here.



atmosphere would increase average global temperatures by 2 to 3 degrees Celsius (4 to 5 degrees Fahrenheit), and as much as 10 degrees Celsius (18 degrees Fahrenheit) at the poles. Rainfall might get heavier in some regions, and other places might turn to desert.

"Some countries would benefit but others would have their agricultural output reduced or destroyed," Black said, in the written summary of his 1978 talk.

His presentations reflected uncertainty running through scientific circles about the details of climate change, such as the role the oceans played in absorbing emissions. Still, Black estimated quick action was needed. "Present thinking," he wrote in the 1978 summary, "holds that man has a time window of five to ten years before the need for hard decisions regarding changes in energy strategies might become critical."

Exxon responded swiftly. Within months the company launched its own extraordinary research into carbon dioxide from fossil fuels and its impact on the earth. Exxon's ambitious program included both empirical CO_2 sampling and rigorous climate modeling. It assembled a brain trust that would spend more than a decade deepening the company's understanding of an environmental problem that posed an existential threat to the oil business.

Then, toward the end of the 1980s, **Exxon curtailed its carbon dioxide research.** In the decades that followed, Exxon worked instead at the forefront of climate denial. It put its muscle behind efforts to manufacture doubt about the reality of global warming its own scientists had once confirmed. It lobbied to block federal and international action to control greenhouse gas emissions. It helped to erect a vast edifice of misinformation that stands to this day.

Timeline

1977

Exxon: The Road Not Taken

Exxon's Legacy of 'No': 25 Years of Rejecting Shareholders' Climate Concerns

Watch the video from FRONTLINE

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Exxon Believed Deep Dive Into Climate Research Would Protect Its Business

Exxon Confirmed Global Warming Consensus in 1982 with In-House Climate Models

ExxonMobil Faces Heightened Risk of Climate Litigation, Its Critics Say

This untold chapter in Exxon's history, when one of the world's largest energy companies worked to understand the damage caused by fossil fuels, stems from an eight-month investigation by InsideClimate News. ICN's reporters interviewed former Exxon employees, scientists, and federal officials, and consulted hundreds of pages of internal Exxon documents, many of them written between 1977 and 1986, during the heyday of Exxon's innovative climate research program. ICN combed through thousands of documents from archives including those held at the University of Texas-Austin, the Massachusetts Institute of Technology and the American Association for the Advancement of Science.

The documents record budget requests, research priorities, and debates over findings, and reveal the arc of Exxon's internal attitudes and work on climate and how much attention the results received.

Reporter Neela Banerjee on Exxon an...

Of particular significance was a project launched in August 1979, when the company outfitted a supertanker with custom-made instruments. The project's mission was to sample carbon dioxide in the air and ocean along a route from the Gulf of Mexico to the Persian Gulf.

In 1980, Exxon assembled a team of climate modelers who investigated fundamental questions about the climate's sensitivity to the buildup of carbon dioxide in the air. Working with university scientists and the U.S. Department of Energy, Exxon

strove to be on the cutting edge of inquiry into what was then called the greenhouse effect.

Exxon's early determination to understand rising carbon dioxide levels grew out of a corporate culture of farsightedness, former employees said. They described a company that continuously examined risks to its bottom line, including environmental factors. In the 1970s, Exxon modeled its research division after Bell Labs, staffing it with highly accomplished scientists and engineers.

In written responses to questions about the history of its research, ExxonMobil spokesman Richard D. Keil said that "from the time that climate change first emerged as a topic for scientific study and analysis in the late 1970s, ExxonMobil has committed itself to scientific, fact-based analysis of this important issue."

"At all times," he said, "the opinions and conclusions of our scientists and researchers on this topic have been solidly within the mainstream of the consensus scientific opinion of the day and our work has been guided by an overarching principle to follow where the science leads. The risk of climate change is real and warrants action."

At the outset of its climate investigations almost four decades ago, many Exxon executives, middle managers and scientists armed themselves with a sense of urgency and mission.

One manager at Exxon Research, **Harold N. Weinberg**, shared his "grandiose thoughts" about Exxon's potential role in climate research in a March 1978 internal company memorandum that read: "This may be the kind of opportunity that we are looking for to have Exxon technology, management and leadership resources put into the context of a project aimed at benefitting mankind."

His sentiment was echoed by **Henry Shaw**, the scientist leading the company's nascent carbon

dioxide research effort.

"Exxon must develop a credible scientific team that can critically evaluate the information generated on the subject and be able to carry **bad news**, if any, to the corporation," Shaw wrote to his boss **Edward E. David**, the president of Exxon Research and Engineering in 1978. "This team must be recognized for its excellence in the scientific community, the government, and internally by Exxon management."

Irreversible and Catastrophic

Exxon budgeted more than $1 million over three years for the tanker project to measure how quickly the oceans were taking in CO_2. It was a small fraction of Exxon Research's annual $300 million budget, but the question the scientists tackled was one of the biggest uncertainties in climate science: how quickly could the deep oceans absorb atmospheric CO_2? If Exxon could pinpoint the answer, it would know how long it had before CO_2 accumulation in the atmosphere could force a transition away from fossil fuels.

Exxon also hired scientists and mathematicians to develop better climate models and publish research results in peer-reviewed journals. By 1982, the company's own scientists, collaborating with outside researchers, created rigorous climate models – computer programs that simulate the workings of the climate to assess the impact of emissions on global temperatures. They confirmed an emerging

scientific consensus that warming could be even worse than Black had warned five years earlier.

Between 1979 and 1982, Exxon researchers sampled carbon dioxide levels aboard the company's Esso Atlantic tanker (shown here).

Exxon's research laid the groundwork for a **1982 corporate primer** on carbon dioxide and climate change prepared by its environmental affairs office. Marked "not to be distributed externally," it contained information that "has been given wide circulation to Exxon management." In it, the company recognized, despite the many lingering unknowns, that heading off global warming "would require major reductions in fossil fuel combustion."

Unless that happened, "there are some potentially catastrophic events that must be considered," the primer said, citing independent experts. "Once the effects are measurable, they might not be reversible."

The Certainty of Uncertainty

Like others in the scientific community, Exxon researchers acknowledged the uncertainties surrounding many aspects of climate science, especially in the area of forecasting models. But they saw those uncertainties as questions they wanted to address, not an excuse to dismiss what was increasingly understood.

"Models are controversial," **Roger Cohen**, head of theoretical sciences at Exxon Corporate Research Laboratories, and his colleague, Richard Werthamer, senior technology advisor at Exxon Corporation, wrote in a May 1980 status report on Exxon's climate modeling program. "Therefore, there are research opportunities for us."

When Exxon's researchers confirmed information the company might find troubling, they did not sweep it under the rug.

"Over the past several years a clear scientific consensus has emerged," Cohen wrote in September 1982, reporting on Exxon's own analysis of climate models. It was that a doubling of the carbon dioxide blanket in the atmosphere would produce average global warming of 3 degrees Celsius, plus or minus 1.5 degrees C (equal to 5 degrees Fahrenheit plus or minus 1.7 degrees F).

"There is unanimous agreement in the scientific community that a temperature increase of this magnitude would bring about significant changes in the earth's climate," he wrote, "including rainfall distribution and alterations in the biosphere."

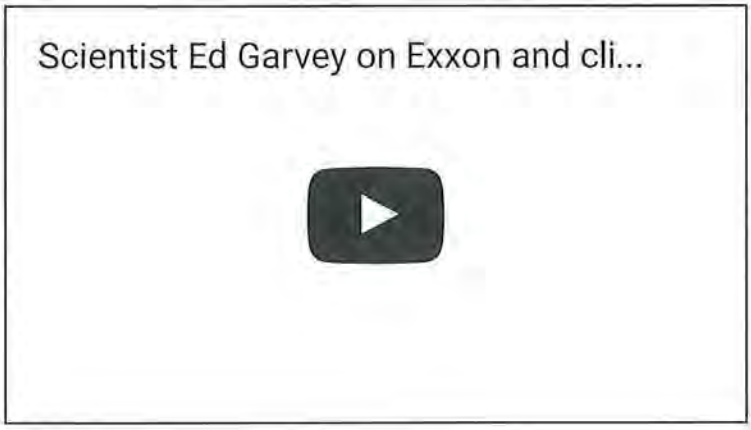
He warned that publication of the company's conclusions might attract media attention because of the "connection between Exxon's major business and the role of fossil fuel combustion in contributing to the increase of atmospheric CO_2."

Nevertheless, he recommended publication.

Our "ethical responsibility is to permit the publication of our research in the scientific literature," Cohen wrote. "Indeed, to do otherwise would be a breach of Exxon's public position and ethical credo on honesty and integrity."

Exxon followed his advice. Between 1983 and 1984, its researchers published their results in at least three peer-reviewed papers in *Journal of the*

Atmospheric Sciences and an American Geophysical Union monograph.



David, the head of Exxon Research, **told a global warming conference** financed by Exxon in October 1982 that "few people doubt that the world has entered an energy transition away from dependence upon fossil fuels and toward some mix of renewable resources that will not pose problems of CO_2 accumulation." The only question, he said, was how fast this would happen.

But the challenge did not daunt him. "I'm generally upbeat about the chances of coming through this most adventurous of all human experiments with the ecosystem," David said.

Exxon considered itself unique among corporations for its carbon dioxide and climate research. The company boasted in a January 1981 report, "Scoping Study on CO_2," that no other company appeared to be conducting similar in-house research into carbon dioxide, and it swiftly gained a reputation among outsiders for genuine expertise.

"We are very pleased with Exxon's research intentions related to the CO_2 question. This represents very responsible action, which we hope will serve as a model for research contributions from the corporate sector," said David Slade, manager of the federal government's carbon dioxide research program at the Energy Department, in a May 1979 letter to Shaw. "This is

truly a national and international service."

Business Imperatives

In the early 1980s Exxon researchers often repeated that unbiased science would give it legitimacy in helping shape climate-related laws that would affect its profitability.

Still, corporate executives remained cautious about what they told Exxon's shareholders about global warming and the role petroleum played in causing it, a review of federal filings shows. The company did not elaborate on the carbon problem in annual reports filed with securities regulators during the height of its CO_2 research.

Nor did it mention in those filings that concern over CO_2 was beginning to influence business decisions it was facing.

Throughout the 1980s, the company was worried about developing an enormous gas field off the coast of Indonesia because of the vast amount of CO_2 the unusual reservoir would release.

Exxon was also concerned about reports that synthetic oil made from coal, tar sands and oil shales could significantly boost CO_2 emissions. The company was banking on synfuels to meet growing demand for energy in the future, in a world it believed was running out of conventional oil.

In the mid-1980s, after an unexpected oil glut caused prices to collapse, Exxon cut its staff deeply to save money, including many working on climate. But the climate change problem remained, and it was becoming a more prominent part of the political landscape.

"Global Warming Has Begun, Expert Tells Senate," declared the headline of a June 1988 New York Times article describing the Congressional testimony of NASA's James Hansen, a leading climate expert.

Hansen's statements compelled Sen. Tim Wirth (D-Colo.) to declare during the hearing that "Congress must begin to consider how we are going to slow or halt that warming trend."

With alarm bells suddenly ringing, Exxon started financing efforts to amplify doubt about the state of climate science.

Exxon helped to found and lead the Global Climate Coalition, an alliance of some of the world's largest companies seeking to halt government efforts to curb fossil fuel emissions. Exxon used the American Petroleum Institute, right-wing think tanks, campaign contributions and its own lobbying to push a narrative that climate science was too uncertain to necessitate cuts in fossil fuel emissions.

As the international community moved in 1997 to take a first step in curbing emissions with the Kyoto Protocol, Exxon's chairman and CEO **Lee Raymond** argued to stop it.

"Let's agree there's a lot we really don't know about how climate will change in the 21st century and beyond," Raymond said in his speech before the World Petroleum Congress in Beijing in October 1997.

"We need to understand the issue better, and fortunately, we have time," he said. "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."

Over the years, several Exxon scientists who had confirmed the climate consensus during its early research, including Cohen and David, took Raymond's side, publishing views that ran contrary to the scientific mainstream.

Paying the Price

Exxon's about-face on climate change earned the

scorn of the scientific establishment it had once courted.

In 2006, the Royal Society, the United Kingdom's science academy, sent a harsh letter to Exxon accusing it of being "inaccurate and misleading" on the question of climate uncertainty. Bob Ward, the Academy's senior manager for policy communication, demanded that Exxon stop giving money to dozens of organizations he said were actively distorting the science.

In 2008, under mounting pressure from activist shareholders, the company announced it would end support for some prominent groups such as those Ward had identified.

Still, the millions of dollars Exxon had spent since the 1990s on climate change deniers had long surpassed what it had once invested in its path-breaking climate science aboard the *Esso Atlantic*.

"They spent so much money and they were the only company that did this kind of research as far as I know," **Edward Garvey**, who was a key researcher on Exxon's oil tanker project, said in a recent interview with InsideClimate News and Frontline. "That was an opportunity not just to get a place at the table, but to lead, in many respects, some of the discussion. And the fact that they chose not to do that into the future is a sad point."

Michael Mann, director of the Earth System Science Center at Pennsylvania State University, who has been a frequent target of climate deniers, said that inaction, just like actions, have consequences. When he recently spoke to InsideClimate News, he was unaware of this chapter in Exxon's history.

"All it would've taken is for one prominent fossil fuel CEO to know this was about more than just shareholder profits, and a question about our legacy," he said. "But now because of the cost of inaction—what I call the 'procrastination penalty'—

we face a far more uphill battle."

*Click here for **Part II**, an accounting of Exxon's early climate research; **Part III**, a review of Exxon's climate modeling efforts; **Part IV**, a dive into Exxon's Natuna gas field project; **Part V**, a look at Exxon's push for synfuels; **Part VI**, an accounting of Exxon's emphasis on climate science uncertainty.*

ICN staff members Zahra Hirji, Paul Horn, Naveena Sadasivam, Sabrina Shankman and Alexander Wood also contributed to this report.

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EXXON: THE ROAD NOT TAKEN

Exxon Believed Deep Dive Into Climate Research Would Protect Its Business

Outfitting its biggest supertanker to measure the ocean's absorption of carbon dioxide was a crown jewel in Exxon's research program.

NEELA BANERJEE, LISA SONG, DAVID HASEMYER

SEP 17, 2015

ABOUT THIS SERIES

After eight months of investigation, InsideClimate News presents this multi-part history of Exxon's engagement with the emerging science of climate change. The story spans four decades, and is based on primary sources including internal company files dating back to the late

Researchers conducted Exxon's first climate-related project aboard the Esso Atlantic tanker, pictured here, between 1979 and 1982.

In 1981, 12-year-old Laura Shaw won her seventh-grade science fair at the Solomon Schechter Day School in Cranford, N.J. with a project on the greenhouse effect.

For her experiment, Laura used two souvenir miniatures of the Washington Monument, each with a thermometer attached to one side. She placed them in glass bowls and covered one with plastic wrap – her model of how a blanket of carbon dioxide traps the reflected heat of the sun and warms the Earth. When she turned a lamp on them, the thermometer in the plastic-covered bowl showed a higher temperature than the one in the uncovered bowl.

If Laura and her two younger siblings were unusually well-versed in the emerging science of the greenhouse effect, as global warming was known, it was because their father, **Henry Shaw**, had been busily tracking it for Exxon Corporation.

Henry Shaw, a former Exxon scientist, and his son David Shaw. (Credit: Family of Henry Shaw)

"I knew what the greenhouse effect was before I knew what an actual greenhouse was," David Shaw,

1970s, interviews with former company employees, and other evidence, much of which is being published here for the first time.

It describes how Exxon conducted cutting-edge climate research decades ago and then, without revealing all that it had learned, worked at the forefront of climate denial, manufacturing doubt about the scientific consensus that its own scientists had confirmed.

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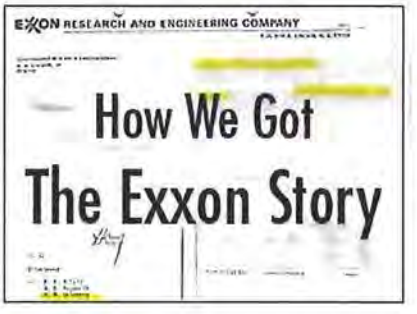
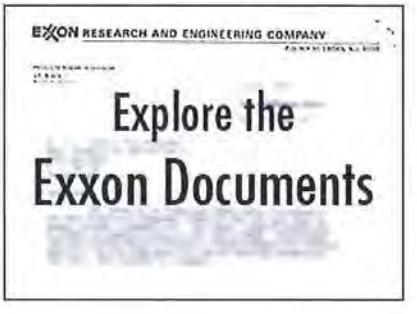




Henry's son, said in a recent interview.

Henry Shaw, who died in 2003, was one of the Exxon scientists engaged in an ambitious quest to comprehend the potentially devastating effects that carbon dioxide emissions could have on the climate. From the late 1970s to the mid-80s, Exxon scientists worked at the cutting edge of climate change research, documents examined by InsideClimate News show. This history of that research emerged from an eight-month investigation by InsideClimate News.

Exxon documents show that top corporate managers were aware of their scientists' early conclusions about carbon dioxide's impact on the climate. They reveal that scientists warned management that policy changes to address climate change might affect profitability. After a decade of frank internal discussions on global warming and conducting unbiased studies on it, Exxon changed direction in 1989 and spent more than 20 years discrediting the research its own scientists had once confirmed.

After reading the first chapter of InsideClimate News' series on Exxon's carbon dioxide research, the company declined to answer specific questions. In an email, Exxon spokesman Richard D. Keil said he would no longer respond to inquiries from InsideClimate News, and added, "ExxonMobil scientists have been involved in climate research and related policy analysis for more than 30 years, yielding more than **50 papers in peer-reviewed publications**."

Building the Team

Henry Shaw was part of an accomplished group at Exxon tasked with studying the greenhouse effect. In the mid-70s, documents show that Shaw was responsible for seeking out new projects that were "of national significance," and that could win federal funding. Others included **Edward E. David, Jr.**, a

former science advisor to President Richard Nixon, and **James F. Black**, who worked on hydrogen bomb research at Oak Ridge National Laboratory in the 1950s.

Black, who died in 1988, was among the first Exxon scientists to become acquainted with the greenhouse effect. Esso, as Exxon was known when he started, allowed him to pursue personal scientific interests. Black was fascinated by the idea of intentionally modifying weather to improve agriculture in arid countries, said his daughter, Claudia Black-Kalinsky.

"He believed that big science could save the world," she said. In the early 1960s, Black helped draft a National Academy of Sciences report on weather and climate modification. Published in 1966, it said **the buildup of carbon dioxide in the atmosphere** "agrees quite well with the rate of its production by man's consumption of fossil fuels."

In the same period, a report for President Lyndon Johnson from the President's Science Advisory Council in 1965 said the burning of fossil fuels "may be sufficient to produce measurable and perhaps marked changes in climate" by the year 2000.

By 1977, Black had become a top technical expert at Exxon Research & Engineering, a research hub based in Linden, N.J., and a science advisor to Exxon's top management. **That year he made a presentation** to the company's leading executives warning that carbon dioxide accumulating in the upper atmosphere would warm the planet and if the CO_2 concentration continued to rise, it could harm the environment and humankind.

"The management committee consisted of the top level senior managers at Exxon. The chairman, the president, the senior vice presidents, corporate wide," **N. Richard Werthamer**, who worked at Exxon Research, said in a recent interview with InsideClimate News. "The management committee

only has a limited amount of time and they're only going to deal with issues that are of relevance to the corporation as a whole. They're not interested in science per se, they are interested in the implications, so it was very significant."

In those years, the evidence of global warming justified neither panic nor complacency. "A lively sense of urgency," is what the National Academy of Sciences (NAS) **called for in a 1977 report** that contained a comprehensive survey of what was understood about global warming at that time.

The NAS report said that it would be understandable if the uncertainties of climate science elicited a cautious response from researchers and policymakers. But "if the decision is postponed until the impact of man-made climate changes has been felt, then, for all practical purposes, the die will already have been cast," it concluded.

Shaw heard these conclusions in October 1977 at a meeting in Atlanta organized by scientists and officials from the Carter administration who had formed a "study group on global environmental effects of carbon dioxide," **he told Exxon colleagues in a memo two weeks later**.

The NAS report had concluded that the climatic effects of rising carbon dioxide "may be the primary limiting factor on energy production from fossil fuels over the next few centuries," Shaw wrote, quoting the report's central conclusion almost verbatim.

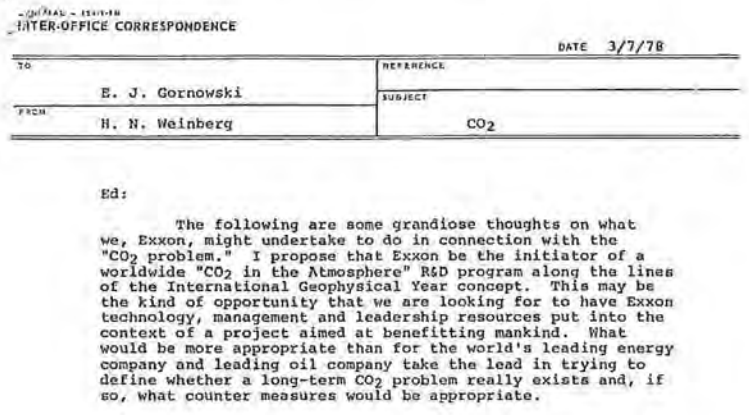
Along with an awareness of the science, Shaw gained a sense of opportunity, Exxon documents show. The U.S. Energy Department, which had only been created in 1977 in response to a global oil shortage, was launching a research program into carbon dioxide's effects and planned to disburse about $9 million to research laboratories, Shaw learned.

At the time, two major uncertainties plagued climate

science: how much of the CO_2 in the air came from fossil fuels as opposed to deforestation? And how quickly could the oceans absorb atmospheric CO_2? The scientists at the Atlanta meeting considered it crucial to investigate those questions immediately, Shaw wrote.

Both issues were vital to the oil industry's future. If deforestation played as great a role as fossil fuels in CO_2 accumulation, then responsibility for reducing carbon dioxide emissions would not fall entirely on the energy industry. If the oceans could slow the greenhouse effect by absorbing more CO_2, there would be time before the fossil fuel industry had to adjust.

In a **memo to a colleague in March 1978**, one of Shaw's bosses, **Harold N. Weinberg**, wrote: "I propose that Exxon be the initiator of a worldwide 'CO_2 in the Atmosphere' R&D program...What would be more appropriate than for the world's leading energy company and leading oil company [to] take the lead in trying to define whether a long-term CO_2 problem really exists, and if so, what counter measures would be appropriate."



INTER-OFFICE CORRESPONDENCE

DATE 3/7/78

TO: E. J. Gornowski

FROM: H. N. Weinberg

REFERENCE:

SUBJECT: CO_2

Ed:

The following are some grandiose thoughts on what we, Exxon, might undertake to do in connection with the "CO_2 problem." I propose that Exxon be the initiator of a worldwide "CO_2 in the Atmosphere" R&D program along the lines of the International Geophysical Year concept. This may be the kind of opportunity that we are looking for to have Exxon technology, management and leadership resources put into the context of a project aimed at benefitting mankind. What would be more appropriate than for the world's leading energy company and leading oil company take the lead in trying to define whether a long-term CO_2 problem really exists and, if so, what counter measures would be appropriate.

But Weinberg's vision proved too ambitious for Exxon.

Exxon Research "considered an independent research program but concluded that the amount of effort required and the scope of disciplines involved made it impractical for a single institution to attack

this problem alone," Walter R. Eckelmann, an executive at the Science & Technology Department at Exxon headquarters in New York wrote to a senior vice president.

Eckelmann's letter was one of many instances when Exxon's CO_2 research would reach beyond Exxon Research & Engineering in New Jersey and to executives at the company's New York headquarters, documents show.

Exxon's extensive research was driven by the threat accumulating CO_2 posed to the company's core business, according to participants and documents.

"My guess is they were looking for what might happen if we keep burning fossil fuels; what that would mean to them," said **Taro Takahashi**, an adjunct professor at Columbia University's Lamont-Doherty Earth Observatory. Takahashi, who spent his career studying climate change, collaborated on a research project with Exxon in the late 1970s to early 80s and used data from the research in several studies he later published in peer-reviewed journals.

The project he worked on—outfitting an ocean tanker to measure the ocean's absorption of carbon dioxide—was a crown jewel in Exxon's research program.

Groundbreaking Experiments

Bold research projects were not uncommon at Exxon, which in the 1970s considered gradually shifting from oil to become a diversified energy company. Through its research units, Exxon explored ways to encourage more efficient consumption of petroleum and a wide range of alternative fuels. After company scientist Elliot Berman found a way to slash the cost of making photovoltaic solar cells by 80 percent, Exxon's chairman Clifton Garvin publicized how he heated his family swimming pool with solar power to show support for energy diversification.

To nudge greater innovation, Garvin hired Edward E. David, Jr. in 1977 to run Exxon Research. David had spent two decades at Bell Labs, a leader in the blue-sky research that led to big leaps in technology, and eventually became its director of research. While serving as Nixon's science advisor from 1970-'73, White House staff taught him about climate science as part of a report on energy and electricity issues, one former staff member recalled.

At Exxon, David opened the door wide to studying carbon dioxide.

In a letter to David and 14 other Exxon Research executives in December 1978, Shaw spelled out why Exxon should take on carbon dioxide research—specifically, with the ambitious ocean-sampling initiative.

"The rationale for Exxon's involvement and commitment of funds and personnel is based on our need to assess the possible impact of the greenhouse effect on Exxon business," Shaw wrote. "Exxon must develop a credible scientific team that can critically evaluate the information generated on the subject and be able to carry bad news, if any, to the corporation.

"We see no better method to acquire the necessary reputation than by attacking one of the major uncertainties in the global CO_2 balance, i.e., the flux to the oceans and providing the necessary data."

Scientists knew the oceans had some ability to absorb CO_2 and potentially neutralize climate change. Any CO_2 that made its way from the atmosphere into the deep oceans—more than 50 to 100 feet below the surface—would be sequestered away for hundreds of years. But they also knew the rate of absorption was limited, and determining the exact rate was crucial for understanding the oceans' ability to delay the greenhouse effect.

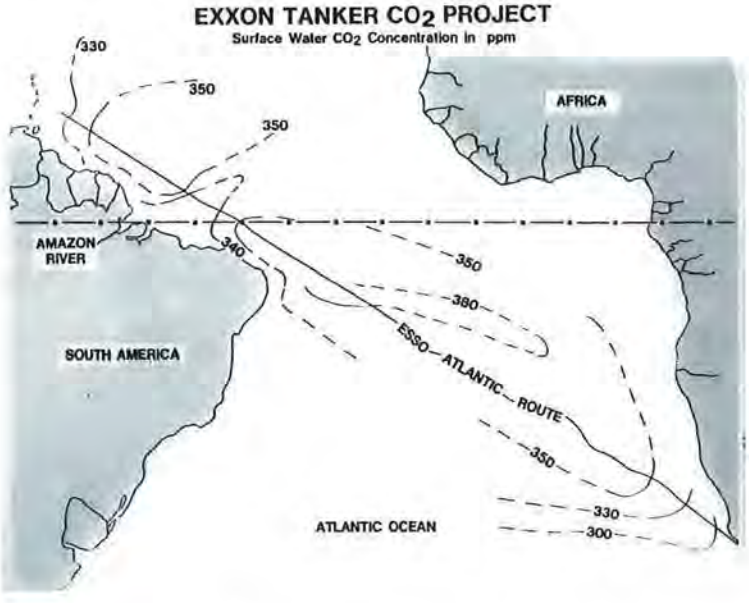
Exxon's Floating Lab

Exxon delved into the oceans' role by installing a state-of-the-art lab aboard the *Esso Atlantic,* one of the biggest supertankers of the time.

Exxon planned to gather atmospheric and oceanic CO_2 samples along the *Esso Atlantic's* route from the Gulf of Mexico to the Persian Gulf. If the sensors revealed a deep enough oceanic sink, or absorption, the fossil fuel industry might have more time before it had to make tough decisions about its role in warming the planet.

"We couldn't account for everything because the exchanges between the atmosphere and the oceans weren't fully understood," Edward Garvey, Shaw's main researcher on the tanker project, said in an interview. "Our goal was to complete the carbon cycle to understand where global carbon production would end up and then make forecasts of how the system would react in the future."

The experiment began on August 8, 1979, when Garvey oversaw the equipping of the *Esso Atlantic,* which was docked by the Lago Refinery in Aruba, an island in Dutch West Indies.



The route of Exxon's Esso Atlantic tanker.

Werthamer, Shaw's boss in 1980-81, said the project

wouldn't have happened without Shaw's initiative.

"Henry Shaw was a very forceful guy, quiet, he didn't hit you over the head, but he presented his case in ways that made it hard to not agree with it," Werthamer said in a recent interview. "He had the political savvy to put it over and the technical savvy to make it happen."

While the company had the wherewithal to carry out the study on the oceans, it lacked the expertise. So Exxon recruited two experts, **Wallace Broecker and Takahashi**, his colleague at Columbia University's Lamont-Doherty Geological Observatory.

Takahashi said he made it clear that he and **Broecker** would not compromise their scientific integrity. "The one condition that was not negotiable was we shall publish our results to the open public no matter the results," he said in an interview.

Exxon scientists and managers involved with the project agreed.

"The tanker project was intended to provide valid, legitimate, scientific data, unassailable hopefully, on key questions in atmospheric chemistry [of] CO_2 emissions," Werthamer said. "Henry's additional goal was to make Exxon a credible participant in that research and in the dialogue that would inevitably follow...He wanted Exxon to be respected as a valid player and have Exxon's opinions solicited, and participate in discussions on policy, rather than have the issue suddenly dumped with Exxon's back turned."

Responding to ICN's questions about the tanker research last week, Exxon spokesman Richard Keil said it "was actually aimed at increasing understanding of the marine carbon cycle – it had nothing to do with CO_2 emissions."

But from the beginning of the research, documents show, its participants described it differently.

In a memo to Harold Weinberg on July 3, 1979, Shaw described in detail the tanker's route and its instruments, explaining that "this will provide information on the possible growth of CO_2 in the atmosphere."

In a **November 1979 memo** to Weinberg, he wrote, "It behooves us to start a very aggressive defensive program in the indicated areas of atmospheric science and climate because there is a good probability that legislation affecting our business will be passed."

Depending on its findings, the research might provide an escape valve from the carbon problem, or point to some new direction in energy.

The research "could well influence Exxon's view about the long-term attractiveness of coal and synthetics relative to nuclear and solar energy" David wrote in a November 1979 letter to senior vice president **George T. Piercy**.

Exxon's enthusiasm for the project flagged in the early '80s when federal funds fell through. Exxon Research cancelled the tanker project in 1982, but not before Garvey, Shaw and other company engineers **published an initial paper in a highly specialized journal** on the project's methodology.

"We were anxious to get the word out that we were doing this study," Garvey said of the paper, which did not reach sweeping conclusions. "The paper was the first of what we hoped to be many papers from the work," he said in a recent email. But the other publications never materialized.

Takahashi later **co-authored a study in 1990** partially based on the tanker data that said land-based ecosystems—boreal forests, for example—absorbed more atmospheric CO_2 than the oceans. He used Exxon's tanker records again in 2009, **in an updated study that compiled** 30 years of oceanic CO_2 data from dozens of reports. This time, his team

concluded the oceans absorb only about 20 percent of the CO_2 emitted annually from fossil fuels and other human activities. The paper earned Takahashi a "Champions of the Earth" prize from the United Nations.

Columbia scientist Taro Takahashi helped review and process the climate-related data collected aboard Exxon's Esso Atlantic tanker. (Credit: Taro Takahashi)

Other research ideas that bubbled up in those days were even more imaginative.

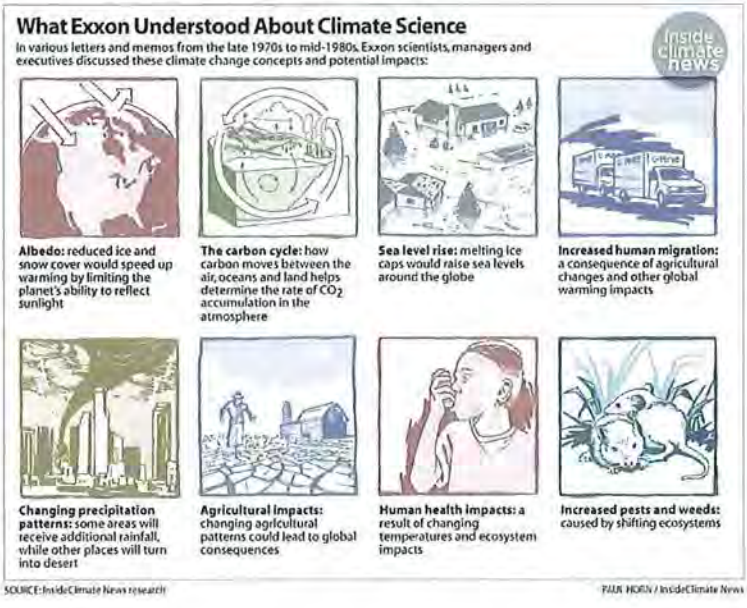
Shaw and Garvey sketched out a second project to determine how much carbon dioxide in the atmosphere was attributable to fossil fuels as compared to deforestation. Shaw's team proposed measuring the carbon isotopes—a chemical fingerprint—in 100 bottles of vintage French wine over time. To ensure data quality, they would only sample wine from long-established vineyards that kept careful records of temperatures and growing conditions. In the same file was a New York Times review by wine critic Frank Prial of classic Bordeaux vintages, including a $300 Lafite-Rothschild bottle from 1945.

"The C-isotope studies of biological material also appear useful and novel," David Slade, the head of

the Energy Department's carbon dioxide research, wrote to Shaw in a May 1979 letter. "We congratulate (with some envy) Exxon's resourcefulness in selecting aged wines as the biological material."

Implications Become Clearer

As Exxon worked to reduce the uncertainties of climate science, its employees developed a sophisticated understanding of the potential effects of rising CO_2 concentrations, documents show. They understood that the Earth's poles would warm more quickly than the rest of the planet, and how a reduction in ice and snow cover would change the planet's ability to reflect sunlight.



They also discussed among themselves and with corporate executives other potential effects of climate change, including an increase in weeds, pests, and human migration, the documents show.

Some of the company's highest-ranking executives were told of the studies and of estimates about when the impact of global warming might be felt. On November 9, 1979, Edward David wrote a three-page letter to senior vice president Piercy explaining the importance of the ocean investigations.

In January 1980, Science & Technology's Eckelmann wrote to senior vice president **M.E.J. "Morey" O'Loughlin** that his unit "feels that the build-up of carbon dioxide in the atmosphere is a potentially serious problem requiring the results of a huge worldwide research effort before quantitative predictions can be reached on the probabilities and timing of world climate changes."

Piercy and O'Loughlin seemed particularly interested in following the emerging climate science, **internal documents indicate**. In a memo to Werthamer and Shaw in June 1980, Weinberg wrote that Piercy "questioned him closely" at an Exxon meeting about the movement of carbon dioxide between the atmosphere and the oceans.

Outside Experts Take Notice

During this time, Exxon was building a reputation for expertise on carbon dioxide, prompting government and industry to seek its input on the issue. As early as 1979, the American Petroleum Institute formed a CO_2 and Climate Task Force, and Exxon sent Shaw to the group's meetings as its representative, according to documents. The other industry members were Sohio, Texaco, and Shell. They often met in a conference room at LaGuardia Airport.

Shaw was a regular on advisory committees and government task forces, rubbing shoulders with many leading climate scientists, including NASA's James Hansen and Columbia's Stephen Schneider, whom Exxon even considered as a possible recruit, according to one document.

U.S. government officials expressed their appreciation to Exxon for the company's contributions, calling it a valued partner.

In a letter to Shaw in May 1979, David Slade, the head of the Energy Department's Carbon Dioxide and Climate Research program, wrote: "This represents very responsible action, which we hope

will serve as a model for research contributions from the corporate sector."

Two years later, Slade's successor in President Ronald Reagan's administration, Frederick A. Koomanoff, wrote: "We feel that Exxon should be commended for their initiatives to investigate the carbon dioxide issue."

*Check out **Part I**, **Part III**, **Part IV**, **Part V** and **Part VI** of the series.*

ICN staff members Zahra Hirji, Paul Horn, Naveena Sadasivam, Sabrina Shankman and Alexander Wood also contributed to this report.

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PRINTER-FRIENDLY VERSION

EXXON: THE ROAD NOT TAKEN

Exxon Confirmed Global Warming Consensus in 1982 with In-House Climate Models

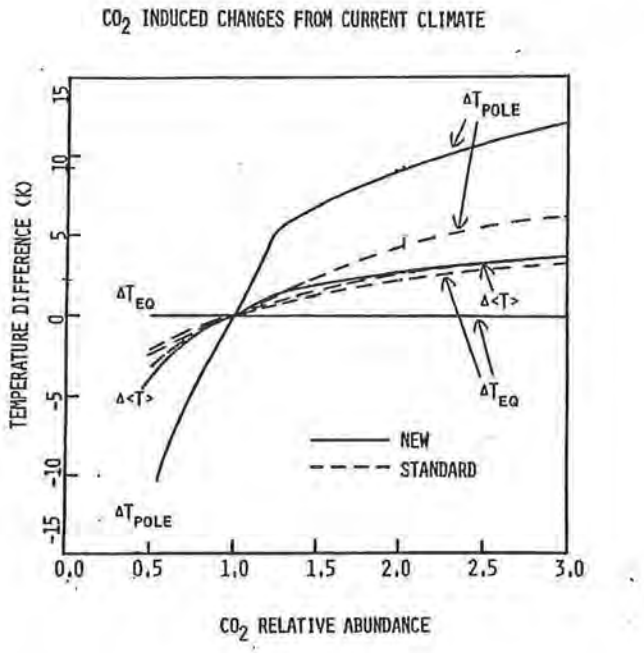
The company chairman would later mock climate models as unreliable while he campaigned to stop global action to reduce fossil fuel emissions.

LISA SONG, NEELA BANERJEE, DAVID HASEMYER

SEP 22, 2015

ABOUT THIS SERIES

After eight months of investigation, InsideClimate News presents this multi-part history of Exxon's



In 1982, Exxon scientist Andrew Callegari put together a presentation on Exxon modeling results including the chart pictured here.

Steve Knisely was an intern at Exxon Research and Engineering in the summer of 1979 when a vice president asked him to analyze how global warming might affect fuel use.

"I think this guy was looking for validation that the greenhouse effect should spur some investment in alternative energy that's not bad for the environment," Knisely, now 58 and a partner in a management consulting company, recalled in a recent interview.

Knisely projected that unless fossil fuel use was constrained, there would be "noticeable temperature changes" and 400 parts per million of carbon dioxide (CO_2) in the air by 2010, up from about 280 ppm before the Industrial Revolution. The summer intern's predictions turned out to be very close to the mark.

Knisely even concluded that the fossil fuel industry might need to leave 80 percent of its recoverable reserves in the ground to avoid doubling CO_2 concentrations, a notion **now known as the carbon**

engagement with the emerging science of climate change. The story spans four decades, and is based on primary sources including internal company files dating back to the late 1970s, interviews with former company employees, and other evidence, much of which is being published here for the first time.

It describes how Exxon conducted cutting-edge climate research decades ago and then, without revealing all that it had learned, worked at the forefront of climate denial, manufacturing doubt about the scientific consensus that its own scientists had confirmed.

Find the entire project here.

budget. In 2013, the United Nations' Intergovernmental Panel on Climate Change formally endorsed the idea.

"The potential problem is great and urgent," Knisely wrote. "Too little is known at this time to recommend a major U.S. or worldwide change in energy type usage but it is very clear that immediate research is necessary."

The report, which circulated within the company through the early 1980s, reflected Exxon's growing need to understand when the climate implications of increased CO_2 emissions would begin to spur policy changes.

So Exxon (now ExxonMobil) shelved an ambitious but costly program that sampled carbon dioxide in the oceans—the centerpiece of its climate research in the 1970s—as it created its own computerized climate models. The models aimed to simulate how the planet's climate system would react to rising CO_2 levels, relying on a combination of mathematics, physics, and atmospheric science.

Through much of the 1980s, Exxon researchers worked alongside university and government scientists to generate objective climate models that yielded papers published in peer-reviewed journals. Their work confirmed the emerging scientific consensus on global warming's risks.

Yet starting in 1989, Exxon leaders went down a different road. They repeatedly argued that the uncertainty inherent in computer models makes them useless for important policy decisions. Even as the models grew more powerful and reliable, Exxon publicly derided the type of work its own scientists had done. The company continued its involvement with climate research, but its reputation for objectivity began to erode as it campaigned internationally to cast doubt on the science.

This **eight-month InsideClimate News**

investigation details Exxon's early research into global warming, based on hundreds of pages of internal documents and interviews with former employees and scientists. The company declined to provide comment or answer questions for this article.

Brian Flannery. (Credit: © Academia Engelberg Foundation)

One scientist who crossed over from academia to Exxon Research was **Brian Flannery**, an associate professor of astronomy from Harvard and an expert in mathematical modeling. Flannery joined the company in 1980. At about the same time, Exxon hired **Andrew Callegari**, a mathematics professor at New York University. When the company shifted its focus to modeling in 1981, Callegari became head of the company's CO_2 research, replacing **Henry Shaw**, who had steered the ocean sampling project.

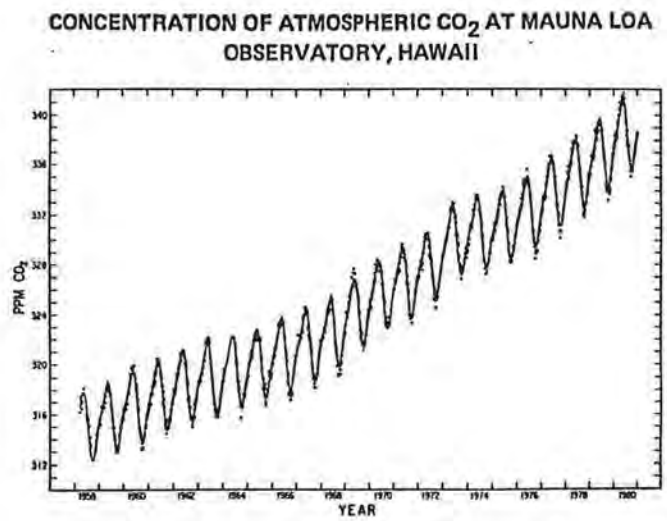
Callegari approached **Martin Hoffert**, an old colleague at NYU, to work with the Exxon team as a consultant on modeling. Hoffert jumped at the chance. He was already deeply concerned about the consequences of atmospheric carbon and saw the opportunity as an "all hands on deck" approach to heading off an environmental disaster.

"We were all interested as geek scientists at the time," Hoffert, who is now retired, recalled in a recent interview. "There were no divisions, no agendas."

Flannery and Callegari were "very legitimate research guys," Hoffert said. "We talked about the politics of this stuff a lot, but we always separated the politics from the science."

Climate 'Catastrophe' Foreseen

By 1981, Exxon scientists were no longer questioning whether the buildup of CO_2 would cause the world to heat up. Through their own studies and their participation in government-sponsored conferences, company researchers had concluded that rising CO_2 levels could create catastrophic impacts within the first half of the 21st century if the burning of oil, gas and coal wasn't contained.



A chart showing the increase in the growth rate of carbon dioxide measurements in Hawaii. Exxon scientists shared this chart in their documents discussing the company's climate modeling efforts.

"When I arrived there, I was quite surprised to discover that people in the research lab were very aware of the increase in the growth rate of carbon dioxide measurements in Hawaii [at the Mauna Loa observatory]," Morrel H. Cohen, a senior scientist at Exxon Research from 1981 to 1996, said in a recent interview. "They were very aware of the greenhouse effect."

As the researchers alerted Exxon's upper management about the CO_2 problem, the scientists worked to provide better estimates of when the warming trend would create noticeable damage, and how large the impacts might be.

One scientist, Werner Glass, wrote an analysis in 1981 for a senior vice president that said the rise in global temperatures would begin to be noticed in a few decades. But Glass hedged his bet, saying the magnitude of the change would be "well short of catastrophic" in the early years.

Exxon manager **Roger Cohen** saw things differently.

"I think that this statement may be too reassuring," Cohen, director of the Theoretical and Mathematical Sciences Laboratory at Exxon Research, **wrote in an August 18, 1981 memo to Glass.**

INTER-OFFICE CORRESPONDENCE

DATE August 18, 1981

TO	REFERENCE
W. Glass	SUBJECT
FROM R. W. Cohen	

I have looked over the draft of the EED reply to the request from O'Loughlin. The only real problem I have is with the second clause of the last sentence in the first paragraph: "but changes of a magnitude well short of catastrophic..." I think that this statement may be too reassuring. Whereas I can agree with the statement that our best guess is that observable effects in the year 2030 are likely to be "well short of catastrophic", it is distinctly possible that the CPD scenario will later produce effects which will indeed be catastrophic (at least for a substantial fraction of the earth's population). This is because the global ecosystem in 2030 might still be in a transient, headed for much more significant effects after time lags perhaps of the order of decades. If this indeed turns out to be case, it is very likely that we will unambiguously recognize the threat by the year 2000 because of advances in climate modeling and the beginning of real experimental confirmation of the CO_2 effect. The effects of such a recognition on subsequent fossil fuel combustion are unpredictable, but one can say that predictions based only on our knowledge of availability and economics become hazardous.

He called it "distinctly possible" that the projected warming trend after 2030 "will indeed be catastrophic (at least for a substantial fraction of the earth's population)."

Cohen continued: "This is because the global ecosystem in 2030 might still be in a transient, headed for much significant effects after time lags perhaps of the order of decades."

Cohen demonstrated a sophisticated understanding

of the climate system. He recognized that even if the impacts were modest in 2030, the world would have locked in enough CO_2 emissions to ensure more severe consequences in subsequent decades. By 2030, he warned, the damage could be irreversible.

Unanimous Agreement

"Over the past several years a clear scientific consensus has emerged regarding the expected climatic effects of increased atmospheric CO_2," **Cohen wrote to A.M. Natkin** of Exxon Corporation's Science and Technology Office in 1982. "The consensus is that a doubling of atmospheric CO_2 from its pre-industrial revolution value would result in an average global temperature rise of (3.0 ± 1.5)°C." (Equal to 5.4 ± 2.7°F).

"There is unanimous agreement in the scientific community that a temperature increase of this magnitude would bring about significant changes in the earth's climate, including rainfall distribution and alterations in the biosphere."

Exxon's own modeling research confirmed this and the company's results were later published in at least three peer-reviewed science articles. Two of them were **co-authored by Hoffert**, and a third was **written entirely by Flannery**.

Exxon's modeling experts also explained away the less-dire predictions of a 1979 study led by Reginald Newell, a prominent atmospheric scientist at the Massachusetts Institute of Technology. **Newell's model projected** that the effects of climate change would not be as severe as most scientists were predicting.

Specifically, Newell and a co-author from the Air Force named Thomas Dopplick challenged the prevailing view that a doubling of the earth's CO_2 blanket would raise temperatures about 3°C (5°F)– a measure known as climate sensitivity. Instead, they said the earth's true climate sensitivity was roughly

less than 1°C (2°F).

They based their results on a mechanism called "evaporative buffering," in which excess warming at the equator causes increased evaporation, cooling the planet in the same way that perspiration cools a marathon runner.

Exxon's research team disagreed. Even if the mechanism cooled the equator, the worldwide warming would still be higher, they found, according to the researchers' peer-reviewed studies.

"In summary, the results of our research are in accord with the scientific consensus on the effect of increased atmospheric CO_2 on climate," Cohen wrote in the 1982 letter he sent to Natkin.

Martin Hoffert (Credit: NASA)

Exxon's science turned out to be spot on, and the company's early modeling projections still hold up more than 30 years later, Hoffert said in an email to InsideClimate News. The Arctic's rapid warming and the extreme vulnerability of Antarctica's ice sheets are "consistent with the results of our theory which predicted them before they happened," Hoffert wrote.

Exxon "should be taking credit for their role in developing useful model predictions of the pattern of global warming by their research guys, as opposed to their denialist lobbyists saying global

warming from fossil fuel burning doesn't exist or is at best 'unproven,'" he wrote.

Spreading the Word, Internally

The conclusions of Exxon's climate modeling were being circulated broadly within the company in the 1980s.

Marvin B. Glaser, an Environmental Affairs Manager at Exxon, **distributed a 43-page primer** on climate change on Nov. 12, 1982.

In a cover letter to 15 Exxon executives and managers, Glaser said the document provided guidance "on the CO_2 'Greenhouse' Effect which is receiving increased attention in both the scientific and popular press as an emerging environmental issue." He continued: "The material has been given wide circulation to Exxon management and is intended to familiarize Exxon personnel with the subject."

"However, it should be restricted to Exxon personnel and not distributed externally," he wrote.

Glaser's primer drew from the best research of the time, including Exxon's, to explain how global temperatures would rise considerably by the end of the 21st century. Because of the warming, "there are some potentially catastrophic events that must be considered," including sea level rise from melting polar ice sheets, according to the document. It noted that some scientific groups were concerned "that once the effects are measurable, they might not be reversible."

Reining in "the greenhouse effect," the primer said, "would require major reductions in fossil fuel combustion."

Yet the report also argued against a rapid shift to non-fossil fuel energy sources, noting that "making significant changes in energy consumption...amid all

the scientific uncertainties would be premature in view of the severe impact such moves could have on the world's economies and societies."

Exxon's reputation for conducting serious carbon dioxide research was growing outside the company. Its scientists were frequent participants on industry and government panels.

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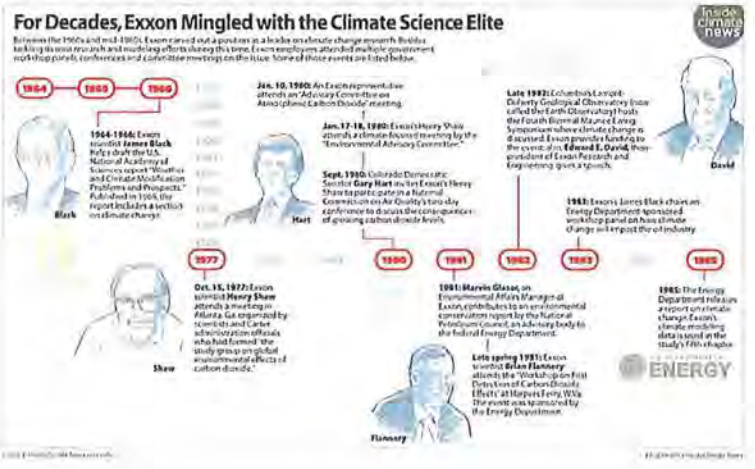

Flannery, for example, contributed to a multi-volume series of Energy Department reports published in 1985 on the state of climate change science. It concluded that atmospheric carbon dioxide concentrations had already increased by about 25 percent in the past century, and continued use of fossil fuels would lead to substantial temperature increases in the future.

Flannery was the only industry representative among 15 scientists **who wrote the volume titled** "Projecting the Climatic Effects of Increasing Carbon Dioxide."

Hoffert and Flannery co-authored a chapter that concluded that since the Industrial Revolution the Earth would warm 1°C (or 2°F) by 2000 and rise another 2 to 5°C (4 to 9°F) over the next hundred years.

As it turned out, the world's temperature has risen

about 0.8°C (1.4°F) and mainstream scientists continue to predict, with increasing urgency, that if emissions are not curtailed, carbon pollution would lock in warming of as much as 3 to 6°C (or 5 to 11°F) over the next several decades.

Quantifying the Uncertainty

Throughout its climate modeling phase, Exxon researchers, like outside scientists, grappled with the uncertainties inherent in climate model projections.

"Models are being used to explore physical effects (scenarios) and as a predictive tool," **Andrew Callegari said in a Feb. 2, 1984 presentation** for colleagues. The "validity of models [are] not established," Callegari wrote. "Complexity of carbon cycle and climate system require many approximations."

Scientists, regulators and Exxon all had to ask themselves: what should be done, given that uncertainty? Should governments and corporations wait for the ambiguities to be resolved before acting to cut fossil fuel emissions? Or should the researchers recommend immediate action because of a preponderance of evidence?

Since then, modeling has become an increasingly useful and reliable tool. The IPCC, the United Nations institution that compiles the scientific consensus on global warming, has issued a series of reports since 1990 based on those models. Each report has grown more certain. By the fifth report in 2013, the IPCC said it was *"extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century."

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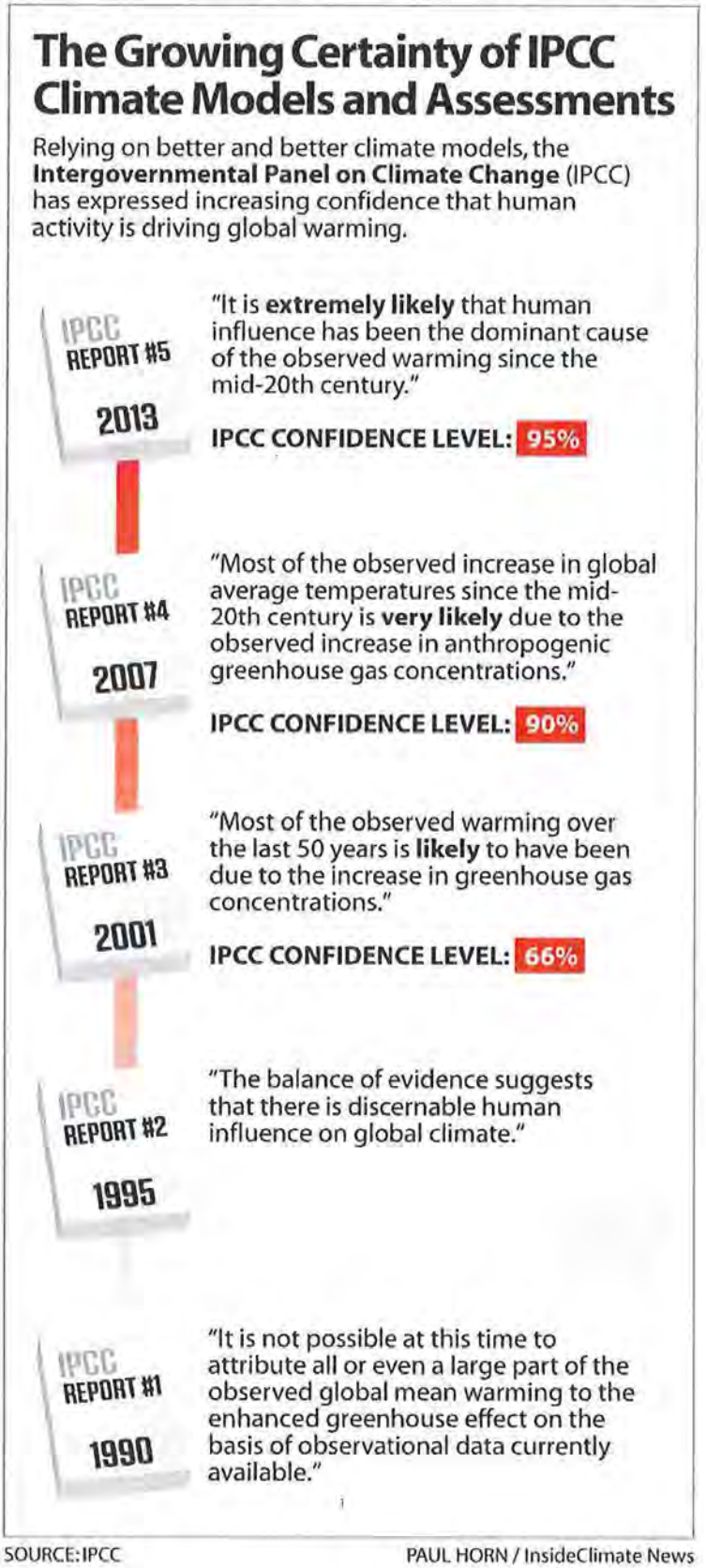

SOURCE: IPCC PAUL HORN / InsideClimate News

As the consensus grew within the scientific world, Exxon doubled down on the uncertainty. Its campaign to muddy research results placed the company outside the scientific mainstream. Some of the researchers who once led the company's

modeling became vocal climate contrarians, among them Brian Flannery and Roger Cohen.

Flannery survived the lay-offs of the mid-1980s that decimated the Exxon Research staff and rose in the corporate ranks to become the company's chief scientist. He attended IPCC meetings from the outset and by the early 1990s, he emerged as a prominent skeptic of the science he had once conducted.

For example, in a 1999 paper based on a speech to Exxon's European affiliates, Flannery derided the second IPCC assessment that concluded in 1995 that the scientific evidence suggested "a discernible human influence on climate."

"You'll note that this is a very carefully worded statement, recognizing that the jury is still out, especially on any quantifiable connection to human actions," Flannery wrote. "The conclusion does not refer to global warming from increases in greenhouse gases. Indeed, many scientists say that a great deal of uncertainty still needs to be resolved."

The change in Cohen's thinking was also stark, as he acknowledged in 2008. While still at Exxon he was "well convinced, as were most technically trained people, that the IPCC's case for Anthropogenic Global Warming (AGW) is very tight." But he wrote in a 2008 essay for the Science and Public Policy Institute, a climate denial website, that upon closer inspection of the research he found it to be "flimsy."

In 2007, the American Physical Society, the country's largest organization of physicists, adopted a strong statement on climate change that said "The evidence is incontrovertible: Global warming is occurring."

Cohen, an APS fellow, helped lead a campaign to weaken the APS's official position and earlier this year succeeded in stripping out the word

'incontrovertible' from a draft text. APS members will vote on the final language in November.

Flannery and Cohen declined to comment, despite multiple requests.

Exxon's former chairman and CEO, **Lee Raymond**, took an even tougher line against climate science. Speaking before the World Petroleum Congress in Beijing in 1997, Raymond mocked climate models in an effort to stop the imminent adoption of the Kyoto Protocol, an international accord to reduce emissions.

"They are notoriously inaccurate," Raymond said. "1990's models were predicting temperature increases of two to five degrees Celsius by the year 2100," he said, without explaining the source of those numbers. "Last year's models say one to three degrees. Where to next year?"

*Check out **Part I**, **Part II**, **Part IV**, **Part V** and **Part VI** of the series.*

ICN staff members Zahra Hirji, Paul Horn, Naveena Sadasivam, Sabrina Shankman and Alexander Wood also contributed to this report.

Correction 9/22: An earlier version of this article misstated the rank of an Exxon official who ordered the fuel use report written by Steve Knisely, an intern at the company, in 1979. He was a vice president of Exxon Research & Engineering, not a senior vice president at Exxon Corporation.

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EXXON: THE ROAD NOT TAKEN

Exxon's Business Ambition Collided with Climate Change Under a Distant Sea

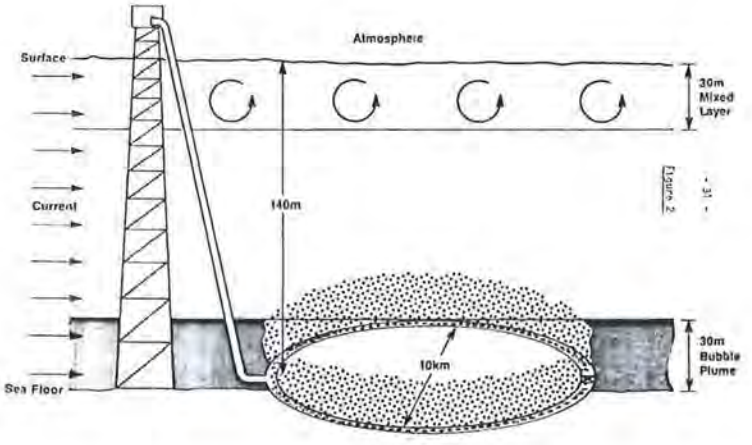
Throughout the 1980s, the company struggled to solve the carbon problem of one of the biggest gas fields in the world out of concern for climate impacts.

BY NEELA BANERJEE & LISA SONG

OCT 8, 2015

ABOUT THIS SERIES

After eight months of investigation, InsideClimate News presents this multi-part history of Exxon's



After Exxon got the rights to develop the Natuna gas field, company researchers determined that the project site was contaminated with much more carbon dioxide than normal. This picture is from one of the company's documents exploring how to address the carbon dioxide issue.

In 1980, as Exxon Corp. set out to develop one of the world's largest deposits of natural gas, it found itself facing an unfamiliar risk: the project would emit immense amounts of carbon dioxide, adding to the looming threat of climate change.

The problem cropped up shortly after Exxon signed a contract with the Indonesian state oil company to exploit the Natuna gas field in the South China Sea—big enough to supply the blossoming markets of Japan, Taiwan and Korea with liquefied natural gas into the 21st century.

Assessing the environmental impacts, Exxon Research and Engineering quickly identified Natuna's greenhouse gas problem. The reservoir was contaminated with much more carbon dioxide than normal. It would have to be disposed of somehow—and simply venting it into the air could have serious consequences, Exxon's experts warned.

Exxon's dawning realization that carbon dioxide and the greenhouse effect posed a danger to the world collided with the company's fossil fuel ambitions.

engagement with the emerging science of climate change. The story spans four decades, and is based on primary sources including internal company files dating back to the late 1970s, interviews with former company employees, and other evidence, much of which is being published here for the first time.

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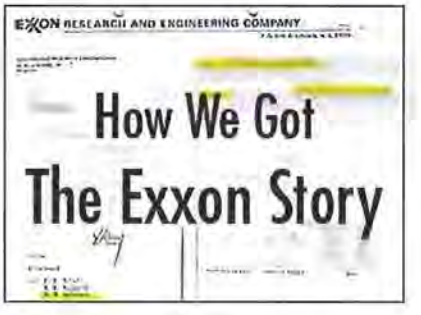

"They were being farsighted," recalled John L. Woodward, who wrote an internal report in 1981 on Natuna's climate implications.

"They weren't sure when CO_2 controls would be required and how it would affect the economics of the project."

Since 1978, long before the general public grew aware of the climate crisis, Exxon had worked at the cutting edge of emerging climate science. At first, Exxon's internal studies had described climate change as an important but somewhat distant problem. Now, sooner than expected, climate considerations were affecting strategic business decisions. Natuna was one example; another was **Exxon's proposed leap into synthetic fuels**.

Releasing Natuna's carbon pollution would make it "the world's largest point source emitter of CO_2 and raises concern for the possible incremental impact of Natuna on the CO_2 greenhouse problem," **declared an October 1984 report** from Exxon's top climate modeler, Brian Flannery, and his boss Andrew Callegari.

Documents and other evidence uncovered by InsideClimate News also show that Exxon calculated that Natuna's emissions would have twice the climate impact of coal. The company spent years researching possible remedies, but found them all too costly or ineffective, ICN's eight-month investigation found.

Exxon managers saw the problem as both technically vexing and environmentally fraught. Not only was there carbon dioxide to be dealt with, it was mixed with toxic, flammable hydrogen sulfide, a contributor to acid rain.

"I think we generally agree that we are seeking a method of disposing of the off gases in a manner which will minimize the risk of environmental damage," wrote Exxon's manager of environmental

affairs Alvin M. Natkin in **an October 1983 letter to Natuna project executive Richard L. Preston**.

"We must also have the data which will be convincing not only to ourselves but also to the international environmental community that the method selected is environmentally sound."

The company consulted with leading scientists, including NASA's pioneering expert James E. Hansen, to understand the effect on atmospheric CO_2 concentrations if the gas from Natuna were released. It sent staff to facilities at Dalhousie University in Halifax, Canada to simulate the diffusion of the gas into ocean water. Over the years, Exxon scientists developed mathematical models to assess the options.

Because the project was so complex and expensive, the Natuna staff presented regular updates, including details of the CO_2 issue, to Exxon's board of directors, whose members were drawn almost entirely from the company's upper management.

Some Exxon directors accepted the emerging climate consensus. Others were less sure of the science, but agreed that as popular attention to global warming mounted, releasing Natuna's greenhouse gases into the air could turn into a public relations debacle, former employees said.

Either way, directors repeatedly told project staff Natuna could not proceed unless the CO_2 was handled in a cost-effective way that did not harm the atmosphere.

"Their concerns kept getting stronger," said a former employee with knowledge of the project, who asked for anonymity because the issue remains sensitive even years later. "Their attitude went from, 'Maybe we have to remove the CO_2,' to, as the years went by, their saying, 'This project cannot go ahead unless we remove the CO_2.'"

In 1984, Lee Raymond joined Exxon's board of

directors. A senior vice president, Raymond's responsibilities included overseeing Exxon Research and Engineering, which conducted the Natuna studies. In the summer of 1985, ER&E prepared documents for Raymond about a study that examined disposing Natuna's CO_2 into the ocean, an Exxon memo shows.

Eventually, Raymond would rise to become chairman and chief executive, and to lead a public campaign discrediting the scientific consensus on climate change and fighting measures to control greenhouse gas emissions.

In the meantime Exxon, now known as ExxonMobil, appears to have kept its years of climate-related deliberations about Natuna mostly to itself. Exxon only began to disclose climate risks to its shareholders years after it first weighed Natuna's risks, federal filings show.

ExxonMobil declined to answer specific questions for this article. In July, when ICN questioned him for an earlier article about Natuna, spokesman Richard Keil said, "It is company policy not to comment on potential commercial operations."

The Carbon Footprint

First discovered by the Italian oil company Agip in the early 1970s, the Natuna gas field lies about 700 miles north of Jakarta and holds about 46 trillion cubic feet of recoverable methane, or natural gas. But the undersea formation also contains 154 trillion cubic feet of other gases, mostly CO_2.

To liquefy Natuna's methane for shipping, it must be supercooled. At those low temperatures, the carbon dioxide would freeze into dry ice and clog equipment, so it had to be removed. The question was where to put it.

The Indonesian government and the state-run oil company had no issue with releasing the CO_2 into

the air, former Exxon staff said. But awareness of carbon dioxide's impact on global temperatures had been seeping through Exxon, from its rank-and-file engineers to its board of directors.

"Within Exxon in those days, there were probably two to three believers in global warming for every denier or those who emphasized the uncertainty," said another former Exxon Research executive, who asked not to be identified for fear of reprisal.

Exxon's Natuna Gas Field a Major Source of CO_2

In 1980, Exxon acquired the rights to develop the Natuna field, one of the world's largest untapped reservoirs of natural gas. Soon after, the company determined the field would be the world's largest point source of carbon dioxide. Exxon still owns the Natuna license but has shelved its development indefinitely.

SOURCE: Exxon PAUL HORN / InsideClimate News

Among the key people searching for a solution was Gilbert Gervasi, the Natuna project manager, who worked in Houston under executive Richard Preston for Esso Eastern, the unit that oversaw projects in East Asia. Gervasi spearheaded the effort from the early to mid-1980s to figure out how big Natuna's carbon footprint would be and what to do about it.

In a **Feb. 3, 1981 letter to Gene Northington** at Research and Engineering, Gervasi challenged a "rough calculation" that Northington had made of the CO_2 emissions from producing Natuna's gas and burning it as fuel. Northington's math showed Natuna's total CO_2 emissions would be "no higher

than what would be emitted by burning" an equivalent amount of coal, Gervasi wrote.

After conducting what he described as "more rigorous" calculations, Gervasi concluded "that the total release of CO_2 from producing Natuna gas and burning of the LNG manufactured from the gas would be almost twice that emitted by burning an equivalent amount of coal."

Six months later, Research and Engineering sent Gervasi a report, entitled "Possible Climate Modification Effects of Releasing Carbon Dioxide to the Atmosphere from the Natuna LNG Project." It commissioned assessments of Natuna by seven eminent atmospheric scientists, including the climatologists Helmut Landsberg of University of Maryland and NASA's Hansen.

The report, written by John Woodward, a high level engineer at Exxon Research, presented a mixed message. Natuna would constitute a "small fraction of worldwide CO_2 budget," it found. But it also found that "emissions are nonetheless substantial by several comparisons."

Disposal Options

Woodward examined the option of flaring the CO_2 after it had been stripped from the natural gas.

Although not combustible, the CO_2 had to be flared rather than simply vented because it was mixed with hydrogen sulfide, which is often burned to convert it to safer compounds. But flaring would not eliminate Natuna's greenhouse gas emissions.

Next, Woodward looked at releasing the CO_2 into seawater around Natuna, a process known as sparging. The gas from the Natuna well would be piped to a nearby platform where the valuable methane would be separated from the waste CO_2 and the toxic hydrogen sulfide. Those unwanted gases, in turn, would then be sent from the platform

to a pipe about 300 feet below on the ocean floor. The pipe would be arranged in a circle 6 miles in diameter and the gas would be bubbled out of perforations every six to 10 feet, like aerating an aquarium.

Woodward said that in 1982 he visited the oceanography department at Dalhousie University in Nova Scotia to use their equipment to collect data for sparging models. Dalhousie had a tank about 40 feet high and 10 feet wide, filled with ocean water. Researchers released CO_2 at the bottom of the tank, and Woodward measured the size and quantity of the bubbles at various depths as they rose to the surface to understand how the gas dissipated.

In the end, the hydrogen sulfide released with the CO_2 stymied the sparging idea, Woodward said. Exxon worried that a toxic plume might kill fish and result in bad press.

Back to Square One

The Natuna project staff and Research and Engineering specialists probed for answers through the 1980s, sometimes revisiting the approaches that Woodward had examined.

In October 1983, **Gervasi sent a letter and background paper on Natuna** to about a dozen staff and executives from different branches of the corporation to develop "a study program which over the next 1-2 years will put Exxon in a position to reach a final decision on the environmental aspects of the project."

The background paper laid out options to dispose of the CO_2, none of them optimal. Releasing the waste gases into the air remained the simplest, cheapest method. "However, this raises environmental questions concerning the 'greenhouse' effect of the CO_2," the paper said.

Gervasi's paper said the only effective way to

dispose of carbon dioxide and hydrogen sulfide without harming the atmosphere or ocean would involve injecting the gases underground into the Natuna formation itself or a nearby reservoir. But that option appeared prohibitively expensive.

Thwarted by cost or environmental impact, Exxon returned to mathematical models over the next two years to home in on a suitable approach.

By February 1984, Exxon Research began modelling once more the feasibility of sparging.

The scientists found that the ocean would release the CO_2 into the atmosphere, probably in 10 years or sooner. Further, increased CO_2 would raise the acidity of the ocean water, damaging the local environment. "Our conclusion is that atmospheric discharge is preferable to seawater sparging," Flannery and others concluded.

Study after study returned Exxon back to square one with Natuna: it held the rights to an enormously promising field but was unable to develop it because it was unwilling to pump so much CO_2 into the air.

The scientists' conclusions were reflected in **papers prepared for a 1985** meeting with Lee Raymond on Exxon Research's activities.

Their synopsis said: "We modeled the sub-sea disposal of CO_2 in the shallow basin near the Natuna site and found that retention in the sea is only about a decade, as opposed to 1000 years if the CO_2 is disposed in the deep ocean. We recommend that the sub-sea sparging of CO_2 not be implemented since it offers little advantage over direct atmospheric release."

By the late 1980s, Exxon started to explore pumping the CO_2 back into the Natuna formation, the safest option but probably the priciest.

The company found a cost-effective method to

dispose of half of Natuna's CO_2 underground, but calculated that the rest of the CO_2 would still be the equivalent of half of Canada's annual greenhouse gas emissions, said Roger Witherspoon, a former Program Officer in Corporate Contributions in the Public Affairs department.

Company officials asked Witherspoon to find a way to plant 100,000 trees annually to offset Natuna's remaining CO_2 emissions. The total acreage would eventually equal the size of Connecticut, Witherspoon said.

As Witherspoon researched the options starting around 1993, Exxon had embarked on a public campaign casting doubt on climate science as a basis for strong policy actions. Internally, the attitude was different.

"It was that greenhouse gas buildup could pose a threat to our business," said Witherspoon, a longtime journalist who worked at Exxon's Texas headquarters from 1990 to 1995. "You didn't want climate change caused by oil and gas. So the responsible thing to do was offset any greenhouse gases you were putting into the atmosphere."

Witherspoon said Exxon started his tree planting plan, but he does not know how long it lasted.

Exxon continued to investigate possibilities for responsibly disposing of Natuna's CO_2. The project remains dormant, but Exxon never gave up. After an on-and-off relationship with Indonesia, the company still holds the license, which is up for renewal next summer.

Coming soon, Part VI: Exxon embarks on a public campaign of climate denial that would last for decades.

*Check out **Part I**, **Part II**, **Part III**, **Part V** and **Part VI** of the series.*

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BUSINESS AND ACCOUNTABILITY, CLIMATE SCIENCE,
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EXXON: THE ROAD NOT TAKEN

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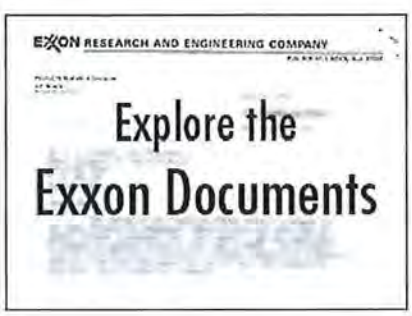
0 1

Highlighting the Allure of Synfuels, Exxon Played Down the Climate Risks

In the 1980s, Exxon lobbied to replace scarce oil with synthetic fossil fuels, but it glossed over the high carbon footprint associated with synfuels.

BY JOHN H. CUSHMAN JR., INSIDECLIMATE NEWS

OCT 8, 2015



ABOUT THIS SERIES

After eight months of investigation, InsideClimate News presents this multi-part history of Exxon's

In 1980, Exxon acquired the Colony Shale Oil Project in Colorado to support the production of synfuels. Two years later, Exxon announced the termination of the project, in part due to low oil prices. (Credit: U.S. National Archives via Wikimedia Commons)

Early in the 1980s, the lingering fear of oil scarcity and the emerging threat of climate change were beginning to intersect. And at that junction stood Exxon Corp., working out its strategy for survival in the uncertain 21st century.

At the time, Exxon believed oil supplies could not keep up with demand, so it put its weight behind a crusade to develop synthetic fossil fuels as a costly and carbon intensive, but potentially profitable alternative. It could liquefy the vast deposits of coal, oil shale and tar sands that were readily available in North America. This would be the new black gold, supplying as much as a third of the energy the United States would use in the early 21st century, company executives estimated.

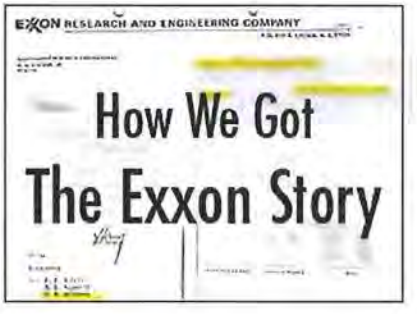
"These resources are adequate to support a 15 million barrel a day industry for 175 years," said Randall Meyer, a senior vice president, in a 1981 speech before the U.S. Chamber of Commerce.

By then, however, researchers at Exxon were well aware of the looming problem of climate change.

engagement with the emerging science of climate change. The story spans four decades, and is based on primary sources including internal company files dating back to the late 1970s, interviews with former company employees, and other evidence, much of which is being published here for the first time.

It describes how Exxon conducted cutting-edge climate research decades ago and then, without revealing all that it had learned, worked at the forefront of climate denial, manufacturing doubt about the scientific consensus that its own scientists had confirmed.

Find the entire project here.



Years earlier, one climate researcher at the company, Henry Shaw, had called management's attention to a key conclusion of a landmark National Academy of Sciences report: global warming caused by carbon dioxide emissions, not a scarcity of supply, would likely set the ultimate limit on the use of fossil fuels.

Yet in his speech, Meyer said nothing about the carbon footprint of synfuels – even though the company was aware that making and burning them would release much more carbon dioxide into the atmosphere than ordinary oil.

In a 21-page speech, Meyer explained that a national synfuels program would require investing almost $800 billion (in 1980 dollars) over three decades. He said it would create 870,000 jobs. It would, he promised, carry the nation through a long-term transition to "non-depleting and renewable" energy sources.

"Over the past couple of years my associates and I have talked about synthetic fuels as a major national need to a lot of audiences," he noted. "In the federal government, that included the White House and most cabinet members. At the state level, we visited with governors, and a good many senators and congressmen. We have had audiences like GM's and Ford's senior managements, the Business Roundtable, national labor leaders, major media companies, influential academics and many others."

The government did respond, with a costly synfuels program that ultimately folded as oil markets turned from shortage to glut and the technology proved to be unaffordable. Congress withdrew funding from the United States Synfuels Corporation, and most forms of synfuels production never grew to global significance.

One important remnant that survived was the industry's foray into tar sands oil, especially in Canada, where Exxon would become a major player

– and where the carbon dioxide problem still plagues the industry after more than three decades. Recent research finds that substantial growth in tar sands production is incompatible with keeping CO_2 emissions below the internationally accepted target of 2 degrees C.

But in the early days of synfuels, as Exxon defended them as a costly but plausible solution to oil scarcity, it sidestepped the carbon problem. In the text of a speech by Exxon chief executive Clifton Garvin before a particularly skeptical audience, the Environmental Defense Fund, in April 1981, global warming was never mentioned among the environmental risks that he said the industry would be "held primarily responsible for solving."

Nor, it appears, did Exxon elaborate on the link between synfuels and global warming in annual reports to shareholders filed with regulatory agencies in those early days, when synfuels remained at the heart of the company's long term ambitions.

Yet all along, there had been a bubbling concern among researchers, including some inside Exxon, about the carbon implications of synfuels.

Company documents discovered during an eight-month investigation by InsideClimate News show that Exxon Research & Engineering estimated that producing and burning oil shales would release 1.4 to 3 times more carbon dioxide than conventional oil, and would accelerate the doubling of greenhouse gases in the atmosphere by about five years. The company knew that a doubling would risk about 3 degrees Celsius of warming, or 5.4 degrees Fahrenheit.

The company was tracking the research closely. When two U.S. Geological Survey scientists estimated in Science magazine in 1979 that the carbon footprint from synfuels might be three to five times more than conventional fuels, ER&E

climate researcher Henry Shaw wrote in a memo that the upper range "may alarm the public unjustifiably."

As early as November, 1979, Shaw had told Harold Weinberg in a memo on atmospheric research that environmental groups "have already attempted to curb the budding synfuels industry because it could accelerate the buildup of CO_2 in the atmosphere." He warned Exxon not to be caught off guard, the way the aviation industry had been surprised by the threat to supersonic airplane development when the ozone hole was discovered.

In 1980, after attending a federal advisory committee meeting, Shaw explained why he didn't think the carbon dioxide problem would block work on synfuels any time soon.

"I attended the last meeting of this committee on January 17 and 18, 1980, and found such a vast diversity of interests and backgrounds that I believe no imminent action is possible," he wrote in a memo.

"For example, some environmentalists suggested that all development of synthetic fuels be terminated until sufficient information becomes available to permit adequate strategic decisions to be made. The industrial representation, on the other hand, indicated that the build up of CO_2 in the atmosphere was not necessarily anthropogenic, and is of little consequence for the next century."

But Shaw also circulated a clipping from The New York Times in August 1981, under the headline "Synthetic Fuels Called a Peril to the Atmosphere."

In the article, the Associated Press quoted an economist named Lester Lave as testifying before Congress that "if we take CO_2 seriously, we would change drastically the energy policy we are pursuing."

As in so many other realms of its research, Exxon studied a potential future of synthetic fuels while recognizing that carbon dioxide could be a powerful factor in its business decisions for decades to come.

Coming soon, Part VI: Exxon embarks on a public campaign of climate denial that would last for decades.

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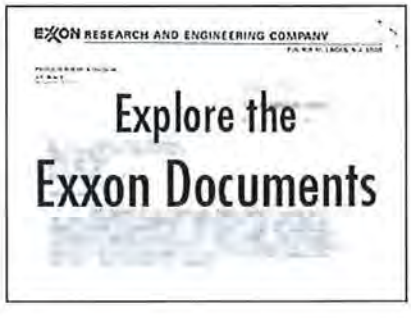
EXXON: THE ROAD NOT TAKEN

Exxon Sowed Doubt About Climate Science for Decades by Stressing Uncertainty

Collaborating with the Bush-Cheney White House, Exxon turned ordinary scientific uncertainties into weapons of mass confusion.

BY DAVID HASEMYER AND JOHN H. CUSHMAN JR.

OCT 22, 2015



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After eight months of investigation, InsideClimate News presents this multi-part history of Exxon's

Credit: Paul Horn/InsideClimate News

As he wrapped up nine years as the federal government's chief scientist for global warming research, Michael MacCracken lashed out at ExxonMobil for opposing the advance of climate science.

His own great-grandfather, he told the Exxon board, had been John D. Rockefeller's legal counsel a century earlier. "What I rather imagine he would say is that you are on the wrong side of history, and you need to find a way to change your position," he wrote.

Addressed to chairman **Lee Raymond** on the letterhead of the United States Global Change Research Program, **his September 2002 letter** was not just forceful, but unusually personal.

No wonder: in the opening days of the oil-friendly Bush-Cheney administration, Exxon's chief lobbyist had written the new head of the White House environmental council demanding that **MacCracken** be fired for "political and scientific bias."

Exxon was also attacking other officials in the U.S. government and at the UN's Intergovernmental Panel on Climate Change (IPCC), MacCracken wrote, interfering with their work behind the scenes and distorting it in public.

engagement with the emerging science of climate change. The story spans four decades, and is based on primary sources including internal company files dating back to the late 1970s, interviews with former company employees, and other evidence, much of which is being published here for the first time.

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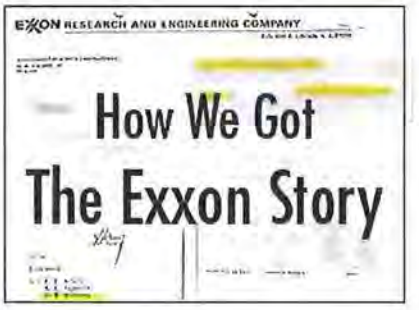


Exxon wanted scientists who disputed the mainstream science on climate change to oversee Washington's work with the IPCC, the authoritative body that defines the scientific consensus on global warming, documents written by an Exxon lobbyist and one of its scientists show. The company persuaded the White House to block the reappointment of the IPCC chairman, a World Bank scientist. Exxon's top climate researcher, **Brian Flannery**, was pushing the White House for a wholesale revision of federal climate science. The company wanted a new strategy to focus on the uncertainties.

Michael MacCracken (Credit: Michael MacCracken)

"To call ExxonMobil's position out of the mainstream is thus a gross understatement," MacCracken wrote. "To be in opposition to the key scientific findings is rather appalling for such an established and

scientific organization."

MacCracken had a long history of collaboration with Exxon researchers. He knew that during the 1970s and 1980s, well before the general public understood the risks of global warming, the company's researchers had worked at the cutting edge of climate change science. He had edited and even co-authored some of their reports. So he found it galling that Exxon was now leading a concerted effort to sow confusion about fossil fuels, carbon dioxide and the greenhouse effect.

Exxon had turned a colleague into its enemy.

It was a vivid example of Exxon's undermining of mainstream science and embrace of denial and misinformation, which became most pronounced after President George W. Bush took office. The campaign climaxed when Bush pulled out of the Kyoto Protocol in 2001. Taking the U.S. out of the international climate change treaty was Exxon's key goal, and the reason for its persistent emphasis on the uncertainty of climate science.

This **in-depth series by InsideClimate News** has explored Exxon's early engagement with climate research more than 35 years ago – and its subsequent use of scientific uncertainty as a shield against forceful action on global warming. The series is based on Exxon documents, interviews, and other evidence from an eight-month investigation.

"What happened was an incredible disconnect in people trained in physical science and engineering," recalled **Martin Hoffert**, a New York University professor who collaborated with Exxon's team as its early computer modeling confirmed the emerging scientific consensus on global warming. "It's an untold story of how we got to the point where climate change has become a threat to the world."

The Uncertainty Agenda

As the Bush-Cheney administration arrived in the White House in 2001, ExxonMobil (NYSE: XOM) now had partners for a climate uncertainty strategy.

Just weeks after Bush was sworn in, Exxon's top lobbyist Randy Randol **sent the White House a memo** complaining that "Clinton/Gore carry-overs with aggressive agendas" were still playing a role at the IPCC as it prepared its next assessment of the climate science consensus.

MacCracken and three colleagues should be replaced, or at least kept out of "any decisional activities," he wrote. Meanwhile, U.S. input to the IPCC should be delayed.

Further, two scientists highly critical of the prevailing consensus should be enlisted: John Christy of the University of Alabama should take the science lead and Richard Lindzen of MIT should review U.S. submissions to the IPCC.

Exxon had been circulating a proposal to fundamentally overhaul MacCracken's global change research program, by emphasizing the uncertainties of climate science.

The timing was not coincidental because the administration, as required by law, was about to lay out a new federal climate research strategy. Exxon and its allies wanted the work done during the Clinton-Gore years to be marginalized.

In March 2002, Flannery, Exxon's science strategy and programs manager, contacted John H. Marburger, the president's incoming assistant for science and technology, **to pitch the company's favored approach of emphasizing the uncertainty**. Earlier discussions, he asserted, "have not sought to place the uncertainty in the context of why it is important to public policy."

Exxon's position paper, attached to his letter, took a dig at the work of the IPCC.

"A major frustration to many is the all-too-apparent bias of IPCC to downplay the significance of scientific uncertainty and gaps," the memo said.

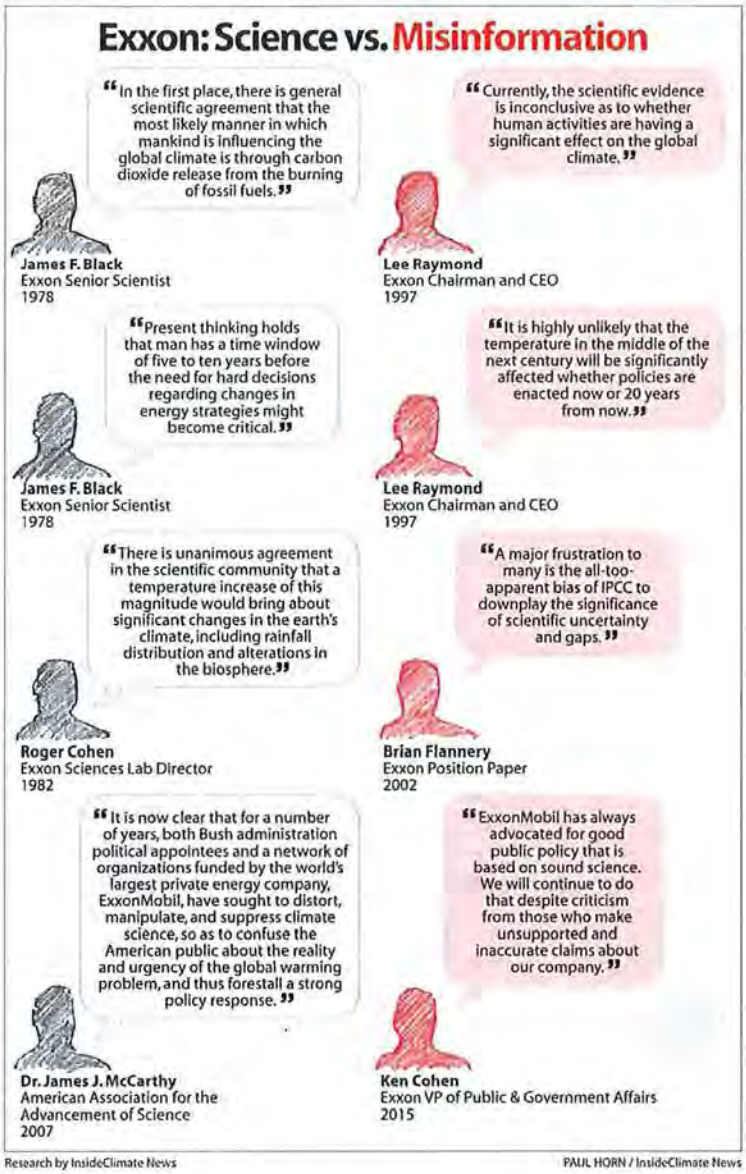
A Seat at the Table

Exxon had not always been so at odds with the prevailing science.

Since the late 1970s, Exxon scientists had been **telling top executives** that the most likely cause of climate change was carbon pollution from the combustion of fossil fuels, and that it was important to get a grip on the problem quickly. Exxon Research & Engineering had **launched innovative ocean research** from aboard the company's biggest supertanker, the Esso Atlantic. ER&E's modeling experts, by the early 1980s, had **confirmed the consensus** among outside scientists about the climate's sensitivity to carbon dioxide.

"The facts are that we identified the potential risks of climate change and have taken the issue very seriously," said Ken Cohen, Exxon's vice president of public and government affairs, **in a press release** on October 21 addressing the ICN reports. "We embarked on decades of research in collaboration with many parties."

Exxon has declined to answer specific questions from InsideClimate News.



A **1980 memo proposed an ambitious public-relations plan** aimed at "achieving national recognition of our CO_2 Greenhouse research program."

"It is significant to Exxon since future public decisions aimed at controlling the build-up of atmospheric CO_2 could impose limits on fossil fuel combustion," said the memo. "It is significant to all humanity since, although the CO_2 Greenhouse Effect is not today widely perceived as a threat, the popular media are giving increased attention to doom-saying theories about dramatic climate changes and melting polar icecaps."

Most of all, Exxon wanted a seat at the policy-making table, and the credibility of its research had

earned that. In 1979, David Slade, manager of carbon dioxide research at the Energy Department, called it "a model for research contributions from the corporate sector."

Sen. Gary Hart, a Colorado Democrat, invited **Henry Shaw**, an early Exxon scientist, to join the policy deliberations. He was the only industry representative invited to an October 1980 conference of the National Commission on Air Quality, newly set up by Congress, to discuss "whether potential consequences of increased carbon dioxide levels warrant development of policies to mitigate adverse effects."

Shaw's bosses agreed that he should attend, "both to be informed as to what actions or proposals that result and to bring objective thinking and information to the meeting," **Harold Weinberg**, Shaw's boss in Exxon Research and Engineering, wrote in a memo. But first, he said, Shaw needed to be briefed by public affairs executives "on possible hidden agenda and individual biases of which we may not already be aware."

When Shaw gave feedback to the commission in December, **he noted the uncertainties about carbon dioxide and climate change**. At the same time, he wrote that it was "important" to place CO_2 on the nation's public policy agenda, as the commission was recommending, and supported the panel's suggestion that it was "timely to consider ways of reducing CO_2 emissions now."

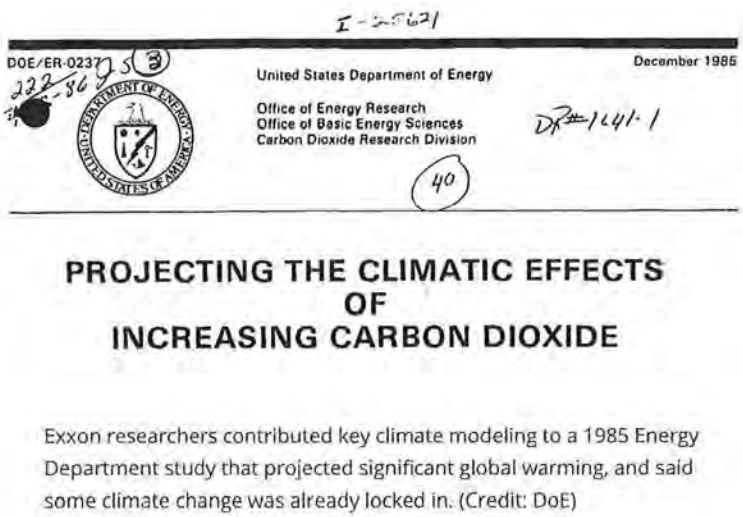
He also backed a recommendation that the U.S. "seek to develop discussions on national and international policies."

In late spring of 1981, Flannery was one of the few industry representatives at a large gathering of accomplished scientists at Harper's Ferry, W. Va., for a Department of Energy "Workshop on First Detection of Carbon Dioxide Effects." He sat on a panel with NASA's James Hansen, who was about to

publish a landmark study in Science magazine warning of significant warming even if controls were placed on carbon emissions.

The **workshop's proceedings** would declare that "scientists are agreed" that carbon dioxide was building up in the atmosphere, that the effects "are well known" and "will bring about an increase in the mean global temperature," and that it is "commonly accepted" that warming "will affect the biosphere through a change in climate."

Working with Hoffert, Flannery wrote a highly technical 50-page chapter to a **1985 Energy Department report**. Their modeling projected up to 6 degrees Celsius of warming by the end of the 21st century unless emissions of greenhouse gases were curtailed.



DOE/ER-0237

United States Department of Energy

Office of Energy Research
Office of Basic Energy Sciences
Carbon Dioxide Research Division

December 1985

PROJECTING THE CLIMATIC EFFECTS OF INCREASING CARBON DIOXIDE

Exxon researchers contributed key climate modeling to a 1985 Energy Department study that projected significant global warming, and said some climate change was already locked in. (Credit: DoE)

The influential government report said the models provided a "firm basis" for this kind of projection, and that "we are already committed to some of this warming as a result of emissions over the last several decades."

The Harper's Ferry conference was chaired by MacCracken; he also edited the warming report. He recalled recently that "the underlying push was for a level of understanding that was convincing enough to let policymakers become aware of what the issue

was that society faced."

As Hoffert put it in a recent interview, in those days at Exxon "there were no divisions, no agendas. We were coming together as scientists to address issues of vital importance to the world."

Fork in the Road

In 1988, James Hansen told Congress that there was now enough warming to declare that the greenhouse effect had arrived. Also that year, the United Nations set up the Intergovernmental Panel on Climate Change.

It was a moment that Exxon's climate experts had been forecasting for a decade: that as warming became unmistakable, governments would move to control it.

Looking backward, one Exxon document from the early 1990s reflects a trail of research into global warming stretching back "long before the issue achieved its current prominence."

An internal compendium of the company's environmental record, on file in the official ExxonMobil historical archives at the University of Texas-Austin, acknowledged the uncertainties that have always faced climate researchers, but it didn't downplay the risks.

"Fossil fuel use dominates as the source of man-made emissions of carbon dioxide," said one section of the encyclopedic review. "Current scientific understanding demonstrates the potential for climate change to produce serious impacts."

"For Exxon and the petroleum industry, potential enhancement of the greenhouse effect and the possibility of adverse climate are of particular and fundamental concern," it said.

Drilling for Uncertainty

The IPCC published its first report in 1990. Despite the scientific gaps, the panel warned that unrestrained emissions from burning fossil fuels would surely warm the planet in the century ahead. The conclusion, the IPCC said after intense deliberations, was "certain." It prescribed deep reductions in greenhouse gas emissions to stave off a crisis in the coming decades.

At this crucial juncture, Exxon pivoted toward uncertainty and away from the global scientific consensus.

At the IPCC's final session to draft its summary for policymakers, Exxon's Flannery was in the room as an observer. He took the microphone to challenge both the certainty and the remedy. None of the other scientists agreed with Flannery, and the IPCC brushed off Exxon's advice to water down the report, according to Jeremy Leggett's eyewitness account in his book, *The Carbon War*.

At a conference in June 1991, MacCracken joined a panel chaired by Flannery to work together on a climate change project involving geo-engineering.

The contact, according to MacCracken, led to an unexpected solicitation from the oil lobby in Washington. Will Ollison, a science adviser at the American Petroleum Institute, in a fax marked urgent, asked MacCracken, then at the Lawrence Livermore National Laboratory, to write a paper highlighting the scientific uncertainties surrounding global warming.

The API, where Exxon held enormous sway, wanted him to write up the complex nuances in plain English – with an emphasis on the unknown, not the known.

Ollison said the IPCC's 1990 report "may not have adequately addressed alternative views."

"A review of these alternative projections would be useful in illustrating the uncertainties inherent in the

'consensus' views expressed in the IPCC report," Ollison wrote.

MacCracken rejected the task as "fruitless."

"I would caution you about too readily accepting whatever the naysayers put forth as a means of achieving balance," MacCracken wrote back.

Flannery, for his part, continued to emphasize uncertainty. And so did Exxon's new chairman and chief executive, Lee Raymond, who spoke of it repeatedly in public.

"Currently, the scientific evidence is inconclusive as to whether human activities are having a significant effect on the global climate," Raymond claimed in a speech delivered in 1996 to the Economic Club of Detroit.

"Many people, politicians and the public alike, believe that global warming is a rock-solid certainty," he said the next year in a speech in Beijing. "But it's not."

Addressing the World Petroleum Congress, which was meeting just before the conclusion of the Kyoto Protocol negotiations, Raymond even disputed that the planet was warming at all. "The earth is cooler today than it was 20 years ago," he said.

That was false. Authoritative climate agencies declared **1997 the warmest year** ever measured. Decade by decade, the warming has continued, in line with the climate models.

But Raymond, turning his back on Exxon researchers and their state-of-the-art work, mocked those climate models.

"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?"

"It is highly unlikely," he said, "that the temperature in the middle of the next century will be significantly affected whether policies are enacted now or 20 years from now."

The Doubt Industry

Exxon and its allies had been working hard to spread this dilatory message.

First, they set up the Global Climate Coalition (GCC), a lobbying partnership of leading oil and automobile companies dedicated to defeating controls on carbon pollution.

"As major corporations with a high level of internal scientific and technical expertise, they were aware of and in a position to understand the available scientific data," recounts an **essay on corporate responsibility for climate change published last month** in the peer-reviewed journal Climatic Change.

"From 1989 to 2002, the GCC led an aggressive lobbying and advertising campaign aimed at achieving these goals by sowing doubt about the integrity of the IPCC and the scientific evidence that heat-trapping emissions from burning fossil fuels drive global warming," says the article, by Harvard climate science historian Naomi Oreskes and two co-authors.

Then, in 1998 Exxon also helped create the Global Climate Science Team, an effort involving Randy Randol, the company's top lobbyist, and Joe Walker, a public relations representative for API.

Their memo, leaked to The New York Times, asserted that it is "not known for sure whether (a) climate change actually is occurring, or (b) if it is, whether humans really have any influence on it." Opponents of the Kyoto treaty, it complained, "have done little to build a case against precipitous action on climate change based on the scientific uncertainty."

The memo declared: "Victory will be achieved when average citizens 'understand' (recognize) uncertainties in climate science," and when "recognition of uncertainty becomes part of the 'conventional wisdom.'"

App. 569

Exxon wholeheartedly embraced that theme. For example, an advertisement called "Unsettled Science" that ran in major papers in the spring of 2000, prompted one scientist to complain that it had distorted his work by suggesting it supported the notion that global warming was just a natural cycle. "It's a shame," Lloyd Keigwin later told the Wall Street Journal. "The implication is that these data show that we don't need to worry about global warming."

Another ad, one of a series placed in The New York Times, cast aspersions on scientists who "believe they can predict changes in climate decades from now."

Then, in the heat of the 2000 presidential race between climate champion Al Gore and erstwhile oilman George W. Bush, Exxon placed an ad in the Washington Post accusing MacCracken's office of putting the "political cart before a scientific horse."

Blowing the Whistle

The collaboration between Exxon, its surrogates, **and the Bush administration** to emphasize uncertainty and stave off action came to light in 2005. A **whistleblower named Rick Piltz** disclosed that Philip Cooney, an oil lobbyist who had become chief of staff at the White House environmental council, had been heavily editing the work of government researchers. Cooney resigned, and was hired by Exxon.

But the clashes continued between the scientific establishment and Exxon's purveyors of uncertainty.

The Royal Society of the United Kingdom, for centuries a renowned arbiter of science, harshly criticized Exxon in 2006 for publishing "very misleading" statements about the IPCC's Third Assessment Report. The IPCC found that most of the observed warming of the planet in the late 20th century was probably caused by humans.

The Society's communications manager Bob Ward reminded Exxon pointedly that one of its own scientists had contributed to the IPCC chapter in question.

The Royal Society said it had no problem with Exxon funding scientific research, but "we do have concerns about ExxonMobil's funding of lobby groups that seek to misrepresent the scientific evidence relating to climate change."

Ward said Exxon **was funding at least 39 organizations** "featuring information on their websites that misrepresented the science on climate change, by outright denial of the evidence that greenhouse gases are driving climate change, or by overstating the amount and significance of uncertainty in knowledge."

Appendix B
Groups and Individuals Associated with ExxonMobil's Disinformation Campaign

Table 1 **Select ExxonMobil-Funded Organizations Providing Disinformation on Global Warming**[174]

Organization	Total ExxonMobil Funding[175] (1998–2005)	Illustrative Information
Africa Fighting Malaria	$30,000	AFM received $30,000 donation in 2004 for "climate change outreach." This grant represents 10% of their total expenses for that year. AFM's website has an extensive collection of articles and commentary that argue against urgent action on climate change.[176]
American Council for Capital Formation, Center for Policy Research	$1,604,523	One-third of the total ExxonMobil grants to ACCF-CPR between 1998 and 2005 were specifically designated for climate change activities. ExxonMobil funds represent approximately 38% of their total expenses in 2005.[177]
American Council on Science and Health	$125,000	ExxonMobil donated $15,000 to ACSH in 2004 for "climate change issues." A September 2006 Better Business Bureau Wise Giving Alliance Charity Report concludes that the ACSH does not meet all the standards for charity accountability.[178]
American Enterprise Institute	$1,625,000	Lee R. Raymond, retired chair and CEO of ExxonMobil, is vice chairman of AEI's Board of Trustees.[179]
American Friends of the Institute of Economic Affairs	$50,000	American Friends of the IEA received a $50,000 ExxonMobil donation in 2004 for "climate change issues." This grant represents 29% of their total expenses for that year. The 2004 IEA study, *Climate Alarmism Reconsidered*, "demonstrates how the balance of evidence supports a benign, enhanced greenhouse effect."[180]
American Legislative Exchange Council	$1,111,700	Of the total ExxonMobil grants to ALEC, $327,000 was specifically for climate change projects. ALEC received $241,500 in 2005 from ExxonMobil.

In 2007, the Union of Concerned Scientists published a report detailing Exxon's campaign of uncertainty, including a table identifying dozens of organizations that the group said had received $16 million in Exxon contributions over several years. (Credit: Union of Concerned Scientists)

Exxon's uncertainty campaign was detailed in three exhaustive reports published in 2007 by the Union of Concerned Scientists and the Government Accountability Project.

At a **Congressional hearing in 2007**, Harvard scientist James McCarthy, who was a member of the

James McCarthy (Credit: Kris Snibbe/Harvard Staff Photographer)

UCS board and the newly elected president of the American Association for the Advancement of Science, declared: "The Bush administration and a network of Exxon-funded, ExxonMobil funded organizations have sought to distort, manipulate and suppress climate science so as to confuse the American public about the urgency of the global warming problem, and thus, forestall a strong policy response."

To this day, top Exxon officials sometimes argue that models are no basis for policy.

While Rex Tillerson, the current chairman, doesn't echo Lee Raymond's science denial **in his formal speeches**, he sometimes backslides when speaking off the cuff.

At Exxon's annual meeting in 2015, Tillerson said it would be best to wait for more solid science before acting on climate change. "What if everything we do, it turns out our models are lousy, and we don't get the effects we predict?" he asked.

And in its formal annual energy forecasts, as well as in its latest report on the implications of its carbon footprint, Exxon adopts business-as-usual assumptions. It deflects the question of how much carbon will build up in the world's atmosphere over

the next few decades, or how much the planet will warm as a result.

"As part of our energy outlook process, we do not project overall atmospheric GHG [greenhouse gas] concentration, nor do we model global average temperature impacts," both reports say.

In footnotes, Exxon offers this excuse: "These would require data inputs that are well beyond our company's ability to reasonably measure or verify."

*Click **here for Part 1**, an overview of Exxon's history with climate change; **Part II**, an accounting of Exxon's early climate research; **Part III**, a review of Exxon's climate modeling efforts; **Part IV**, a dive into Exxon's Natuna gas field project; **Part V**, a look at Exxon's push for synfuels.*

ICN staff members Neela Banerjee, Lisa Song, Zahra Hirji, and Paul Horn also contributed to this report.

PUBLISHED UNDER:
EXXON: THE ROAD NOT TAKEN
BUSINESS AND ACCOUNTABILITY, DENIAL
EXXON: THE ROAD NOT TAKEN

PRINTER-FRIENDLY VERSION

Exxon Made Deep Cuts in Climate Research Budget in the 1980s

The cuts ushered in a five-year hiatus in peer-reviewed publication by its scientists and the era when the company first embraced disinformation.

BY JOHN H. CUSHMAN JR., INSIDECLIMATE NEWS

NOV 25, 2015

Pictured here is the Esso Atlantic tanker, where Exxon's first climate-related project was conducted , between 1979 and 1982.

Internal Exxon Corporation budget documents from the 1980s show that the oil giant sharply curtailed its ambitious program of innovative climate research in those years, chopping well over half from its annual budget for internal investigations into how carbon dioxide emissions from fossil fuels would affect the planet.

Facing a budget crunch and sensing that any government efforts to clamp down on carbon pollution were a long way off, Exxon terminated two especially innovative experiments. One involved oceanic observations during voyages of the Esso Atlantic, a supertanker. The other proposed to test vintage French wines for tell-tale traces of carbon dioxide from fossil fuels or other sources.

And then, in the late 1980s, Exxon ramped up a decades-long public relations campaign to sow uncertainty about the increasing scientific evidence for urgent action on climate change.

Exxon's pivoting from the cutting edge of early climate change science to the forefront of climate denial was described in **a six-part series published by InsideClimate News beginning in September**, based largely on primary sources including Exxon's own internal documents. Similar findings were reached independently by a team based at the Columbia Journalism School in partnership with the Los Angeles Times.

Exxon spokesman Ken Cohen has questioned ICN's reporting that the company "curtailed" its research program after a few years of unusually advanced experiments and modeling work in the 1980s.

But several documents uncovered by ICN show that the budget cuts during the 1980s were steep and sudden. The cuts reversed the course that the company followed in the late 1970s, when top company scientists warned Exxon's management for

BY JOHN H. CUSHMAN JR.

State AGs and Groups Defy Lamar Smith's Subpoena Over Exxon Climate Probes

BY DAVID HASEMYER

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SPECIES ON THE MOVE

Monarch Butterfly

Monarch butterflies can migrate 3,000 miles, but they can't escape climate change.

RELATED

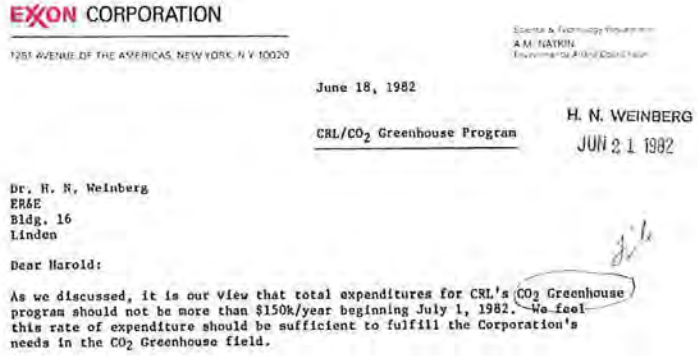
Exxon's Own Research Confirmed Fossil Fuels' Role in Global Warming Decades Ago

BY NEELA BANERJEE, LISA SONG AND DAVID HASEMYER

the first time of the risks of climate change, and launched internal research programs unparalleled among its oil industry peers.

ICN provided an Exxon spokesman copies of the documents being published today and requested any additional information about climate research spending during the 1980s, the period closely examined in **ICN's series, "Exxon: The Road Not Taken."** The spokesman, Alan Jeffers, declined to provide any additional budget numbers.

One of the documents, **a June 18, 1982 memo to Harold Weinberg**, a top research official, informed him that the year's budget for research into the looming CO2 problem was to be cut from $900,000 to $385,000 immediately, and to just $150,000 the following year, an 83 percent cut.



EXXON CORPORATION

1251 AVENUE OF THE AMERICAS, NEW YORK, N.Y. 10020

A.M. NATKIN

June 18, 1982

CRL/CO_2 Greenhouse Program

H. N. WEINBERG
JUN 21 1982

Dr. H. N. Weinberg
ER&E
Bldg. 16
Linden

Dear Harold:

As we discussed, it is our view that total expenditures for CRL's CO_2 Greenhouse program should not be more than $150k/year beginning July 1, 1982. We feel this rate of expenditure should be sufficient to fulfill the Corporation's needs in the CO_2 Greenhouse field.

Click to view the full document.

"We feel this rate of expenditure should be sufficient to fulfill the Corporation's needs in the CO2 greenhouse field," said the memo, written by A.M. Natkin, environmental affairs coordinator in the corporate science and technology department.

"These funds are intended to support a resident source of scientific expertise on all phases and aspects of the CO2 Greenhouse effect," he wrote. "It is important for the corporation to stay abreast of developments in order to assess the impact of new scientific discoveries and to respond to various inquiries."

Exxon Sowed Doubt About Climate Science for Decades by Stressing Uncertainty

BY DAVID HASEMYER AND JOHN H. CUSHMAN JR.

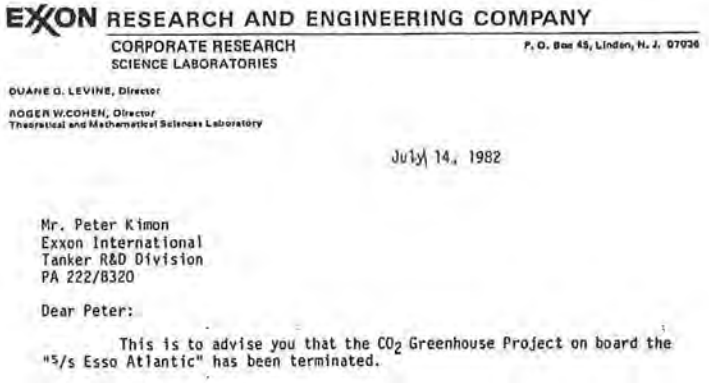
How Exxon Overstates the Uncertainty in Climate Science

BY JOHN H. CUSHMAN JR.

He said that $150,000 a year "should be sufficient to do this."

Exxon's annual research and development budget at the time was more than $600 million, according to a speech by Exxon Research & Engineering chief Ed David at a 1981 Exxon R&D symposium in San Francisco. The company's exploration and capital budgets amounted to $11 billion.

The Natkin memo augured the dismantling of the crown jewel of Exxon's early research on climate change: a seagoing field experiment into the ocean's absorption of carbon dioxide emissions from the burning of fossil fuels. Once envisioned as an expanding, multiyear effort, it was terminated in 1982, **another memo confirmed**.



EXXON RESEARCH AND ENGINEERING COMPANY

CORPORATE RESEARCH
SCIENCE LABORATORIES

P. O. Box 45, Linden, N. J. 07036

DUANE G. LEVINE, Director

ROGER W.COHEN, Director
Theoretical and Mathematical Sciences Laboratory

July 14, 1982

Mr. Peter Kimon
Exxon International
Tanker R&D Division
PA 222/B320

Dear Peter:

This is to advise you that the CO_2 Greenhouse Project on board the "S/s Esso Atlantic" has been terminated.

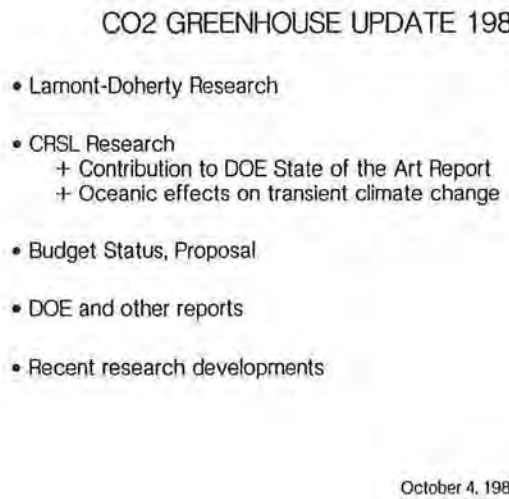
Click to view the full document.

Another innovative proposal to test the carbon dioxide in old vintages of fine French wines also fell by the wayside.

An additional **internal document, this one an October 4, 1985 update** presented by Brian Flannery, Exxon's top climate researcher, showed that Exxon's budget for CO2 research in 1985 and 1986 would be no more than $250,000 each year.

That was to cover professional work by Exxon employees, payments to consultants or contractors for research, travel and miscellaneous expenses,

and payments to the Lamont-Doherty Earth Observatory of Columbia University, which was a partner in the tanker project and other early Exxon work.



CO2 GREENHOUSE UPDATE 1985

- Lamont-Doherty Research
- CRSL Research
  + Contribution to DOE State of the Art Report
  + Oceanic effects on transient climate change
- Budget Status, Proposal
- DOE and other reports
- Recent research developments

October 4, 1985
New York City
B. P. Flannery

Click to view the full document.

Exxon's documents show not only that the research was curtailed, but why.

The idea to cut back the research program first surfaced in **a January 1981 "scoping study."** That was a type of internal Exxon planning document meant to be the "initial phase in the development of comprehensive plans for high-impact programs," a cover sheet explained.

"Our recommendation is that comprehensive program plan development not be undertaken for the atmospheric CO2 area," said the cover sheet.

After all, said the 16-page scoping study, "There is no near term threat of legislation to control CO2. One reason for this is that it has not yet been proven that the increases in atmospheric CO2 constitute a serious problem that requires immediate action."

The scoping study, a 16-page document, was published by ICN as part of the **first installment of**

its six-part investigative series.

"The increasing level of atmospheric CO2 is causing considerable concern due to potential climate effects," the document said. Exxon Research & Engineering, it noted, "has been actively conducting research on certain aspects of the issue for approximately two years. This report addresses the question of whether a comprehensive research plan with greater breadth for ER&E than the current plan should be developed."

The answer to that question was, in short, no. The work "if successful, will likely provide recognition for Exxon for making important technical contributions to this global environmental issue," according to the document.

However, "an expanded R&D program does not appear to offer significantly increased benefits," the document went on. "It would require skills which are in limited supply, and would require additional funds on the part of Exxon since Government funding appears unlikely."

In the mid-1980s the company wrapped up publication of a burst of modeling efforts undertaken during the heyday of its early research–including three important peer-reviewed studies, all **described in the ICN series**. Those studies by Exxon scientists and consultants, one of them published by the federal government and two by academic journals, confirmed the emerging consensus regarding the planet's sensitivity to increased concentrations of carbon dioxide in the atmosphere.

Then Exxon's published research hit a five-year hiatus, as shown in **Exxon's own list** of more than 50 peer-reviewed climate studies its employees have worked on.

From 1986 to 1990, Exxon went without publishing any peer-reviewed scientific research into the

problem, just as it was becoming a hot topic of political debate.

In 1988, 1989 and 1990, Exxon sharply escalated its well-documented efforts to **emphasize the scientific uncertainty** surrounding climate change, a campaign of misinformation that would last for decades.

Exxon asserts that it has been doing important scientific research continuously since the 1970s. It frequently mentions its financial support for work done by programs at the Massachusetts Institute of Technology. (Exxon's support for work at Stanford University, more costly and more geared to developing technologies as opposed to understanding climate change itself, began much later.)

Announced in 1993, Exxon's first grant of $1 million to the MIT program was expressly designed to produce assessments "based on realistic representations of the uncertainties of climate science." That phrase occurred both in the press release announcing the grant and, a year later, **in the program's first report**, entitled "Uncertainty in Climate Change Policy Analysis."

In the light of 20 years of hindsight, that 1994 MIT report's conclusions seem vague and equivocal, providing "no guidance for greenhouse policy."

It said "neither of the extreme positions, to take urgent action now or do nothing awaiting firm evidence, is a constructive response to the climate threat."

"Uncertainty is the essence of the issue," it declared.

PUBLISHED UNDER:
BUSINESS AND ACCOUNTABILITY
EXXON: THE ROAD NOT TAKEN

PRINTER-FRIENDLY VERSION

More Exxon Documents Show How Much It Knew About Climate 35 Years Ago

Documents reveal Exxon's early CO2 position, its global warming forecast from the 1980s, and its involvement with the issue at the highest echelons.

BY NEELA BANERJEE, INSIDECLIMATE NEWS

DEC 1, 2015

A Mobil logo is painted on a storage tank at the Exxon Mobil refinery

MOST POPULAR

GOP and Democratic Platforms Highlight Stark Differences on Energy and Climate

BY PHIL MCKENNA

EPA Clears the Way for Greenhouse Gas Rules on U.S. Airlines

in Joliet, Illinois. Credit: Scott Olson/Getty Images

In our series, "**Exxon: The Road Not Taken**," InsideClimate News published **several dozen documents** that established the arc of Exxon's pioneering yet little-known climate research, which began 40 years ago.

Our reporting team chose them from the thousands of mainly internal company documents that we reviewed in our 10-month investigation.

In addition to the ones we have already published since September—which ExxonMobil has now downloaded from the ICN website and **imported to its blog**—there are more worth sharing.

Each illuminates a nuance of Exxon's early internal discussions about climate change, from interactions at the highest echelons to presentations for the rank-and-file. The documents reveal the contrast between Exxon's initial public statements about climate change and the company's later efforts to deny the link between fossil fuel use and higher global temperatures.

A selection of previously unpublished memos and reports are included and explained here, as part of ICN's continuing exploration of Exxon's climate documents.

Exxon Senior Vice President Weighs in on the 'Greenhouse Program' (1980)

*This **memo from June 9, 1980**, indicates that carbon dioxide research was not a project that Exxon's board simply greenlighted. It was an issue so important that at least one senior vice president was paying close attention to the science, and he was interested and versed enough to argue its arcana.*

BY JOHN H. CUSHMAN JR.

State AGs and Groups Defy Lamar Smith's Subpoena Over Exxon Climate Probes

BY DAVID HASEMYER

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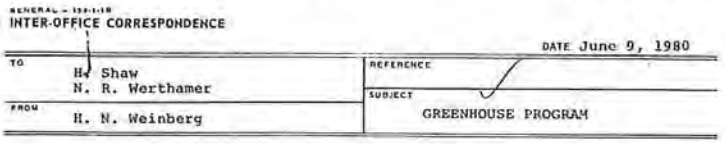


INTER-OFFICE CORRESPONDENCE

DATE June 9, 1980

TO: H. Shaw
N. R. Werthamer

REFERENCE

FROM: H. N. Weinberg

SUBJECT: GREENHOUSE PROGRAM

At the CRIAC Meeting on June 4 I presented the material on the Greenhouse Program as covered in the attached pages 15 and 16. George Piercy questioned me closely on the statement that there is a net CO_2 flux out of the ocean at the upwelling zones. He argued that the concentration of CO_2 in the ocean in parts per million could well be higher than that in the atmosphere in parts per million and that there would be no net flux because those concentrations might be the ones required for equilibrium. On reflection, I think George may be right. Please let me have your comments.

Click to view the full document.

On June 9, 1980, **Harold N. Weinberg, a top manager in Exxon Research and Engineering**, the hub of the company's carbon dioxide research, sent a note to **Richard Werthamer** and **Henry Shaw** with the subject, "Greenhouse Program," the company's CO_2 research initiative. Shaw was the unit's lead climate researcher at the time, Werthamer his boss.

In the note, Weinberg wrote that he gave a presentation at a June 4 meeting about the program and said, "**George Piercy** questioned me closely on the statement that there is a net CO_2 flux out of the ocean at the upwelling zones."

At the time, Exxon had deployed a state-of-the-art supertanker outfitted with equipment for measuring marine CO_2 concentrations to understand the role the oceans play in the world's carbon cycle. Scientists knew that the oceans had absorbed some of the carbon dioxide released from the increased global consumption of fossil fuels. But Exxon's researchers wanted to understand how exactly CO_2 behaved in the oceans—and whether after trapping the gas, the seas would eventually release it into the atmosphere.

Piercy was a senior vice president at Exxon in 1980, and a member of the board of directors. According to the note, he challenged Weinberg's assertion that global circulation patterns move CO_2 out of the deep oceans to the surface where it

Exxon's Own Research Confirmed Fossil Fuels' Role in Global Warming Decades Ago

BY NEELA BANERJEE, LISA SONG AND DAVID HASEMYER

Exxon Believed Deep Dive Into Climate Research Would Protect Its Business

NEELA BANERJEE, LISA SONG, DAVID HASEMYER

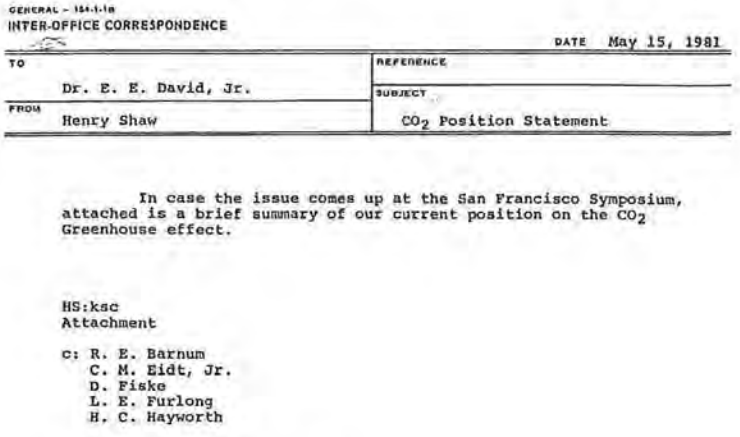
escapes into the atmosphere, a process known as "upwelling."

Piercy disagreed, arguing the oceans can hold higher concentrations of CO_2 without releasing it into the air. (As it turns out, Weinberg was right, though overall, the world's oceans act as a global sink, pulling CO2 from the air into the water and helping dampen the effects of climate change.)

Other memos from the early 1980s (**here** and **here**) show that ER&E staff regularly apprised at least one other senior vice president, M.E.J. O'Loughlin, of the latest climate research, too.

Exxon's Lead Climate Researcher Presents: The Company's Position on the CO_2 Greenhouse Effect (1981)

*In **this May 15, 1981 memo**, Exxon estimates a 3-degree Celsius rise in global average temperatures in 100 years, and appears ready to discuss publicly that a time could arrive when the world would have to shift to renewable energy. Exxon thought such a transition could happen in a gradual, "orderly" way.*



GENERAL - 154.1.18
INTER-OFFICE CORRESPONDENCE

DATE May 15, 1981

TO
Dr. E. E. David, Jr.

REFERENCE

SUBJECT
CO_2 Position Statement

FROM
Henry Shaw

In case the issue comes up at the San Francisco Symposium, attached is a brief summary of our current position on the CO_2 Greenhouse effect.

HS:ksc
Attachment

c: R. E. Barnum
C. M. Eidt, Jr.
D. Fiske
L. E. Furlong
H. C. Hayworth

Click to view the full document.

By 1981, Exxon had already established itself as a leader on the greenhouse effect with many in industry and the government. In early May of that year, Henry Shaw prepared a "brief summary of our current position on the CO_2 Greenhouse effect" for

Edward E. David, Jr., president of Exxon Research and Engineering, in case the topic came up at an Exxon symposium in San Francisco where David would be speaking.

Based on documentary evidence, it appears the summary went through several drafts and the final version went to David's office on May 15.

The bullet points that Shaw presented to David start with the idea that "there is sufficient time to study the problem before corrective action is required." Shaw based his caution on estimates that higher global temperatures caused by rising CO_2 would only be felt around the year 2000, and that CO_2 concentrations in the atmosphere would double in about 100 years. Those gaps, Shaw wrote, permit "time for an orderly transition to non-fossil fuel technologies should restrictions on fossil fuel use be deemed necessary."

The document did not raise doubts about the links between fossil fuel use, higher CO_2 concentrations and a warmer planet. Shaw wrote:

> • "Atmospheric CO_2 will double in 100 years if fossil fuels grow at 1.4%/ a^2.
> • 3°C global average temperature rise and 10°C at poles if CO_2 doubles.
> —Major shifts in rainfall/agriculture
> —Polar ice may melt"

Eleven other staff and managers at Exxon Research, besides David, were sent the paper with the corporate position on global warming that Shaw had articulated.

By the end of the 1980s, Exxon would publicly pivot away from open consideration of any restrictions on fossil fuel use because of its effect on the atmosphere.

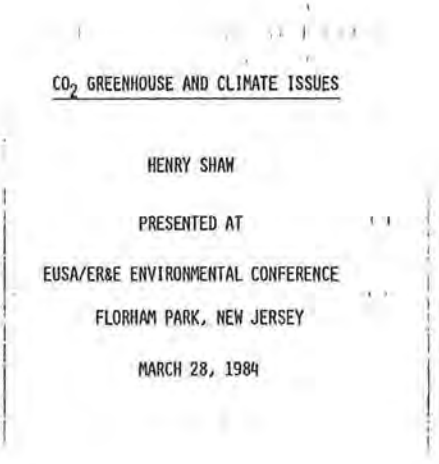
In 1996, when climate research was more certain about the link between fossil fuel combustion and

climate change than during the time of Shaw's memo, Exxon's new chairman and chief executive **Lee Raymond said in a speech in Detroit:** "Currently, the scientific evidence is inconclusive as to whether human activities are having a significant effect on the global climate."

At Exxon's annual meeting in 2015, chairman Rex Tillerson said it would be best to wait for more solid science before acting on climate change. "What if [after] everything we do, it turns out our models are lousy, and we don't get the effects we predict?"

A Presentation on 'CO_2 Greenhouse and Climate Issues' (1984)

Exxon began incorporating CO_2 estimates into its corporate planning as early as 1981, ***this March 28, 1984 presentation shows****. The company acknowledged the link between fossil fuel use and climate change throughout most of the 1980s.*



CO_2 GREENHOUSE AND CLIMATE ISSUES

HENRY SHAW

PRESENTED AT

EUSA/ER&E ENVIRONMENTAL CONFERENCE

FLORHAM PARK, NEW JERSEY

MARCH 28, 1984

Click to view the full document.

In 1984, Shaw no longer ran Exxon's CO_2 research. He had been moved from that post a few years earlier as the company shifted its focus from the expensive empirical research on the tanker to cheaper, yet still highly significant, climate modeling. By the mid-1980s, Shaw worked on keeping track of emerging independent climate research and

apprising top managers.

On March 28, Shaw gave a presentation at an internal Exxon environmental conference in Florham Park, N.J. He showed projections of fossil fuel use through the 21st century and the growth in global carbon dioxide expected from it.

Shaw told his audience that he was regularly asked to prepare estimates for Exxon about CO_2 from fossil fuel use. Those estimates used and were integrated into the company's energy projections for the 21st century and circulated within Exxon.

He wrote in the presentation: "As part of CPPD's technology forecasting activities in 1981, I wrote a CO_2 greenhouse forecast based on publically available information. Soon thereafter, S&T [Science & Technology] requested an update of the forecast using Exxon fossil fuel projections. This request was followed late in 1981 with a request by CPD [Corporate Planning Department] for assistance in evaluating the potential impact of the CO_2 effect in the '2030 Study.' After meeting CPD's specific need, a formal technology forecast update was issued to S&T in the beginning of April 1982. It was subsequently sent for review to the Exxon affiliates."

Exxon's affiliates are the company's various divisions, including exploration and production, refining, international units and shipping.

Then Shaw shared with his audience estimates by Exxon and three other entities—the Environmental Protection Agency, the National Academy of Sciences, and the Massachusetts Institute of Technology—about when CO_2 would double in the atmosphere, what kind of increases could occur in average global temperatures and the effects of such changes on human life.

Exxon estimated that CO_2 would double by 2090, which was later than what the other groups had projected. It estimated that average global

temperatures would rise by 1.3 to 3.1 degrees Celsius (2.3 to 5.6 degrees Fahrenheit), which was in the mid-range of the four projections that Shaw shared.

Shaw showed the policy recommendations of the three organizations and Exxon to address climate change. According to him, MIT argued for an "extreme reduction in fossil fuel use," while the others, including Exxon, urged a more cautious approach. But Exxon did not deny the link between fossil fuel use and climate change as it would begin to do just five years later.

ICN reporter Lisa Song contributed to this report.

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BY DAVID HASEMYER

Escalating Battle Over Exxon Investigation Subpoenas Could End Up in Court
BY DAVID HASEMYER

State Attorneys General Subpoenaed by Rep. Lamar Smith for Exxon Fraud Probe
BY DAVID HASEMYER

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Exxon's Oil Industry Peers Knew About Climate Dangers in the 1970s, Too

Members of an American Petroleum Institute task force on CO2 included scientists from nearly every major oil company, including Exxon, Texaco and Shell.

BY NEELA BANERJEE, INSIDECLIMATE NEWS

DEC 22, 2015

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BY PHIL MCKENNA


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Beginning in 1979 the American Petroleum Institute, the nation's most powerful lobbyist, together with the country's largest oil companies ran a task force to monitor and share climate research. Credit: JOEL SAGET/AFP/Getty Images

The American Petroleum Institute together with the nation's largest oil companies ran a task force to monitor and share climate research between 1979 and 1983, indicating that the oil industry, not just Exxon alone, was aware of its possible impact on the world's climate far earlier than previously known.

The group's members included senior scientists and engineers from nearly every major U.S. and multinational oil and gas company, including Exxon, Mobil, Amoco, Phillips, Texaco, Shell, Sunoco, Sohio as well as Standard Oil of California and Gulf Oil, the predecessors to Chevron, according to internal documents obtained by InsideClimate News and interviews with the task force's former director.

An **InsideClimate News investigative series** has shown that Exxon launched its own cutting-edge CO_2 sampling program in 1978 in order to understand a phenomenon it suspected could harm its business. About a decade later, Exxon spearheaded campaigns to cast doubt on climate science and stall regulation of greenhouse gases. The previously unpublished papers about the climate task force indicate that API, the industry's most powerful lobbying group, followed a similar arc to Exxon's in confronting the threat of climate change.

Just as Exxon began tracking climate science in the late 1970s, when only small groups of scientists in academia and the government were engaged in the research, other oil companies did the same, the documents show. Like Exxon, the companies also expressed a willingness to understand the links between their product, greater CO_2 concentrations and the climate, the papers reveal. Some corporations ran their own research units as well,

BY JOHN H. CUSHMAN JR.

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BY DAVID HASEMYER

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BY NEELA BANERJEE, LISA SONG AND DAVID HASEMYER

although they were smaller and less ambitious than Exxon's and focused on climate modeling, said James J. Nelson, the former director of the task force.

"It was a fact-finding task force," Nelson said in an interview. "We wanted to look at emerging science, the implications of it and where improvements could be made, if possible, to reduce emissions."

The group was initially called the CO_2 and Climate Task Force, but changed its name to the Climate and Energy Task Force in 1980, Nelson said.

A background paper on CO_2 informed API members in 1979 that carbon dioxide in the atmosphere was rising steadily, and it predicted when the first clear effects of climate change might be felt, according to a memo by an Exxon task force representative.

In addition, API task force members appeared open to the idea that the oil industry might have to shoulder some responsibility for reducing CO_2 emissions by changing refining processes and developing fuels that emitted less carbon dioxide.

Bruce S. Bailey of Texaco offered "for consideration" the idea that "an overall goal of the Task Force should be to help develop ground rules for energy release of fuels and the cleanup of fuels as they relate to CO_2 creation," according to the **minutes of a meeting on Feb. 29, 1980**.

The **minutes also show** that the task force discussed a "potential area" for research and development that called for it to "'Investigate the Market Penetration Requirements of Introducing a New Energy Source into World Wide Use.' This would include the technical implications of energy source changeover, research timing and requirements."

Yet by the 1990s, it was clear that API had opted for a markedly different approach to the threat of


Exxon Believed Deep Dive Into Climate Research Would Protect Its Business
NEELA BANERJEE, LISA SONG, DAVID HASEMYER


Exxon Sowed Doubt About Climate Science for Decades by Stressing Uncertainty
BY DAVID HASEMYER AND JOHN H. CUSHMAN JR.

climate change. It joined Exxon, other fossil fuel companies and major manufacturers in the Global Climate Coalition (GCC), a lobbying group whose objective was to derail international efforts to curb heat-trapping emissions. In 1998, a year after the Kyoto Protocol was adopted by countries to cut fossil fuel emissions, API crafted a campaign to convince the American public and lawmakers that climate science was too tenuous for the United States to ratify the treaty.

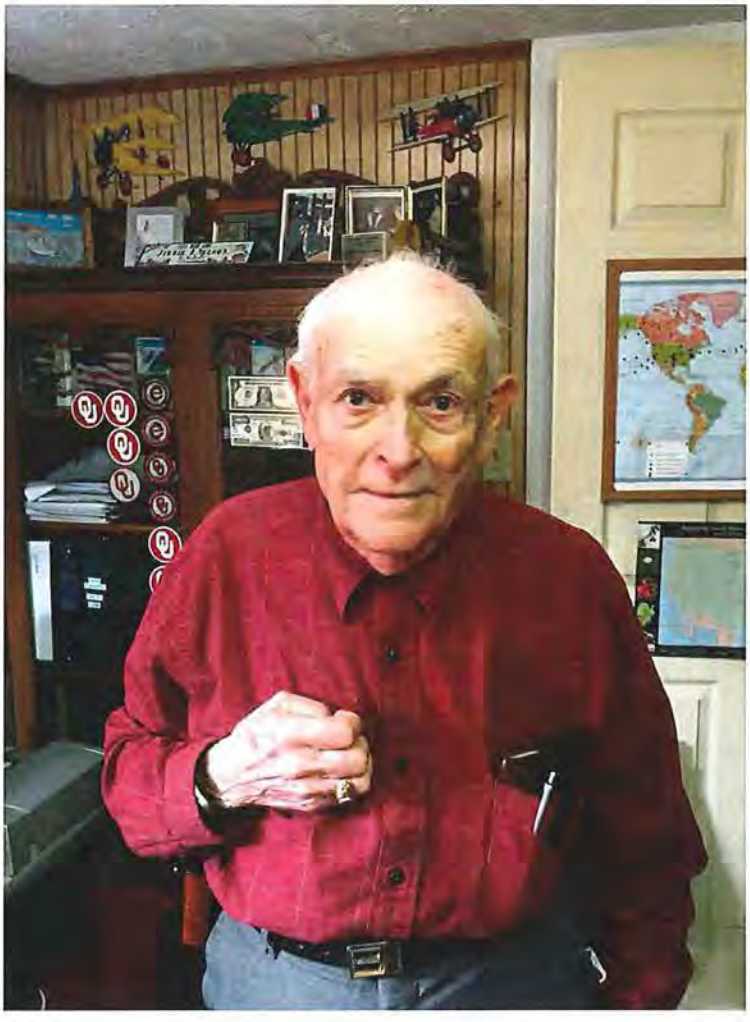
"Unless 'climate change' becomes a non-issue, meaning that the Kyoto proposal is defeated and there are no further initiatives to thwart the threat of climate change, there may be no moment when we can declare victory for our efforts," according to the **draft Global Climate Science Communications Action Plan** circulated by API.

API and GCC were victorious when George W. Bush pulled the U.S. out of the Kyoto agreement. A **June 2001 briefing memorandum** records a top State Department official thanking the GCC because Bush "rejected the Kyoto Protocol in part, based on input from you."

API did not respond to several requests for comment on this story.

The Climate and Energy Task Force continued until at least 1983, when Nelson left API after a four-year stint. At the time, the Environmental Protection Agency's authority was growing, and oil companies believed the agency was silencing them, Nelson said. It became harder for corporations to get scientific papers published or to draw favorable media attention, the industry felt. In the end, company leaders feared this would lead to overregulation.

As a result, API decided that it wasn't enough to have scientists meeting in a task force about climate change or other pollution issues. It needed lobbyists to influence politicians on environmental issues, Nelson said.



James J. Nelson, the former director of the API task force on CO2.
Credit: Neela Banerjee/InsideClimate News

"They took the environmental unit and put it into the political department, which was primarily lobbyists," Nelson said of API. "They weren't focused on doing research or on improving the oil industry's impact on pollution. They were less interested in pushing the envelope of science and more interested in how to make it more advantageous politically or economically for the oil industry. That's not meant as a criticism. It's just a fact of life."

Nelson said he departed API because he was not a lobbyist, but said he did not object to API's lobbying. Nelson does not accept that human activity is the main driver of climate change; he believes that natural cycles and phenomena such as volcanoes and deforestation have contributed significantly to a

warming planet. The API was not about "trying to distort the truth but about getting the information out in a factual manner. It wasn't about propaganda," he said.

Nelson joined API in 1979 after a career as an Air Force pilot and then as the director of the first air quality monitoring system in Fairfax County, Va. At the time, API had an environment division that helped member companies organize and staff committees on potential pollution issues, including waste management and water quality. Nelson was hired to run the air quality committee, which focused largely on pollution such as sulfur dioxide, nitrogen oxides and other pollutants that had more immediate, local consequences.

CO_2 was not among the most pressing issues that API members faced, Nelson said. Still, by the time he arrived, companies were already putting together the task force to monitor the emerging science on higher atmospheric CO_2 concentrations and their possible impact on the climate. They had seen how pollution had hammered other industries, such as acid rain's effect on power generation or asbestos on construction, Nelson said. The oil industry did not want to be blindsided by the CO_2 problem, which the science of the late 1970s had already linked to fossil fuel combustion.

As the group came together, Raymond J. Campion, a scientist at Exxon Research and Engineering and a member of the task force, recommended in memos to colleagues that "CO_2 not receive a high priority" from API. One reason, **Campion wrote**, was because "the industry's credibility on such issues is not high at the present time, and should an API study indicate no serious CO_2 problems, the results would be greeted with skepticism."

Some of the recipients of those memos were top people on the lobbying and planning side of Exxon USA, the company's domestic affiliate. On July 9, 1979, Campion wrote a memo to W.W. Madden, the

manager of strategic planning at Exxon USA. Campion noted "Bill Slick's need for information on atmospheric CO_2 buildup as a potential emerging issue for API to consider." Slick was an Exxon USA vice president and a well-known lobbyist in Washington.

Another reason to pursue a limited agenda, **Campion wrote**, was because the Energy Department and the American Association for the Advancement of Science (AAAS) were expected to issue a report "momentarily" based on an April 1979 climate symposium that "concluded no catastrophic hazards would be associated with the CO_2 buildup over the next 100 years and that society can cope readily with whatever problems ensue."

(Eventually published in October 1980, the AAAS report offered more sobering forecasts than Campion had expected, describing risks to nearly every facet of life on Earth and concluding catastrophes could be avoided only if timely steps were taken to address climate change.)

A **memo from Campion** to colleague J.T. Burgess dated Sept. 6, 1979 showed that the task force moved quickly to draft a background paper about CO_2. Campion wrote that he was asked to critique it for Slick to use in API discussions.

Campion suggested corrections to the background paper's quantification of the rate of CO_2 build-up, as well as an estimate in the paper that the "warming of the atmosphere...may be noticeable within the next twenty years."

He estimated that the effects would be felt after 2000, after a cyclical cooling period had passed. Because a cyclical warming trend was then expected post 2000, it would intensify climate change, "worsening the effect," **he wrote**. It is not known if the corrections were made to the paper.

Campion declined to be interviewed regarding his

participation on the task force. Other Exxon representatives included Robert J. Fritz, who could not be located, and Henry Shaw, the company's lead climate researcher in the late 1970s, who is deceased. Exxon did not answer a request for comment.

The company representatives were scientists and engineers, and well-versed on air quality issues, Nelson recalled. Their views on carbon dioxide's possible impact on the climate varied, with many skeptical that man-made emissions could substantially affect the atmosphere. But they approached their participation on the task force dispassionately, he said.

"The individuals I had on the task force were very, very technically and ethically moral," Nelson said. "They felt that their job for their company was to look at an issue and if there was a problem, or if the petroleum industry was part of it or could contribute to fixing the problem, they wanted to do that."

Nelson organized the monthly meetings, took minutes and disseminated information companies wanted to share. Documents show representatives of about a half-dozen companies at various meetings. The meeting sites rotated among the members' cities, including oil hubs such as Houston and Tulsa; Washington, where API is located; and New York, where Exxon was headquartered at the time.

As Campion had recommended, API did not conduct its own research. But some of its members did, and they were generous about sharing their work and insights, Nelson said. "There were lots of discussions about climate models: whose were right and whose were wrong," he said.

Chevron acquired Texaco in 2000. Nelson said that Texaco's Bailey ran a small climate modeling team at the research facility in Beacon, N.Y. Bailey could not be located for comment. Chevron declined to

comment on early CO_2 research activities.

At Shaw's urging, the task force invited Professor John A. Laurmann of Stanford University to brief members about climate science at the February 1980 meeting in New York. Shaw and Laurmann had participated in the same panel at the AAAS climate conference in April 1979.

Like many scientists at the time, Laurmann openly discussed the uncertainties in the evolving climate research, such as the limited long-term sampling data and the difficulty of determining regional effects of climate change, according to **a copy of his presentation attached to the meeting minutes**.

Still, Laurmann told his audience several times that the evidence showed that the increase in atmospheric CO_2 is likely "caused by anthropogenic release of CO_2, mainly from fossil fuel burning."

In his conclusions section, Laurmann estimated that the amount of CO_2 in the atmosphere would double in 2038, which he said would likely lead to a 2.5 degrees Celsius rise in global average temperatures with "major economic consequences." He then told the task force that models showed a 5 degrees Celsius rise by 2067, with "globally catastrophic effects."

The documents also show that the Energy Department contacted the task force in November 1979 to get its opinion on a study to be published in the journal Science about CO2 emissions from the development of oil shale. The government and oil industry had embarked on a mission to develop synthetic petroleum from sources such as oil shale and coal because of falling conventional oil production in the U.S. and political instability in the Middle East.

The Science study, by two geologists from the U.S. Geological Survey, estimated that synthetic crude from oil shale would generate three to five times

more CO_2 than conventional oil, double previous estimates, the Energy Department said.

The task force spent several months analyzing and refining its statement on the USGS paper, documents show. "Our estimates are less than theirs," Nelson said, "and if their numbers become gospel and no one challenges them, it could cause concern."

Because it was heavily involved in synfuels, Exxon weighed in first in December 1979. Shaw said that the paper was well-written. But he agreed with the Energy Department that the CO_2 estimates were too high, and that "the paper may alarm the public unjustifiably," he wrote in a letter to API.

Shaw's own calculations about CO_2 from synfuels served as the basis of the eventual position paper the task force sent to the Energy Department in the spring of 1980 after multiple drafts. In one draft, the task force stated in March 1980 that the estimates in the Science article were accurate in light of the assumptions it used. "However, several of these assumptions stem from worst-case scenarios that are highly improbable and unrealistic," the task force concluded.

It is unclear what the Energy Department did with the task force's assessment of the paper. Roger C. Dahlman, the Energy Department staff member who sent the article to the task force, did not respond to multiple requests for comment.

After he left API in 1983, Nelson said he followed sporadically the organization's response to climate change. He said he felt the API's lobbying stemmed from a desire to have its concerns heard.

"That was the driving force, a worry about excessive regulation, my impression from having watched it along the way," he said.

Charles DiBona served as president of API from

1979 to 1997, when the organization shifted its approach on climate change from following the science to intense lobbying to discredit it. DiBona said in a phone interview that he did not remember the climate task force. Like Nelson, he does not accept the prevailing scientific consensus that climate change is being driven by fossil fuel combustion. "I think there is some question about the broader scientific community. There's not much evidence that there is real consensus," DiBona said.

In the 1990s, API argued that the science was too weak to warrant action, even as research grew more certain about the link between fossil fuel use, greater CO2 concentrations and rising global temperatures. Exxon chief executive Lee Raymond was API chairman from 1996 to 1997, when he focused on the uncertainty. The GCC emphasized the issue, too, in its public statements.

"Many people, politicians and the public alike, believe that global warming is a rock-solid certainty," Raymond said in a 1997 speech in Beijing. "But it's not."

API organized industry resistance to the possibility of the EPA's regulation of greenhouse gases in 1999. When the Bush administration took office, former API lobbyist Philip A. Cooney became chief of staff at the Council on Environmental Quality, the White House office that drove climate policy. Government scientists accused Cooney of rewriting federal research reports to sow doubt about man-made climate change. Cooney resigned in 2005 and went to work for ExxonMobil.

API's current position is that "**fossil fuel development and environmental progress are not mutually exclusive,**" according to Jack Gerard, the group's president. But API still rejects any federal mandates to reduce greenhouse gas emissions. Gerard decried President Obama's Clean Power Plan to cut emissions from the country's power plants, the cornerstone of the

administration's climate agenda, as destructive "government interference" in free markets.

An earlier version of this story incorrectly stated that scientists from Chevron were involved in the American Petroleum Institute's CO2 task force. The scientists were from the companies that would officially form the company named Chevron in 1984: Standard Oil of California and Gulf.

PUBLISHED UNDER:
BUSINESS AND ACCOUNTABILITY
EXXON: THE ROAD NOT TAKEN

PRINTER-FRIENDLY VERSION

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EXHIBIT 25

Published on *InsideClimate News* (https://insideclimatenews.org)

InsideClimate News Is a Pulitzer Prize Finalist for Exxon Investigation

The nine-part series was recognized in the Public Service category for its exploration of Exxon's conflicted 40-year history with climate science.

By ICN Staff

Apr 18, 2016

The 2016 Pulitzer Prize Finalist in Public Service

Finalist: InsideClimate News

For a probe into a major oil company's decades-long misinformation campaign to muddy the debate over climate change.

InsideClimate News' Exxon: The Road Not Taken [1] series was named a finalist [2] on Monday for the Pulitzer Prize for Public Service.

The gold medal [3] winner of the Public Service award, the most prestigious in American journalism, was the Associated Press, which was honored for Seafood from Slaves [4], an expose that uncovered the use of slave labor in the seafood industry in Asia. The Tampa Bay Times was a second finalist named in the category.

The ICN series describes how Exxon conducted cutting-edge climate research decades ago and later pivoted to the forefront of climate denial, manufacturing doubt about the scientific consensus that its own scientists had confirmed.

The stories were written by a team of ICN reporters—Neela Banerjee, John H. Cushman Jr., David Hasemyer and Lisa Song—after an eight-month investigation which included reviewing hundreds of documents, many from Exxon's own files.

The work had already won five prestigious journalism awards: The National Press Foundation's Stokes Award for energy reporting; finalist for the Goldsmith Prize for Investigative Journalism; the Izzy Award for Excellence by Independent Media; the Scripps Howard Award for Environmental Reporting; and a Society for American Business Editors and Writers award for best investigation by a digital news site.

ICN, a nonpartisan, nonprofit news organization, previously won the Pulitzer Prize for National Reporting in 2013 for The Dilbit Disaster: Inside the Biggest Oil Spill You've Never Heard Of [5].

ICN's work prompted a significant response, including the announcement of a probe of Exxon launched by Eric Schneiderman [6], New York's attorney general, under the state's regulatory disclosure and consumer protection laws. He has subsequently joined a group of 17 attorneys general to press for climate action on multiple legal fronts.

In addition, Reps. Mark DeSaulnier and Ted Lieu (D-Calif.) have called on the Department of Justice [7] to investigate Exxon under the federal RICO (Racketeer Influenced and Corrupt Organizations) Act—the same law used to investigate tobacco companies in the 1990s.

Senator Sheldon Whitehouse (D.-R.I.) and three other congressmen wrote to the Securities and Exchange Commission asking it to investigate ExxonMobil's past federal filings to see if the company violated securities laws by failing to adequately disclose material risks to its business posed by climate change.

Environmental leaders delivered a petition with 350,000 signatures to U.S. Attorney General Loretta Lynch, urging a federal probe of whether ExxonMobil misled the public on global warming. Some 50 heads of national environmental and justice organizations [8] have endorsed the call.

ICN continues to report on the issue, with its latest story detailing how the oil industry [9] has been aware of the global warming risks posed by carbon dioxide as far back as the 1960s.

Published Under:
Business and Accountability [10]
Exxon: The Road Not Taken [11]

Links
[1] http://insideclimatenews.org/content/Exxon-The-Road-Not-Taken
[2] http://www.pulitzer.org/finalists/insideclimate-news
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[10] https://insideclimatenews.org/topics/business-and-accountability-0
[11] https://insideclimatenews.org/tags/exxon-road-not-taken

EXHIBIT 26

Credible Scientific Team 1978 Letter – PDF / 1.08 MB

Technological Forecast on CO2 Greenhouse Effect (1980) – PDF / 4.77 MB

1982 Exxon Primer on CO2 Greehouse Effect – PDF / 13.05 MB

Government Meeting Memo (1977) – PDF / 4.27 MB

Probable Legislation Memo (1979) – PDF / 582.83 KB

Worldwide R&D Memo (1978) – PDF / 975.1 KB

Presentation to NOAA (1979) – PDF / 6.83 MB

Letters to Senior VPS (1980) – PDF / 1.61 MB

Exxon Modeling (1982) – PDF / 5.3 MB

Catastrophic Effects Letter (1981) – PDF / 3.14 MB

Consensus on CO2 Impacts (1982) – PDF / 2.09 MB

CO2 and Fuel Use Projections – PDF / 8.61 MB

Exxon Climate Modeling (1984) – PDF / 2.23 MB

Natuna Environmental Concerns Letter (1983) – PDF / 718.77 KB

Gilbert Gervasi's Natuna CO2 Calculations (1981) – PDF / 1.82 MB

Natuna Background Paper (1983) – PDF / 2.29 MB

CO2 Sparging Report (1984) – PDF / 9.39 MB

Handout for Meeting with Lee Raymond (1985) – PDF / 381.76 KB

James Black 1977 Presentation – *PDF / 3.64 MB*

The Greenhouse Effect – *PDF / 98.69 KB*

Presentation to the Board of Directors Exxon Corporation Feb. 1989 – *PDF / 874.47 KB*

Connections -- Greenhouse Science – *PDF / 1.97 MB*

EXHIBIT 27

GENERAL – 154-1-1B
INTER-OFFICE CORRESPONDENCE

DATE August 18, 1981

TO	REFERENCE
W. Glass	SUBJECT
FROM R. W. Cohen	

I have looked over the draft of the EED reply to the request from O'Loughlin. The only real problem I have is with the second clause of the last sentence in the first paragraph: "but changes of a magnitude well short of catastrophic..." I think that this statement may be too reassuring. Whereas I can agree with the statement that our best guess is that observable effects in the year 2030 are likely to be "well short of catastrophic", it is distinctly possible that the CPD scenario will later produce effects which will indeed be catastrophic (at least for a substantial fraction of the earth's population). This is because the global ecosystem in 2030 might still be in a transient, headed for much more significant effects after time lags perhaps of the order of decades. If this indeed turns out to be case, it is very likely that we will unambiguously recognize the threat by the year 2000 because of advances in climate modeling and the beginning of real experimental confirmation of the CO_2 effect. The effects of such a recognition on subsequent fossil fuel combustion are unpredictable, but one can say that predictions based only on our knowledge of availability and economics become hazardous.

I would feel more comfortable if the first paragraph concluded with a statement to the effect that future developments in global data gathering and analysis, along with advances in climate modeling, may provide strong evidence for a delayed CO_2 effect of a truly substantial magnitude, a possibility which increases the uncertainty surrounding the post-2000 CPD scenario.

ROGER W. COHEN

RWC:tmw

Attachment

cc: H. N. Weinberg
A. J. Callegari

ENERAL ✓ 154-1-1B
TER-OFFICE CORRESPONDENCE

DATE 8/14/81

O See Below	REFERENCE SUBJECT
ROM W. Glass	

J. F. Black
R. W. Cohen
S. A. Diamond
H. Shaw

Morey O'Loughlin has asked Ed David for ER&E's views on the realism of CPD's projections for fossil fuel combustion out to 2030 (attached) in view of potential "greenhouse" and "acid rain" problems. I have been asked to draft a short reply.

A preliminary draft for EED's reply is attached. It is based not on any calculations but on my "understanding" of what I think I've heard you say and write in the past. I would appreciate your reviewing this preliminary draft very critically and letting me know promptly of any changes you would like to see. EED wants to get an answer back to MEJO'L by August 21.

Thank you for your cooperation.

WG:bl
Attachments

c: T. K. Kett

DRAFT
EED TO MEJO'L

You asked about our views on possible emission consequences of the CPD-projected fossil fuel consumption levels out to 2030. Much is still unknown about the sources and sinks for atmospheric CO_2, as well as about the climatic effect of increasing CO_2 levels in the air, so that prognostications remain highly speculative. The models that appear most credible (to us) do predict measurable changes in temperature, rainfall pattern, and sea-level by the year 2030 for the postulated fossil fuel combustion rates, but changes of a magnitude well short of catastrophic and probably below the magnitude that need trigger otherwise non-economic responses to the problem of energy supply.

The fossil fuel contribution to the localized problem of acid rain appears handlable by limiting the release of SO_x, NO_x, and chlorides to the atmosphere--which would decrease but by no means eliminate the economic advantage of fossil fuels.

We would be happy to discuss this with you in greater detail.

INITIAL PROJECTION
WORLD ENERGY SUPPLY
(EXCLUDES CPE)

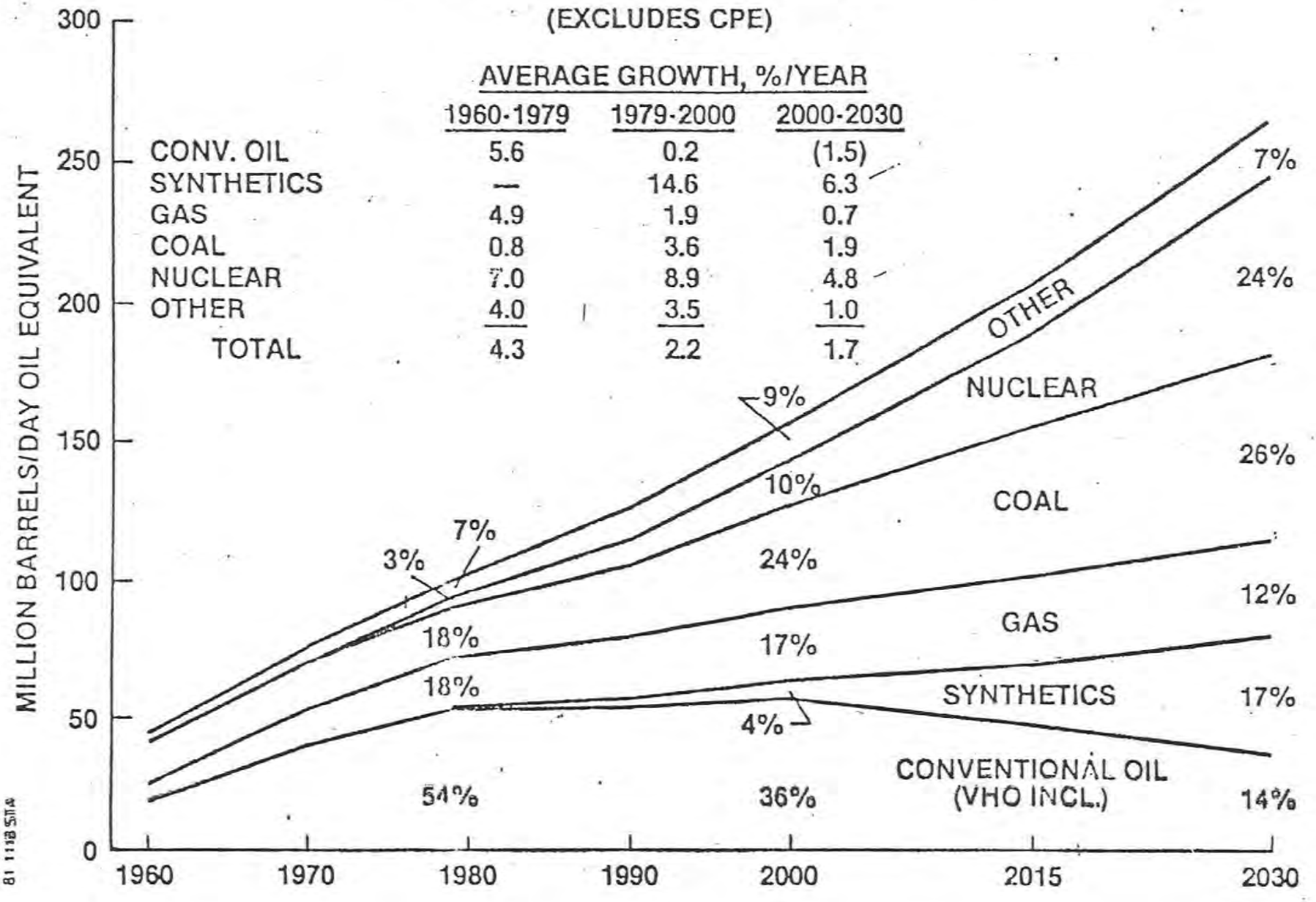


EXHIBIT 28

0757-L-RWC

EXXON RESEARCH AND ENGINEERING COMPANY

CORPORATE RESEARCH
SCIENCE LABORATORIES

P. O. Box 45, Linden, N. J. 07036

DUANE G. LEVINE, Director

ROGER W.COHEN, Director
Theoretical and Mathematical Sciences Laboratory

September 2, 1982

H. N. WEINBERG
SEP 2 1982

Mr. A. M. Natkin
Office of Science and Technology
Exxon Corporation
1251 Avenue of the Americas
New York, New York 10020

Dear Al:

I would like to summarize the findings of our research in climate modeling and place our results in the context of the existing body of knowledge of the CO_2 greenhouse effect.

Although the increase of atmospheric CO_2 is well documented, it has not yet resulted in a measurable change in the earth's climate. The concerns surrounding the possible effects of increased CO_2 have been based on the predictions of models which simulate the earth's climate. These models vary widely in the level of detail in which climate processes are treated and in the approximations used to describe the complexities of these processes. Consequently the quantitative predictions derived from the various models show considerable variation. However, over the past several years a clear scientific consensus has emerged regarding the expected climatic effects of increased atmospheric CO_2. The consensus[+] is that a doubling of atmospheric CO_2 from its pre-industrial revolution value would result in an average global temperature rise of $(3.0 \pm 1.5)^{\circ}C$. The uncertainty in this figure is a result of the inability of even the most elaborate models to simulate climate in a totally realistic manner. The temperature rise is predicted to be distributed nonuniformly over the earth, with above-average temperature elevations in the polar regions and relatively small increases near the equator. There is unanimous agreement in the scientific community that a temperature increase of this magnitude would bring about significant changes in the earth's climate, including rainfall distribution and alterations in the biosphere. The time

[+]National Research Council Panel Report, Carbon Dioxide and Climate: A Second Assessment, National Academy Press, Washington, D.C., 1982.

required for doubling of atmospheric CO_2 depends on future world consumption of fossil fuels. Current projections indicate that doubling will occur sometime in the latter half of the 21st century. The models predict that CO_2-induced climate changes should be observable well before doubling. It is generally believed that the first unambiguous CO_2-induced temperature increase will not be observable until around the year 2000.

It should be emphasized that the consensus prediction of global warming is not unanimous. Several scientists have taken positions that openly question the validity of the predictions of the models, and a few have proposed mechanisms which could mitigate a CO_2 warming. One of the most serious of these proposals has been made by Professor Reginald Newell of MIT. Newell noted that geological evidence points to a relative constancy of the temperature of the equatorial waters over hundreds of millions of years. This constancy is remarkable in view of major climatic changes in other regions of the earth during this period. Newell ascribed this anchoring of the temperature of the equatorial waters to an evaporative buffering mechanism. In this mechanism, when heating increases at the equator, most of the extra energy induces greater rates of evaporation rather than raising temperatures. Newell proposed that this effect might greatly reduce the global warming effect of increased atmospheric CO_2.

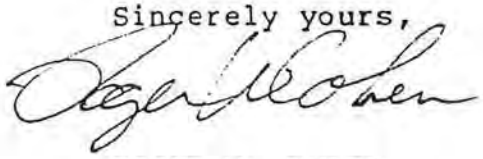
In our climate research we have explored the global effects of Newell's evaporative buffering mechanism using a simple mathematical climate model. Our findings indicate that Newell's effect is indeed an important factor in the earth's climate system. As Newell predicted, evaporative buffering does limit CO_2-induced temperature changes in the equatorial regions. However, we find a compensatingly larger temperature increase in the polar regions, giving a global averaged temperature increase that falls well within the range of the scientific consensus. Our results are consistent with the published predictions of more complex climate models. They are also in agreement with estimates of the global temperature distribution during a certain prehistoric period when the earth was much warmer than today.

In summary, the results of our research are in accord with the scientific consensus on the effect of increased atmospheric CO_2 on climate. Our research appears to reconcile Newell's observations and proposed mechanism with the consensus opinion.

We are now ready to present our research to the scientific community through the usual mechanisms of conference presentations and publications in appropriate journals. I have enclosed a detailed plan for presenting our results.

As we discussed in the August 24 meeting, there is the potential for our research to attract the attention of the popular news media because of the connection between Exxon's major business and the role of fossil fuel combustion in contributing to the increase of atmospheric CO_2. Despite the fact that our results are in accord with those of most researchers in the field and are subject to the same uncertainties, it was recognized that it is possible for these results to be distorted or blown out of proportion. Nevertheless the consensus position was that Exxon should continue to conduct scientific research in this area because of its potential importance in affecting future energy scenarios and to provide Exxon with the credentials required to speak with authority in this area. Furthermore our ethical responsibility is to permit the publication of our research in the scientific literature; indeed to do otherwise would be a breach of Exxon's public position and ethical credo on honesty and integrity.

Sincerely yours,



ROGER W. COHEN

RWC:tmc

Enclosure

cc: A. J. Callegari
E. E. David, Jr.
B. P. Flannery
M. B. Glaser
D. G. Levine
P. J. Lucchesi
H. N. Weinberg

CO_2 Climate Modeling Research: Timetable for Presentations and Publications

I. Presentations

(1) DOE Sponsored CO_2-CLimate Meeting
September 19-23, 1982 (West Virginia)

(a) Results pertaining to general aspects of the model to be presented in an informal session by our collaborator Professor M. I. Hoffert of NYU. The CO_2 calculations will not be included.

(b) Preprints of the paper [#(1) below] to be distributed at this meeting to general peer comments and discussion.*

(2) Ewing Symposium (Lamont-Doherty/Exxon Foundation Supported)
October 25-27, 1982

(a) Results concerning general aspects of the model and the CO_2 calculations to be presented by B. P. Flannery (CR).

II. Publications

(1) Manuscript developing general aspects of the model to be submitted for publication to the Journal of Geophysical Research, September, 1982.*

(2) Manuscript on CO_2 related model predictions to be submitted in late 1982.

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* Provided formal publication clearance has been granted by this time.

EXHIBIT 29

Central Files

PROPRIETARY INFORMATION
For Authorized Company Use Only

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P.O. BOX 101, FLORHAM PARK, NEW JERSEY 07932

EXXON ENGINEERING PETROLEUM DEPARTMENT
Planning Engineering Division

Cable: ENGREXXON, N.Y.

R. L. MASTRACCHIO
Manager
L. E. Hill
Senior Eng. Assoc.

October 16, 1979

Controlling Atmospheric CO_2

79PE 554

Dr. R. L. Hirsch:

The attached memorandum presents the results of a study on the potential impact of fossil fuel combustion on the CO_2 concentration in the atmosphere. This study was made by Steve Knisely, a summer employee in Planning Engineering Division.

The study considers the changes in future energy sources which would be necessary to control the atmospheric CO_2 concentration at different levels. The principle assumption for the CO_2 balance is that 50% of the CO_2 generated by fossil fuels remains in the atmosphere. This corresponds to the recent data on the increasing CO_2 concentration in the atmosphere compared to the quantity of fossil fuel combusted.

Present climatic models predict that the present trend of fossil fuel use will lead to dramatic climatic changes within the next 75 years. However, it is not obvious whether these changes would be all bad or all good. The major conclusion from this report is that, should it be deemed necessary to maintain atmospheric CO_2 levels to prevent significant climatic changes, dramatic changes in patterns of energy use would be required. World fossil fuel resources other than oil and gas could never be used to an appreciable extent.

No practical means of recovering and disposing of CO_2 emissions has yet been developed and the above conclusion assumes that recovery will not be feasible.

It must be realized that there is great uncertainty in the existing climatic models because of a poor understanding of the atmospheric/terrestrial/oceanic CO_2 balance. Much more study and research in this area is required before major changes in energy type usage could be recommended.

W. L. FERRALL

WLF:ceg
Attachment

c: J. F. Black
J. W. Herrmann
L. E. Hill
E. D. Hooper
F. J. Kaiser
R. L. Mastracchio
W. H. Mueller
H. Shaw
G. O. Wilhelm

CONTROLLING THE CO_2 CONCENTRATION IN THE ATMOSPHERE

The CO_2 concentration in the atmosphere has increased since the beginning of the world industrialization. It is now 15% greater than it was in 1850 and the rate of CO_2 release from anthropogenic sources appears to be doubling every 15 years. The most widely held theory is that:

- The increase is due to fossil fuel combustion
- Increasing CO_2 concentration will cause a warming of the earth's surface
- The present trend of fossil fuel consumption will cause dramatic environmental effects before the year 2050.

However, the quantitative effect is very speculative because the data base supporting it is weak. The CO_2 balance between the atmosphere, the biosphere and the oceans is very ill-defined. Also, the overall effect of increasing atmospheric CO_2 concentration on the world environment is not well understood. Finally, the relative effect of other impacts on the earth's climate, such as solar activity, volcanic action, etc. may be as great as that of CO_2.

Nevertheless, recognizing the uncertainty, there is a possibility that an atmospheric CO_2 buildup will cause adverse environmental effects in enough areas of the world to consider limiting the future use of fossil fuels as major energy sources. This report illustrates the possible future limits on fossil fuel use by examining different energy scenarios with varying rates of CO_2 emissions. Comparison of the different energy scenarios show the magnitude of the switch from fossil fuels to non-fossil fuels that might be necessary in the future. Non-fossil fuels include fission/fusion, geothermal, biomass, hydroelectric and solar power. The possible environmental changes associated with each scenario are also discussed.

CONCLUSIONS

As stated previously, predictions of the precise consequences of uncontrolled fossil fuel use cannot be made due to all of the uncertainties associated with the future energy demand and the global CO_2 balance. On the basis that CO_2 emissions must be controlled, this study examined the possible future fuel consumptions to achieve various degrees of control. Following are some observations and the principle conclusions from the study:

- The present trends of fossil fuel combustion with a coal emphasis will lead to dramatic world climate changes within the next 75 years, according to many present climatic models.

- The CO_2 buildup in the atmosphere is a worldwide problem. U.S. efforts to restrict CO_2 emission would delay for a short time but not solve the problem.

- Warming trends which would move the temperate climate northward may be beneficial for some nations (i.e., the USSR, see Figure 1) and detrimental for others. Therefore, global cooperation may be difficult to achieve.

- Removal of CO_2 from flue gases does not appear practical due to economics and lack of reasonable disposal methods.

- If it becomes necessary to limit future CO_2 emissions without practical removal/disposal methods, coal and possibly other fossil fuel resources could not be utilized to an appreciable extent.

- Even with dramatic changes in current energy resource use, it appears unlikely that an increase of 50% over the pre-industrial CO_2 level can be avoided in the next century. This would be likely to cause a slight increase in global temperatures but not a significant change in climate, ocean water level or other serious environmental efforts.

The potential problem is great and urgent. Too little is known at this time to recommend a major U.S. or worldwide change in energy type usage but it is very clear that immediate research is necessary to better model the atmosphere/terrestrial/oceanic CO_2 balance. Only with a better understanding of the balance will we know if a problem truly exists.

Existing Data and Present Models

Since the beginning of industrialization, the atmospheric carbon dioxide concentration has increased from approximately 290 ppm in 1860 to 336 ppm today. Atmospheric CO_2 concentrations have been recorded on a monthly basis by C. D. Keeling since 1958 at Mauna Loa Observatory in Hawaii (see Figure 2). Seasonal variations are clearly shown with the CO_2 concentrations lowest during the North American and Eurasian summers, due to increased photosynthetic activities. Over the last ten years, the atmospheric concentration has been increasing at an average rate of about 1.2 ppm/year.

The present consumption of fossil fuels releases more than 5 billion tons of carbon as CO_2 into the atmosphere each year. Data to date indicate that of the amount released approximately one-half is absorbed by the oceans. The other half remains in the atmosphere. There is some question as to whether the terrestrial biosphere is a sink, absorbing atmospheric CO_2, or a source of CO_2 emissions, due to man's land clearing activities. Current opinion attributes the atmospheric CO_2 increase to fossil fuels and considers the biosphere input to be negligible.

Figure 3 shows the carbon cycle with the ocean and the biosphere as sinks for approximately 50% of the fossil fuel emissions. Most models show the ocean to be a major sink while the biosphere appears to be a much smaller sink if it absorbs any CO_2 at all. It is clear from Figure 3 that the net atmospheric increase in CO_2 is quite small compared to the quantities of CO_2 exchanged between the atmosphere and the earth. This makes it very difficult to analyze the fossil fuel impact on the overall carbon cycle.

The fossil fuel resource is very large compared to the quantity of carbon in the atmosphere. Therefore, if one half of the CO_2 released by combustion of fossil fuels remains in the atmosphere, only about 20% of the recoverable fossil fuel could be used before doubling the atmospheric CO_2 content.

The concern over the increasing CO_2 levels arises because of the radiative properties of the gas in the atmosphere. CO_2 does not affect the incoming short-wave (solar) radiation to the earth but it does absorb long-wave energy reradiated from the earth. The absorption of long-wave energy by CO_2 leads to a warming of the atmosphere. This warming phenomenom is known as the "greenhouse effect."

A vast amount of speculation has been made on how increased CO_2 levels will affect atmospheric temperatures. Many models today predict that doubling the 1860 atmospheric CO_2 concentration will cause a 1^o to 5^oC global temperature increase (see Figure 4). Extrapolation of present fossil fuel trends would predict this doubling of the CO_2 concentration to occur about 2050. A temperature difference of 5^oC is equal to the difference between a glacial and an interglacial period. The temperature increases will also tend to vary with location being much higher in the polar region (see Figure 5). These temperature predictions may turn out too high or low by several fold as a result of many feedback mechanisms that may arise due to increased temperatures and have not been properly accounted for in present models.

These mechanisms include:

- A decrease in average snow and ice coverage. This is a positive feedback mechanism since it would result in a decrease of the earth's albedo (reflectivity) which would produce an added warming effect.

- Cloud Cover. This is considered the most important feedback mechanism not accounted for in present models. A change of a few percent in cloud cover could cause larger temperature changes than those caused by CO_2. Increased atmospheric temperature could cause increased evaporation from the oceans and increased cloud cover.

- Ocean and Biosphere Responses. As the CO_2 level is increased and the ambient temperature rises, the ocean may lose some of its capacity to absorb CO_2 resulting in a positive feedback. However, increased CO_2 levels could increase photosynthetic activities which would then be a negative feedback mechanism.

As evidenced by the balance shown in Figure 3, the atmospheric carbon exchange with the terrestrial biosphere and the oceans is so large that small changes due to these feedback mechanisms could drastically offset or add to the impact of fossil fuel combustion on the earth's temperature.

Appendix A gives one, but not unanimous, viewpoint of how the environment might change if the feedback mechanisms are ignored. The contribution that will ultimately be made by these feedback mechanisms is unknown at present.

Energy Scenarios for Various CO_2 Limits

Using the CO_2 atmospheric concentration data recorded to date, the correlation of these data with fossil fuel consumption and the proposed "greenhouse effect" models, this study reviews various world energy consumption scenarios to limit CO_2 atmospheric buildup. The concentration of CO_2 in the atmosphere is controlled in these studies by regulating the quantity of each type of fossil fuel used and by using non-fossil energy sources when required. The quantity of CO_2 emitted by various fuels is shown in Table 1. These factors were calculated based on the combustion energy/carbon content ratio of the fuel and the thermal efficiency of the overall conversion process where applicable. They show the high CO_2/energy ratio for coal and shale and the very high ratios for synthetic fuels from these base fossil fuels which are proposed as fuels of the future.

The total world energy demand used in these scenarios is based upon the predictions in the Exxon Fall 1977 World Energy Outlook for the high oil price case for the years 1976 to 1990. It is assumed that no changes in the sources of supply of energy could be made during this period of time. Case A, which has no restrictions on CO_2 emissions, follows the high oil price predictions until 2000.

Petroleum production and consumption is the same in each scenario. The high oil price case predictions are followed until 2000. After 2000 petroleum production continues to increase until a reserve to production ratio (R/P) equals ten to one. Production peaks at this point and then continues at a ten to one R/P ratio until supplies run out.

The consumption of coal, natural gas and non-fossil fuels (fission/fusion, geothermal, biomass, hydroelectric and solar power) vary with each scenario. Shale oil makes small contributions past the year 2000. It is not predicted to be a major future energy source due to environmental damage associated with the mining of shale oil, and also due to rather large amounts of CO_2 emitted per unit energy generated (see Table 1). If more shale oil were used, it would have the same effect on CO_2 emissions as the use of more coal. The fossil fuel resources assumed to be recoverable are tabulated in Appendix B.

A. No Limit on CO_2 Emissions

In this scenario no limitations are placed upon future fossil fuel use. The use of coal is emphasized for the rest of this century and continues on into the next century. The development and use of non-fossil fuels continue to grow but without added emphasis. Natural gas production continues at a slowly increasing rate until an R/P ratio of 7/1 is reached around 2030. Production after 2030 continues at a 7/1 ratio until reserves run out. Figure 6 shows the future energy demand for this scenario.

Figure 7 shows that the CO_2 buildup from this energy strategy is quite rapid. The yearly atmospheric CO_2 increase rises from 1.3 ppm in 1976 to 4.5 ppm in 2040. Noticeable temperature changes would occur around 2010 as the concentration reaches 400 ppm. Significant climatic changes occur around 2035 when the concentration approaches 500 ppm. A doubling of the pre-industrial concentration occurs around 2050. The doubling would bring about dramatic changes in the world's environment (see Appendix A). Continued use of coal as a major energy source past the year 2050 would further increase the atmospheric CO_2 level resulting in increased global temperatures and environmental upsets.

B. CO_2 Increase Limited to 510 ppm

This energy scenario is limited to a 75% increase over the pre-industrial concentration of 290 ppm. No limitations are placed on petroleum production. Natural gas production is encouraged beginning in 1990 to minimize coal combustion until non-fossil fuels are developed. Production of natural gas would increase until 2010 when an R/P ratio of 7/1 would be reached. Production would then continue at a R/P of 7/1 until supplies ran out. The development and use of nonfossil fuels are emphasized beginning the 1990's. Non-fossil fuels start to be substituted for coal in 1990's. Figure 8 shows the future energy demand by fuel for this scenario.

Figure 9 shows the atmospheric CO_2 concentration trends for this scenario. The lower graph shows the maximum yearly atmospheric CO_2 increase allowable for the 510 ppm limit. The yearly CO_2 increase peaks in 2005 when it amounts to 2.3 ppm and then steadily decreases reaching 0.2 ppm in 2100. A 0.2 ppm increment is equivalent to the direct combustion of 5.1 billion B.O.E. of coal. This would be approximately 2 to 3% of the total world energy demanded in 2100. (For more detail on the construction of Figure 9, see Appendix C.)

A comparison of the Exxon year 2000 predictions and this scenario's year 2000 requirements shows the magnitude of possible future energy source changes. The Exxon predictions call for nonfossil fuels to account for 18 billion B.O.E. in 2000. This scenario requires that 20 billion B.O.E. be supplied by non-fossil fuels by

2000. This difference of 2 billion B.O.E. is equivalent to the power supplied by 214-1000 MW nuclear power plants operating at 60% of capacity. If it were supplied by methane produced from biomass, it would be equivalent to 80,000 square miles of biomass at a yield of 50 ton/acre, heat value of 6500 Btu/dry pound and a 35% conversion efficiency to methane. Therefore even a 20% increase in non-fossil fuel use is a gigantic undertaking.

The magnitude of the change to non-fossil fuels as major energy sources is more apparent when scenarios A and B are compared in the year 2025. Scenario B requires an 85 billion B.O.E. input from non-fossil fuels in 2025. This is almost double the 45 billion B.O.E. input predicted in scenario A. This 35 billion B.O.E. difference is approximately equal to the total energy consumption for the entire world in 1970.

The environmental changes associated with this scenario wouldn't be as severe as if the CO_2 concentration were allowed to double as in scenario A. Noticeable temperature changes would occur around 2010 when the CO_2 concentration reaches 400 ppm. Significant climate changes would occur as the atmospheric concentration nears 500 ppm around 2080. Even though changes in the environment due to increased atmospheric CO concentrations are uncertain, an increase to 500 ppm would probably bring about undesirable climatic changes to many parts of the earth although other areas may be benefitted by the changes. (See Appendix A, part 1).

C. CO_2 Increase Limited to 440 ppm

This scenario limits future atmospheric CO_2 increases to a 50% increase over the pre-industrial concentration of 290 ppm. As in the previous case, no limitations are placed on petroleum production and increased natural gas production is encouraged. Much emphasis is placed on the development and use of non-fossil fuels. Non-fossil fuels are substituted for coal beginning in the 1990's. By 2010 they will have to account for 50% of the energy supplied worldwide. This would be an extremely difficult and costly effort if possible. In this scenario coal or shale will never become a major energy source. Figure 10 shows the future world energy demand by fuel for this scenario.

The atmospheric CO_2 concentration trends for this scenario are shown in Figure 11. To satisfy the limits of this scenario the yearly CO_2 emissions would have to peak in 1995 at 2.0 ppm,

and then rapidly decrease reaching a value of 0.04 ppm in 2100. A 0.04 ppm maximum allowable increase means that unless removal/disposal methods for CO_2 emissions are available only one billion B.O.E. of coal may be directly combusted in 2100 (or 1.4 billion Barrels of Oil). This would be less than 1% of the total energy demanded by the world in 2100.

To adhere to the 440 ppm limit, non-fossil fuels will have to account for 28 billion B.O.E. in 2000 as compared to 20 billion B.O.E. in scenario B and 18 billion B.O.E. in scenario A. This difference between scenarios A and C of 10 billion B.O.E. is equivalent to over 1000, 1000 MW nuclear power plants operating at 60% of capacity. Ten billion B.O.E. is also approximately equivalent to 400,000 square miles of biomass at 35% conversion efficiency to methane. This is equivalent to almost one-half the total U.S. forest land.

By 2025 the 110 billion B.O.E. input from non-fossil fuels called for in this scenario is more than twice as much as the 45 billion B.O.E. input predicted in scenario A. This difference of 65 billion is approximately equal to the amount of energy the entire world will consume in 1980. In terms of power plants, 65 billion B.O.E. is equivalent to almost 7000, 1000 MW nuclear power plants operating at 60% of capacity.

An atmospheric CO_2 concentration of 440 ppm is assumed to be a relatively safe level for the environment. A slight global warming trend should be noticeable but not so extreme as to cause major changes. Slight changes in precipitation might also be noticeable as the atmospheric CO_2 concentration nears 400 ppm.

S. KNISELY

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b1798

Table 1

CO_2 EMISSIONS

Fuel	lb CO_2 Emitted* / 1000 Btu Fuel	% of Present CO_2 Output
SNG from Coal	0.35	0
Coal Liquids	0.32	0
Methanol from Coal	0.38	0
H_2 from Coal Gasification	0.38	0
Shale Oil	0.23	0
Bituminous Coal	.21	38%
Petroleum	.15	49%
Natural Gas	.11	13%
Fission/Fusion	0	0
Biomass	0	0
Solar	0	0

* Includes conversion losses where applicable.

c1798

APPENDIX A

ECOLOGICAL CONSEQUENCES OF INCREASED CO_2 LEVELS

From:

Peterson, E.K., "Carbon Dioxide Affects Global Ecology," Environmental Science and Technology 3 (11), 1162-1169 (Nov '69).

1. Environmental effects of increasing the CO_2 levels to 500 ppm. (1.7 times 1860 level)

   - A global temperature increase of 3°F which is the equivalent of a 1°-4° southerly shift in latitude. A 4° shift is equal to the north to south height of the state of Oregon.
   - The southwest states would be hotter, probably by more than 3°F, and drier.
   - The flow of the Colorado River would diminish and the southwest water shortage would become much more acute.
   - Most of the glaciers in the North Cascades and Glacier National Park would be melted. There would be less of a winter snow pack in the Cascades, Sierras, and Rockies, necessitating a major increase in storage reservoirs.
   - Marine life would be markedly changed. Maintaining runs of salmon and steelhead and other subarctic species in the Columbia River system would become increasingly difficult.
   - The rate of plant growth in the Pacific Northwest would increase 10% due to the added CO_2, and another 10% due to increased temperatures.

2. Effects of a doubling of the 1860 CO_2 concentration. (580 ppm)

   - Global temperatures would be 9°F above 1950 levels.
   - Most areas would get more rainfall, and snow would be rare in the contiguous states, except on higher mountains.
   - Ocean levels would rise four feet.
   - The melting of the polar ice caps could cause tremendous redistribution of weight and pressure exerted on the earth's crust. This could trigger major increases in earthquakes and volcanic activity resulting in even more atmospheric CO_2 and violent storms.
   - The Arctic Ocean would be ice free for at least six months each year, causing major shifts in weather patterns in the northern hemisphere.

- The present tropics would be hotter, more humid, and less habitable, but the present temperature latitude would be warmer and more habitable.

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APPENDIX B

FOSSIL FUEL RESOURCES

Oil	-	Assume 1.6 trillion barrels of oil potentially recoverable as of 1975 (assuming the future recovery rate to be 40%). The minimum allowable Reserve to Production (R/P) ratio is ten one.
Shale Oil	-	Potential of 3.0 trillion B.O.E. but assuming 1977 technology only 200 billion B.O.E. actually recoverable.
Natural Gas	-	Approximately 1.6 trillion B.O.E. potentially recoverable. Minimum allowable R/P = 7.1.
Coal	-	Potential recoverable reserves equal approximately 12 trillion B.O.E. assuming a conservative 25% recoverability.

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APPENDIX C

CONSTRUCTION OF SCENARIOS B AND C
(Scenario A requires no CO_2 emissions control)

1. Scenario B

The CO_2 concentration vs. year curve in Figure 9 was generated by the following equation:

after 1970 (t = 0), then

*C = 292 ppm + 219 ppm/[1 + 5.37 exp. (-t/24 years)]

where C = concentration in ppm

The curve on the lower section of Figure 9, atmospheric CO_2 increase vs. years, is generated by finding the difference in the concentrations of successive years. This curve gives the maximum yearly increases allowable to stay within the limits placed on this scenario. The amount of fossil fuel that may be consumed in any given year can then be calculated by the lower curve. For example:

In 2100 the maximum allowable CO_2 increase equals 0.2 ppm.

This is equivalent to:

$$\frac{2 \text{ ppm}}{} \times \frac{2.1 \times 10^9 \text{ ton C}}{1 \text{ ppm}} \times \frac{2000 \text{ lb}}{\text{ton}} \times \frac{44 \text{ lb } CO_2}{12 \text{ lb C}} = 3.1 \times 10^{12} \text{ lb } CO_2$$

3.1×10^{12} lb CO_2 may be released by the combustion of:

for coal: $$\frac{3.1 \times 10^{12} \text{ lb } CO_2}{} \times \frac{1000 \text{ Btu}}{.21 \text{ lb } CO_2} \times \frac{1 \text{ B.O.E.}}{5.8 \times 10^6 \text{ Btu}}$$

= 2.5 billion B.O.E. of coal

This scenario is based on the assumption that 50% of CO_2 released each year will always be absorbed by the ocean and the rest will remain in the atmosphere.

*Derived from an equation presented by U. Siegenthaler and H. Oeschger (1978) (see references).

2. Scenario C

The equation for the generation of Figure 11 is derived to be,

after 1970 (t = 0), then

*C = 292 ppm + 146 ppm/[1 + 3.37 exp. (-t/20 years)]

This scenario is the same as Scenario B only with different limits.

Figure 1

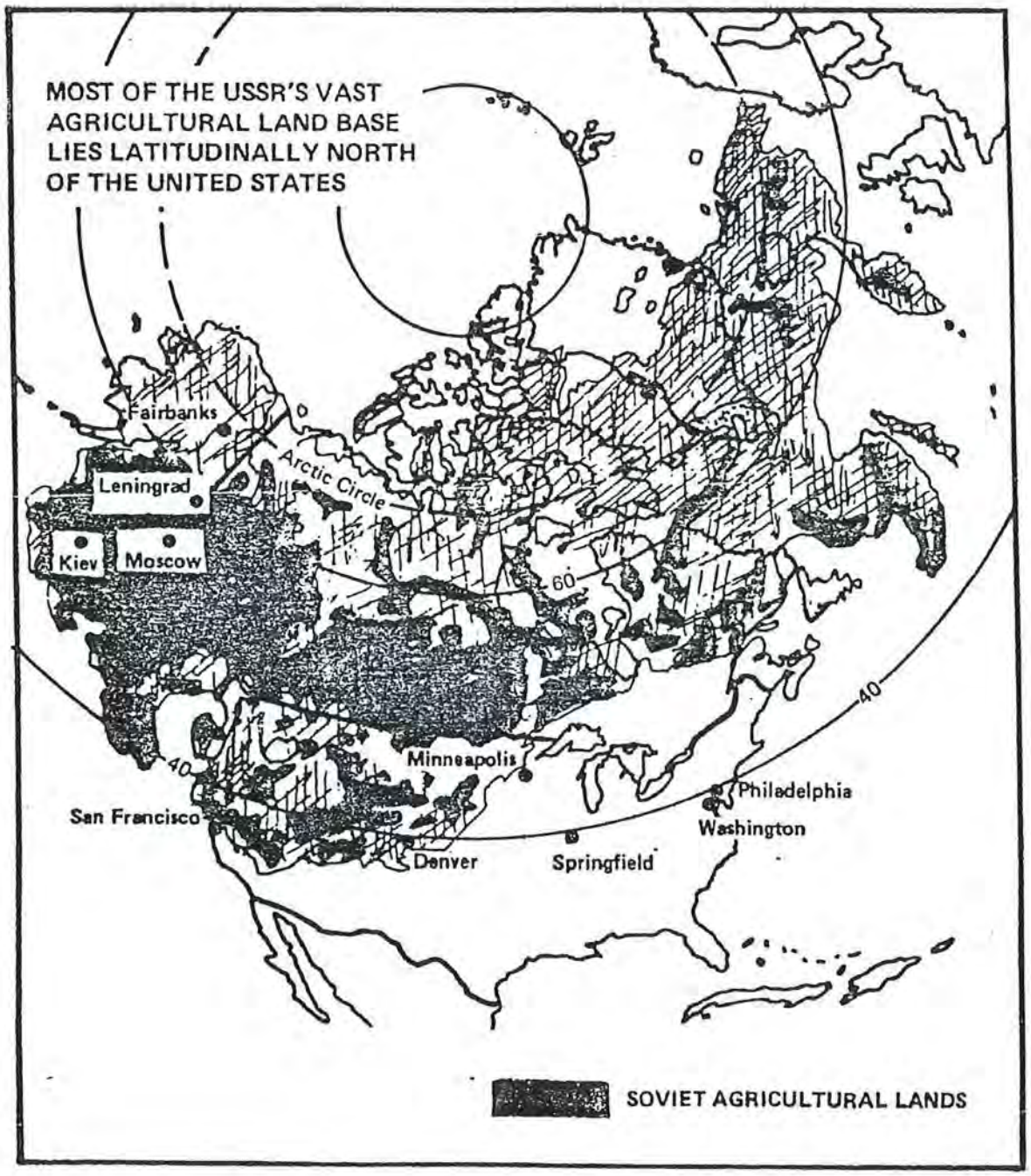
MOST OF THE USSR'S VAST AGRICULTURAL LAND BASE LIES LATITUDINALLY NORTH OF THE UNITED STATES
Fairbanks
Arctic Circle
Leningrad
Kiev
Moscow
60
40
40
Minneapolis
Philadelphia
San Francisco
Washington
Denver
Springfield
SOVIET AGRICULTURAL LANDS

Figure 2

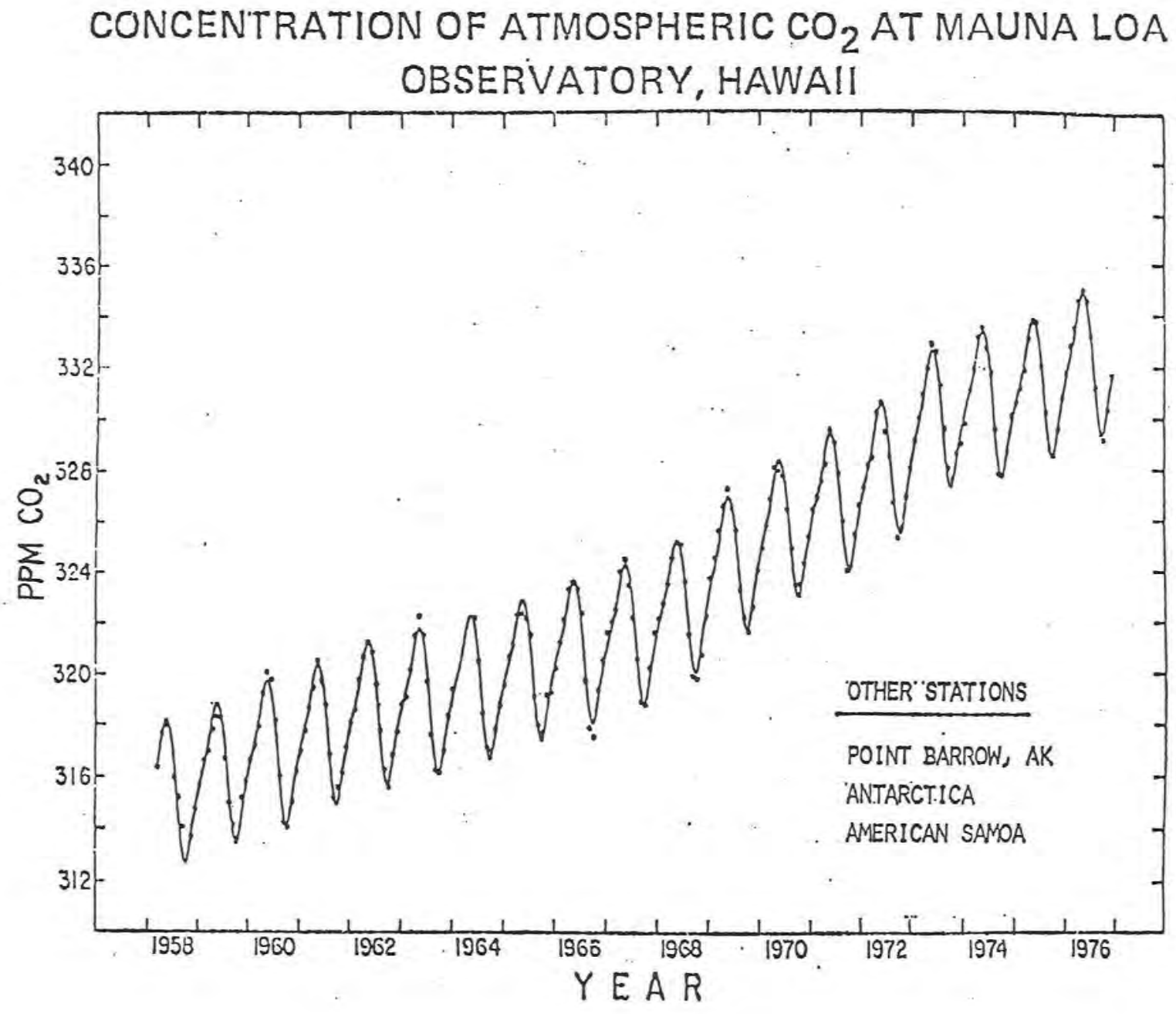
CONCENTRATION OF ATMOSPHERIC CO_2 AT MAUNA LOA OBSERVATORY, HAWAII
340
336
332
328
324
320
316
312
PPM CO_2
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
YEAR
OTHER STATIONS
POINT BARROW, AK
ANTARCTICA
AMERICAN SAMOA

Figure 3

The Carbon Cycle

Current

Fluxes in Gt/a
Pool sizes in Gt

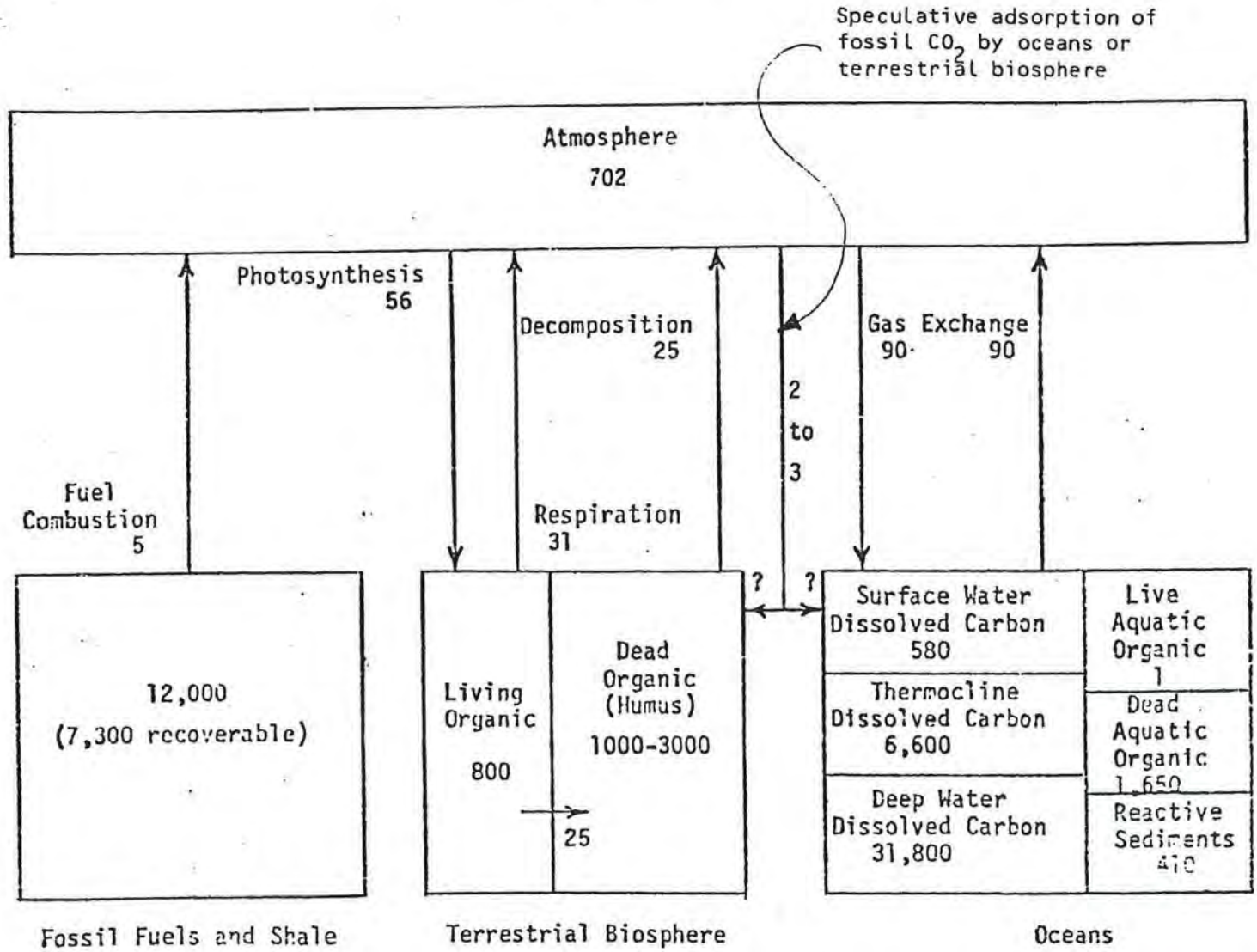

Figure 4

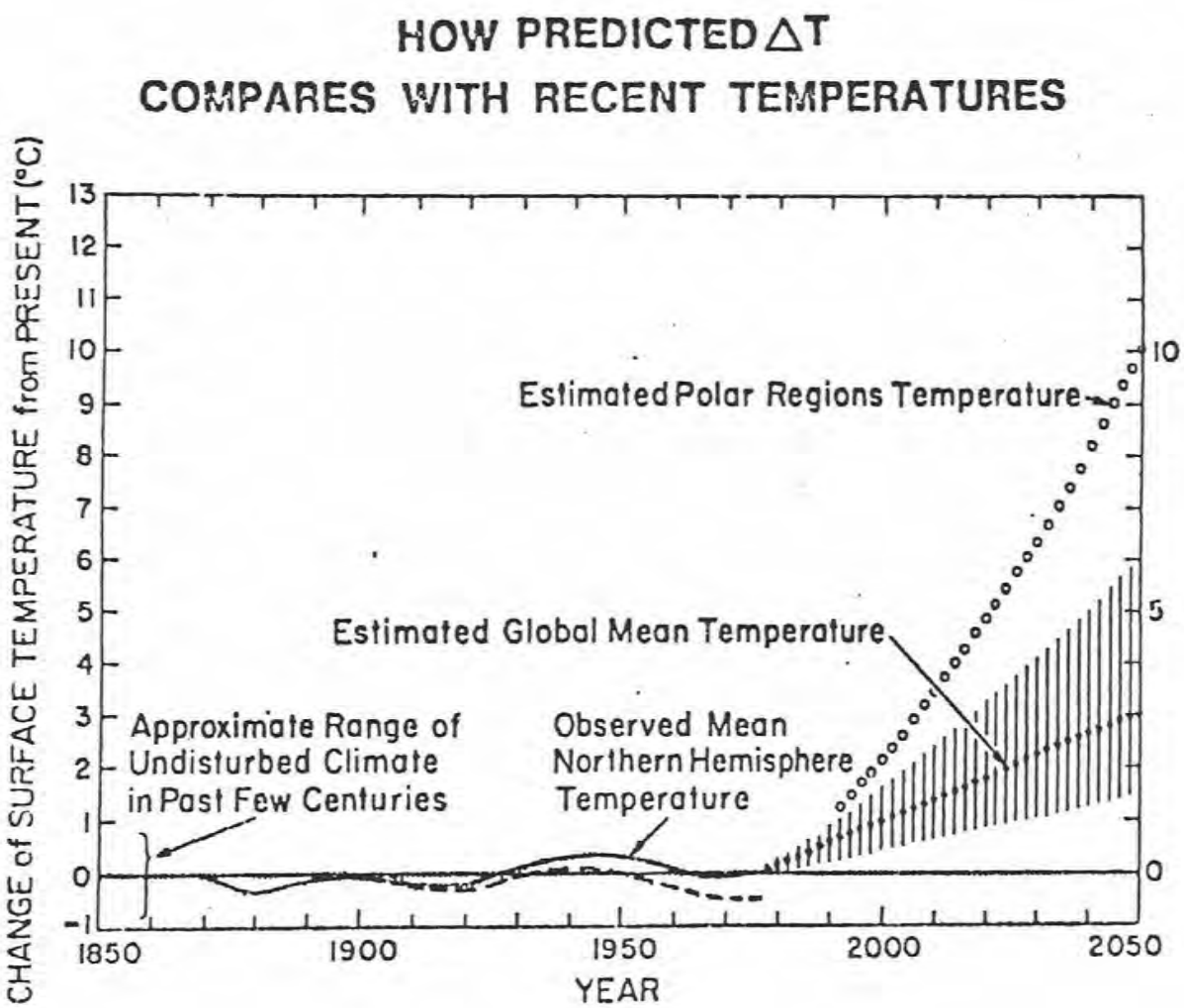
HOW PREDICTED ΔT
COMPARES WITH RECENT TEMPERATURES
CHANGE of SURFACE TEMPERATURE from PRESENT (°C)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
10
5
0
Estimated Polar Regions Temperature
Estimated Global Mean Temperature
Approximate Range of Undisturbed Climate in Past Few Centuries
Observed Mean Northern Hemisphere Temperature
1850
1900
1950
2000
2050
YEAR

Figure 5

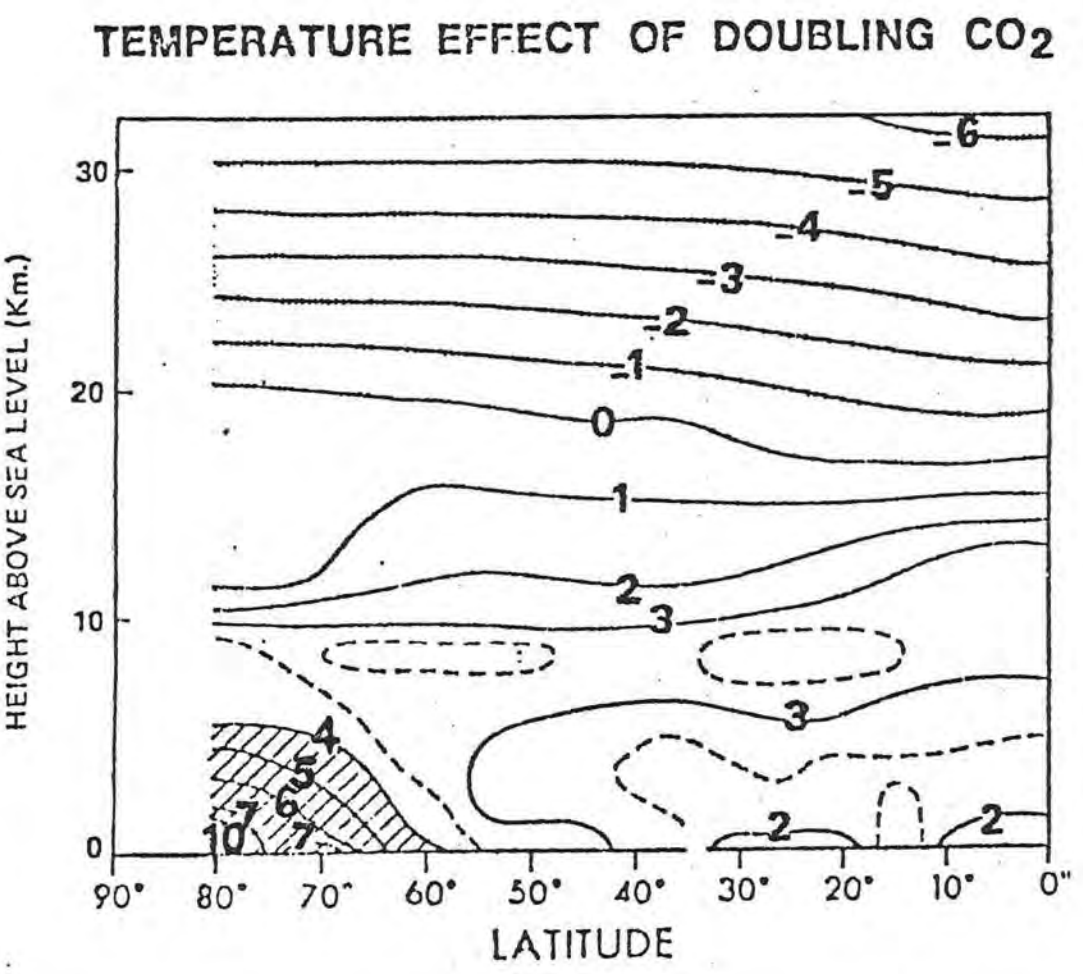

Figure 6

WORLD ENERGY DEMAND BY FUEL
UNLIMITED CO_2 INCREASE
(COAL EMPHASIS)

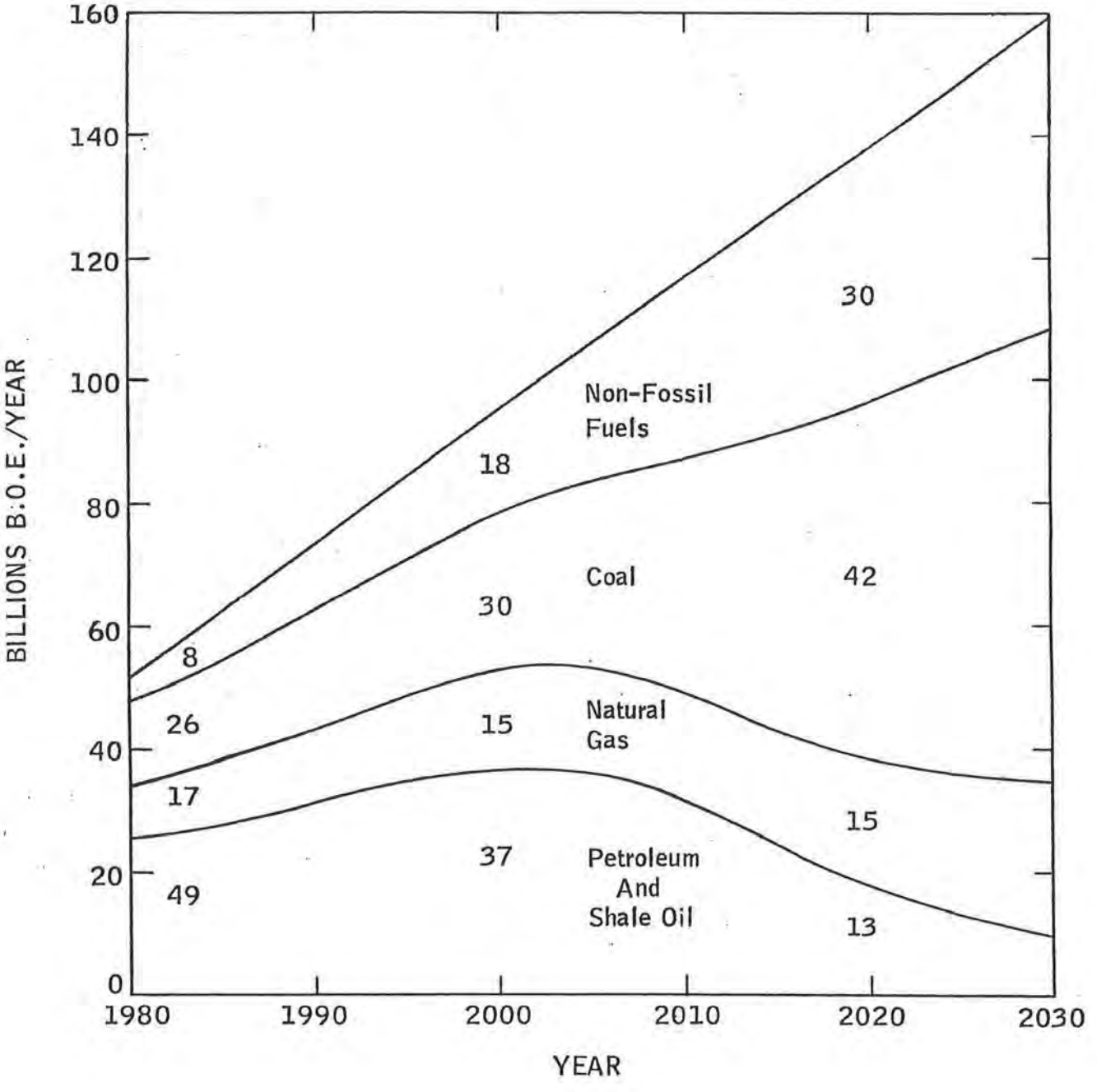

Figure 7

$\frac{CO_2 \text{ IN ATMOSPHERE}}{\text{RATE OF } CO_2 \text{ BUILDUP}}$

UNLIMITED INCREASE

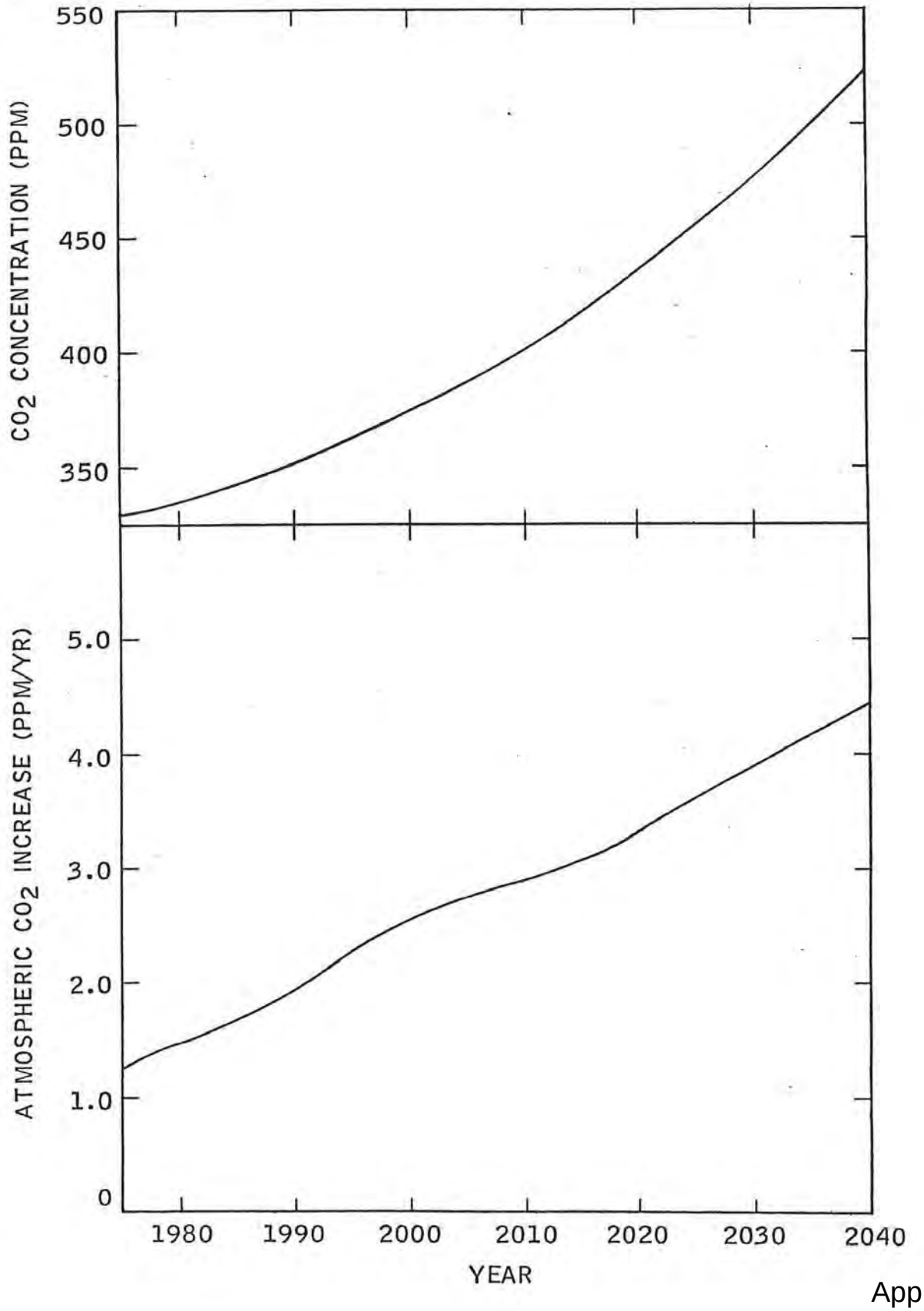

Figure 8

WORLD ENDERGY DEMAND BY FUEL
LIMITED TO A 75% CO_2 INCREASE

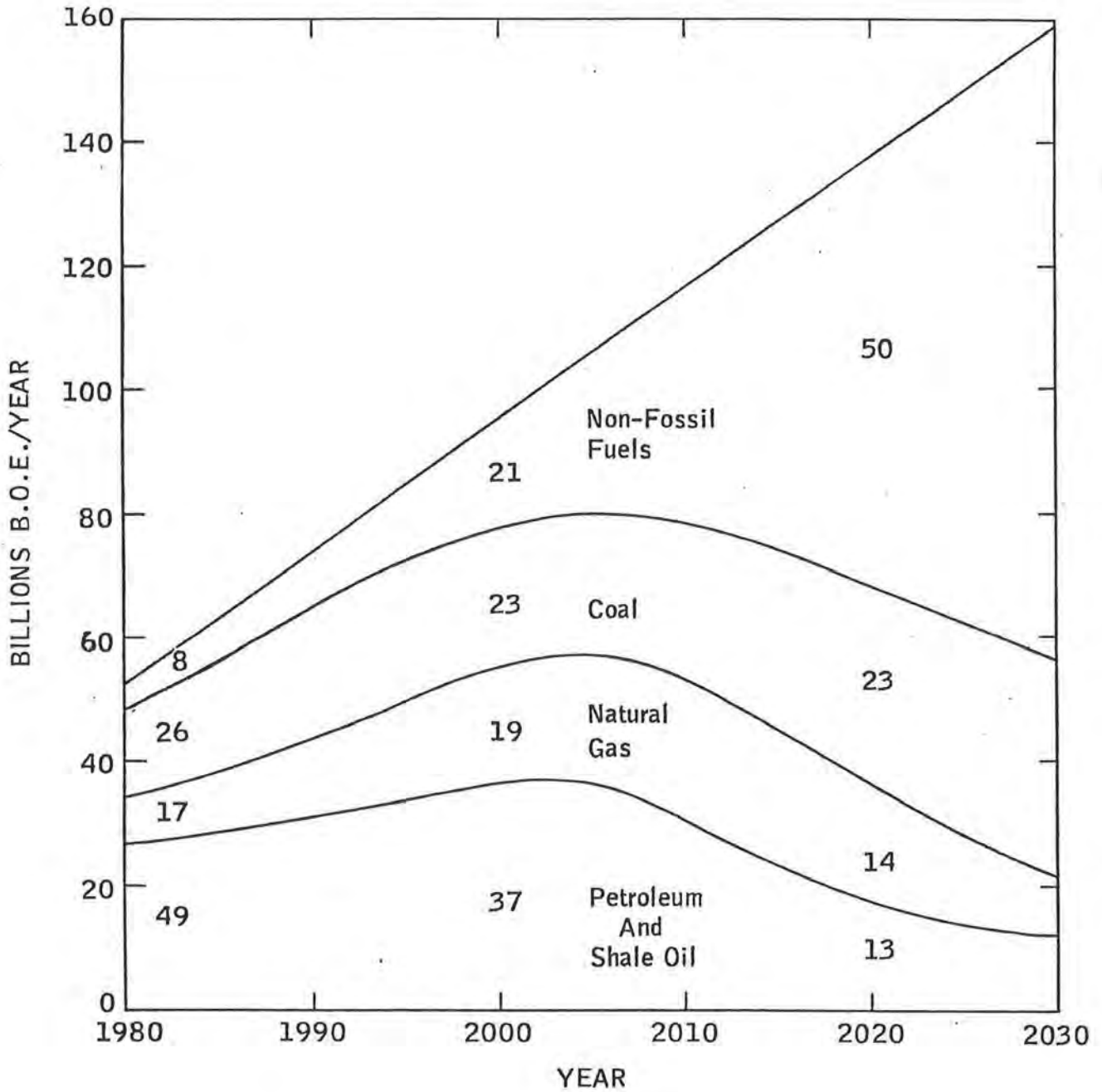

Figure 9

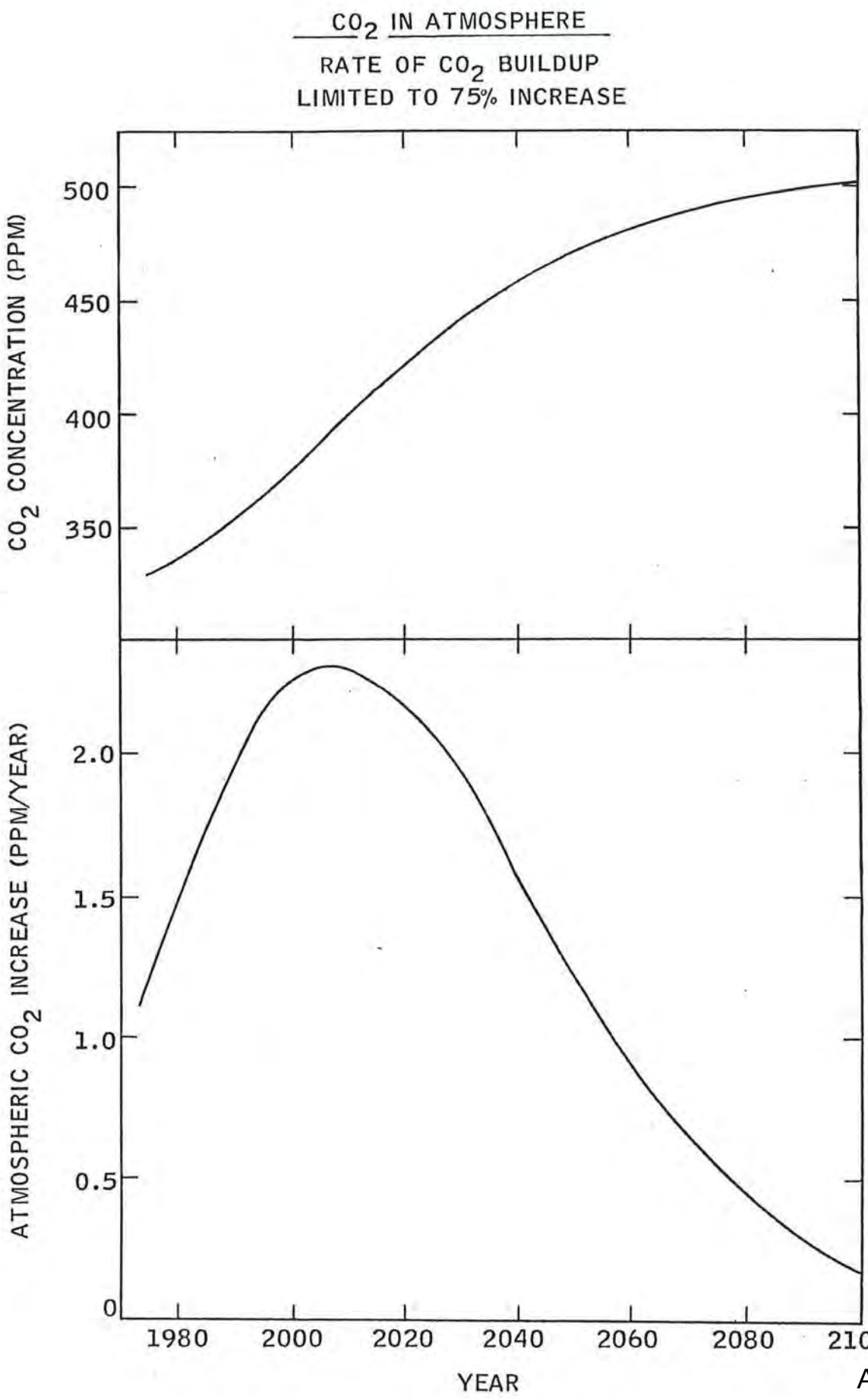
CO_2 IN ATMOSPHERE
RATE OF CO_2 BUILDUP
LIMITED TO 75% INCREASE
CO_2 CONCENTRATION (PPM)
500
450
400
350
ATMOSPHERIC CO_2 INCREASE (PPM/YEAR)
2.0
1.5
1.0
0.5
0
1980
2000
2020
2040
2060
2080
2100
YEAR

Figure 11

$\frac{CO_2 \text{ IN ATMOSPHERE}}{\text{RATE OF } CO_2 \text{ BUILDUP}}$

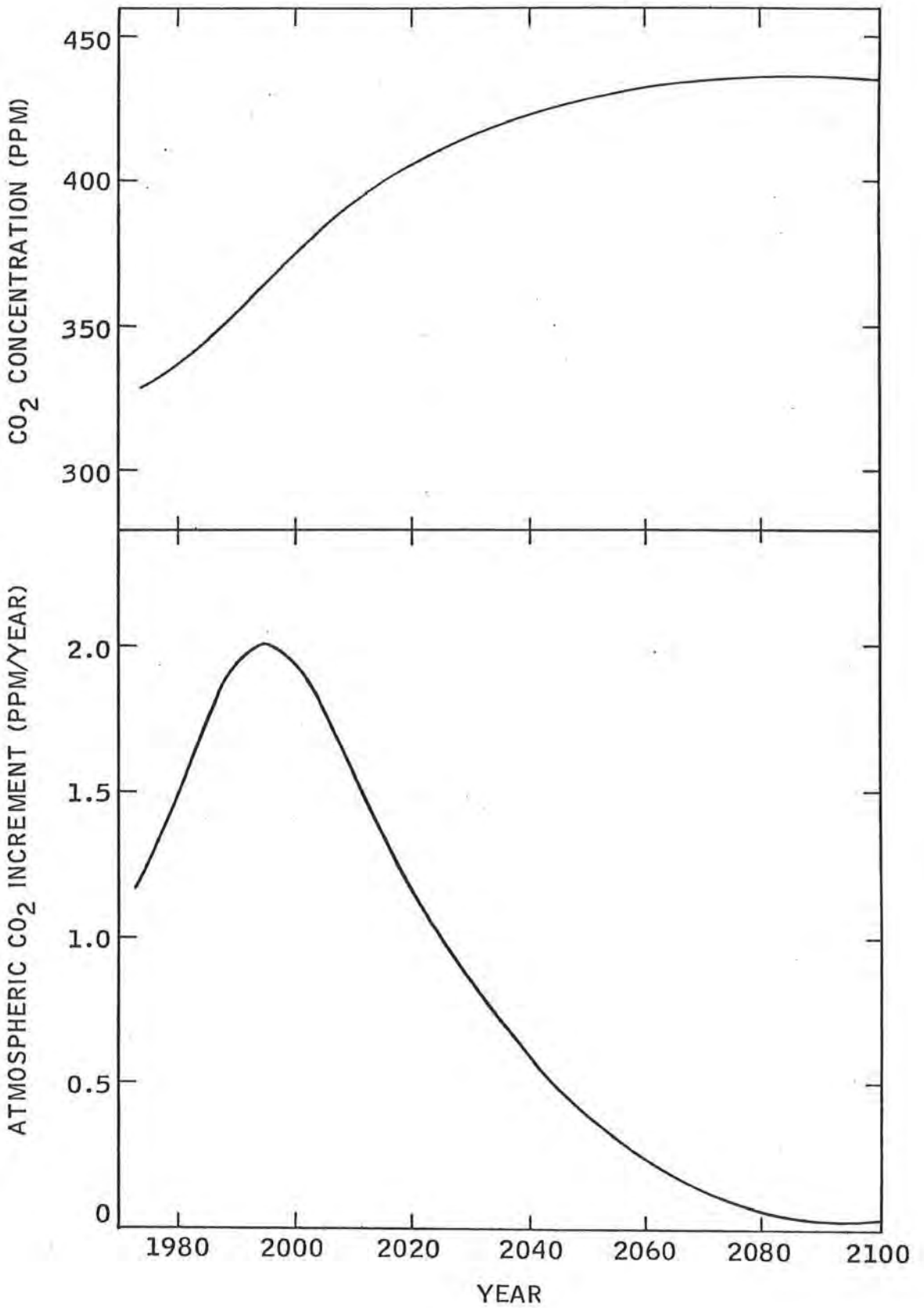

EXHIBIT 30

THE WALL STREET JOURNAL.

http://www.wsj.com/articles/exxon-chevron-shareholders-narrowly-reject-climate-change-stress-tests-1464206192

BUSINESS

Exxon, Chevron Shareholders Narrowly Reject Climate-Change Stress Tests

Supporters of proposals see victory in defeat

The images of journalists were reflected in the sunglasses of a drilling manager at a Chevron site in 2014. Preliminary results Wednesday showed 41% support from voting Chevron investors for stress tests on risks posed by climate change. *PHOTO: BOGDAN CRISTEL/REUTERS*

By **BRADLEY OLSON** and **NICOLE FRIEDMAN**
Updated May 25, 2016 6:57 p.m. ET

Shareholders at Exxon Mobil Corp. and Chevron Corp. narrowly voted down resolutions calling for stress tests to determine the risk that efforts to curb climate change pose to their businesses.

Despite the defeat, the proposals drew more support than any contested climate-related votes in the history of the two biggest U.S. oil and gas companies. Preliminary results showed 41% support from Chevron investors that cast ballots and 38% support at Exxon, an indication that more mainstream shareholders like pension funds, sovereign-wealth

funds and asset managers are starting to take more seriously the threat of a global weaning from fossil fuels.

The number of shareholders supporting the climate-risk measures "is significant, and it will continue to grow," said Beth Richtman, investment manager at the California Public Employees' Retirement System, which manages about $290 billion. Calpers owns about $1 billion worth of Exxon shares and approximately $600 million in Chevron stock.

"There's a groundswell of share owners who are going to keep pushing this forward," she said. "We need to see them rise to the realm of best practices in terms of climate risk reporting, and we're not there yet."

While the shareholder votes aren't binding, supporters of the measures declared victory even in defeat after the oil companies' annual shareholder meetings Wednesday.

"You have to read this as a shot across the bow of the industry," said Andrew Logan, director of the oil and gas program at Ceres, a Boston-based nonprofit group that advocated for the proposals.

Exxon and Chevron had fought to keep the measures off the ballot, a push that the U.S. Securities and Exchange Commission rebuffed.

Separately on Wednesday, the White House said it planned to propose a new rule that companies with federal contracts must disclose whether they share information about the risks that a changing climate could pose to their operations, as well as their goals to reduce greenhouse gas emissions.

That rule, expected to be completed this fall, would affect most federal contracts. The U.S. government is a major buyer of oil products, including jet fuel and diesel used by the military.

Exxon Chief Executive Rex Tillerson said Wednesday the company includes in its energy outlook a proxy cost on carbon.

"It's really the only way we know to accommodate in our financial decision-making the impacts of future policies that are yet to be formulated," he said. He added that most Exxon projects are either too short-term or too large for the theoretical cost of carbon they use in planning purposes to affect their decision-making.

Exxon has also noted it published a 2014 report on managing climate risks that said

none of the company's oil and gas holdings are threatened by a global push to reduce carbon emissions.

Chevron told investors that the proposed climate measure was flawed. Efforts to limit warming could allow some energy producers, such as those who sell natural gas, to benefit while others fall out of favor, including coal-mining companies, Chevron said. The company is a large producer of natural gas and factors in a theoretical future price of carbon when deciding which projects to sanction, making a stress test unnecessary, the company said.

"We don't think this proposal will advance our thinking," Chevron Chief Executive John Watson said Wednesday.

Measures of this sort have been pushed in prior years by environmental groups and activist investors, but now more traditional shareholders are putting their muscle behind the proposals as concern spreads over the effect that policies to mitigate climate change could have on energy company financials.

Those who led the filing of the Exxon resolution were the Church Commissioners for England and the New York State Common Retirement Fund, along with others. The lead filers for the Chevron resolution were Hermes Equity Ownership Services and Wespath Investment Management, a division of the United Methodist Church.

Investors representing more than $10 trillion in assets pledged to support the climate proxy measures, which assert that Exxon, Chevron and other big oil companies should be transparent about how their drilling prospects would suffer if the world turned away from carbon-intensive fuels, including crude oil.

The New York State Common Retirement Fund, Norway's sovereign-wealth fund, the Church of England, Calpers and others actively campaigned for the proposals.

In December, nearly 200 countries pledged in Paris to hold the rise in average global temperatures to less than 2 degrees Celsius above preindustrial levels. This is the yardstick many shareholder resolutions have used to urge the companies to take greater action and show how such a goal will affect their business units.

Supporters of that effort say more investors want to see how companies are preparing for climate change impacts. A stress-test measure at Occidental Petroleum Corp. received 49% of votes, and similar proposals passed overwhelmingly last year at two other big oil companies, BP PLC and Royal Dutch Shell PLC.

In a report on climate released this month, Total SA, the French energy company, said it has reduced activity in Canada's oil-sands region and is avoiding Arctic exploration over

concerns that some fossil fuels will have to stay in the ground if the goals set forth in Paris are achieved.

ConocoPhillips and Statoil ASA have issued projections that global oil demand could fall significantly by 2040 if measures to reduce climate risk are put in place. By contrast, Exxon's projection for global oil demand in that year is 28% higher than peers' forecasts.

"There's an awful lot of shareholder disquiet about how Exxon is approaching climate change," said Edward Mason, head of responsible investment for the Church Commissioners for England, which manages the assets of the Church of England.

At the Exxon annual meeting, shareholders did approve one shareholder proposal, giving investors greater power to propose director candidates. None of eight proposed shareholder measures passed at Chevron's meeting.

—Amy Harder contributed to this article.

Write to Bradley Olson at Bradley.Olson@wsj.com and Nicole Friedman at nicole.friedman@wsj.com

What To Read Next...

BUSINESS

Low Crude Prices Hammer Big Oil Companies

TODAY'S MARKETS

Global Stocks Up After Most European Banks Survive Stress Tests

EXHIBIT 31

Biz

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Really? ExxonMobil left the risk out of its climate risk report

Natasha Lamb and Bob Litterman
Wednesday, May 28, 2014 - 4:30am

ExxonMobil sign image by Taina Sohlman via Shutterstock.

Natasha Lamb

Director of Equity Research and Shareholder Engage

Arjuna Capital

Bob Litterman

Kepos Financial

Imagine cycling down a sweeping mountain road when you hit a dense patch of fog. You know there's a hairpin turn ahead that runs across the lip of a dangerous cliff, but you don't know exactly how far ahead it is. When do you start braking? And how hard do you brake over time?

The answers seem so intuitive that the questions are hardly worth asking — you'd hit the brakes immediately, and hard — but these are the fundamental questions society must ask to address the risks posed by climate change.

Scientists have made clear that if we continue burning fossil fuels as we have, at some point we will face a dangerous cliff — a tipping point of rapid, irreversible change with catastrophic impacts. We just don't know when.

Our speeding bike already has pumped enough carbon dioxide into the atmosphere to far exceed the historical level of 280 parts per million, and we have surpassed 400 ppm at breakneck speed. When do we as a society hit the brakes?

If we know a cliff is ahead — and we do — but we don't know exactly where — and we don't — the logical response is to slam on the brakes hard enough to insure we can safely navigate the turn.

We believe society will do just that and, indeed, the process already has begun. Through some combination of market forces and regulatory intervention, we're confident that a "low-carbon" scenario will unfold in the not-too-distant future to appropriately reduce our dependence on fossil fuels.

In December, sustainable wealth manager Arjuna Capital and nonprofit As You Sow filed a shareholder proposal asking ExxonMobil how the firm would deal with such a scenario. The proposal didn't ask Exxon whether such a scenario was likely, only how the firm would deal with it should it come to pass.

It's a highly pertinent question for shareholders. Governments around the globe agree that global warming must be limited to no more than 2 degrees Celsius to avoid disaster. The best climate science tells us that to hit this mark, up to two-thirds of the fossil fuel reserves of energy companies must remain in the ground, unburned. And yet those reserves are valued on the companies' balance sheets at roughly $27 trillion. What will those reserves be worth if they become "stranded" in the ground? Investors refer to this as "carbon asset risk."

This, it would seem, is one of the most pressing risks faced by energy companies in the 21st century. And one would think that assessing and planning for that risk would rank high among the priorities of any energy company management.

Last month, Exxon responded to Arjuna Capital's proposal by issuing a report on carbon asset risk in exchange for Arjuna's withdrawal of the shareholder proposal. The report, "Managing the Risks," forgot to address one thing: the risks.

Exxon asserted in the report that it is "confident" a low-carbon scenario won't come to pass, and that consequently, none of it hydrocarbon reserves will become stranded. The firm's argument was basically that policymakers won't intervene in the face of unabated global energy demand.

But Arjuna's question wasn't whether a low-carbon future was likely. It was how the firm would deal with such a future possibility. It was a request for the most fundamental risk-management and scenario-planning exercise. Exxon's report said, in effect, we're certain that scenario won't happen so we don't need to plan for it.

But how can it be so certain?

Exxon's report does acknowledge the threat of climate change and accepts in a general way that we, as a society, should be braking rather than pedaling faster down the mountain. But the report argues that rather than braking harder and sooner to reduce climate risk, society should start cautiously and then make larger investments further into the future.

In its analysis of a low-carbon scenario, the report suggests that to hit the low-carbon target of a maximum of 450 ppm, society would need to spend around 2 percent of total income on emissions reduction today, with that figure ramping up to 44 percent of median income in 2090, or more than $1,000 per ton of carbon dioxide in today's dollars.

One can only assume that this is its projected cost of a last-ditch effort to avoid catastrophe by pulling carbon directly out of the atmosphere at scale — that is, air capture and sequestration. This is indeed a rather strange forecast because most experts believe that air capture would cost less than that today, much less in 75 years.

Or perhaps it's just a scare tactic.

The company then argues that this low-carbon path is far too expensive to be feasible, and that we won't, in fact, spend such amounts. And because society won't bear these costs, a low-carbon future that strands Exxon's carbon assets isn't a realistic possibility. Q.E.D.

The report's ultimate advice: Shoot for 550 or 650 ppm and hope for the best. And at those levels, we can burn all our hydrocarbons.

Put differently: We're going to ignore this risk. It's safe for investors to do likewise.

Exxon is taking a myopic, indeed, willfully distorted view of climate and carbon-asset risk in order to minimize the extent to which investors accurately price it into Exxon's shares. The firm's "plan" is not a rational one for society, nor does it serve the long-term interests of its shareholders.

To us cyclists headed down the mountain in the fog, Exxon is saying, "Ignore the cliff. Don't worry about slowing down yet. It's a long way off. Let's go for it."

Our advice to shareholders: Beware investing in stranded assets. When climate risk is properly accounted for, their prices will fall.

ExxonMobil sign image by Taina Sohlman via Shutterstock.

Topics:

- Energy & Climate
- Corporate Reporting
- Oil & Gas
- Socially Responsible Investing

EXHIBIT 32

Joe Walker

To: Global Climate Science Team
Cc: Michelle Ross; Susan Moya
Subject: Draft Global Climate Science Communications Plan

As promised, attached is the draft Global Climate Science Communications Plan that we developed during our workshop last Friday. Thanks especially to those of you who participated in the workshop, and in particular to John Adams for his very helpful thoughts following up our meeting, and Alan Caudill for turning around the notes from our workshop so quickly.

Please review the plan and get back to me with your comments as soon as possible.

As those of you who were at the workshop know, we have scheduled a follow-up team meeting to review the plan in person on Friday, April 17, from 1 to 3 p.m. at the API headquarters. After that, we hope to have a "plan champion" help us move it forward to potential funding sources, perhaps starting with the global climate "Coordinating Council." That will be an item for discussion on April 17.

Again, thanks for your hard work on this project. Please e-mail, call or fax me with your comments. Thanks.

Regards,
Joe Walker

Global Climate Science Communications

Action Plan

Project Goal

A majority of the American public, including industry leadership, recognizes that significant uncertainties exist in climate science, and therefore raises questions among those (e.g. Congress) who chart the future U.S. course on global climate change.

Progress will be measured toward the goal. A measurement of the public's perspective on climate science will be taken before the plan is launched, and the same measurement will be taken at one or more as-yet-to-be-determined intervals as the plan is implemented.

Victory Will Be Achieved When

- Average citizens "understand" (recognize) uncertainties in climate science; recognition of uncertainties becomes part of the "conventional wisdom"
- Media "understands" (recognizes) uncertainties in climate science.
- Media coverage reflects balance on climate science and recognition of the validity of viewpoints that challenge the current "conventional wisdom"
- Industry senior leadership understands uncertainties in climate science, making them stronger ambassadors to those who shape climate policy
- Those promoting the Kyoto treaty on the basis of extant science appear to be out of touch with reality.

Current Reality

Unless "climate change" becomes a non-issue, meaning that the Kyoto proposal is defeated and there are no further initiatives to thwart the threat of climate change, there may be no moment when we can declare victory for our efforts. It will be necessary to establish measurements for the science effort to track progress toward achieving the goal and strategic success.

Because the science underpinning the global climate change theory has not been challenged effectively in the media or through other vehicles reaching the American public, there is widespread ignorance, which works in favor of the Kyoto treaty and against the best interests of the United States. Indeed, the public has been highly receptive to the Clinton Administration's plans. There has been little, if any, public resistance or pressure applied to Congress to reject the treaty, except by those "inside the Beltway" with vested interests.

Moreover, from the political viewpoint, it is difficult for the United States to oppose the treaty solely on economic grounds, valid as the economic issues are. It makes it too easy for others to portray the United States as putting preservation of its own lifestyle above the greater concerns of mankind. This argument, in turn, forces our negotiators to make concessions that have not been well thought through, and in the end may do far more harm than good. This is the process that unfolded at Kyoto, and is very likely to be repeated in Buenos Aires in November 1998.

The advocates of global warming have been successful on the basis of skillfully misrepresenting the science and the extent of agreement on the science, while industry and its partners ceded the science and fought on the economic issues. Yet if we can show that science does not support the Kyoto treaty – which most true climate scientists believe to be the case – this puts the United States in a stronger moral position and frees its negotiators from the need to make concessions as a defense against perceived selfish economic concerns.

Upon this tableau, the Global Climate Science Communications Team (GCSCT) developed an action plan to inform the American public that science does not support the precipitous actions Kyoto would dictate, thereby providing a climate for the right policy decisions to be made. The team considered results from a new public opinion survey in developing the plan.

Charlton Research's survey of 1,100 "informed Americans" suggests that while Americans currently perceive climate change to be a great threat, public opinion is open to change on climate science. When informed that "some scientists believe there is not enough evidence to suggest that [what is called global climate change] is a long-term change due to human behavior and activities," 58 percent of those surveyed said they were more likely to oppose the Kyoto treaty. Moreover, half the respondents harbored doubts about climate science.

GCSCT members who contributed to the development of the plan are A. John Adams, John Adams Associates; Candace Crandall, Science and Environmental Policy Project; David Rothbard, Committee For A Constructive Tomorrow; Jeffrey Salmon, The Marshall Institute; Lee Garrigan, Environmental Issues Council; Lynn Bouchey and Myron Ebell, Frontiers of Freedom; Peter Cleary, Americans for Tax Reform; Randy Randol, Exxon Corp.; Robert Gehri, The Southern Company; Sharon Kneiss, Chevron Corp; Steve Milloy, The Advancement of Sound Science Coalition; and Joseph Walker, American Petroleum Institute.

The action plan is detailed on the following pages.

April 3, 1998

Global Climate Science Communications

Action Plan

Situation Analysis

In December 1997, the Clinton Administration agreed in Kyoto, Japan, to a treaty to reduce greenhouse gas emissions to prevent what it purports to be changes in the global climate caused by the continuing release of such emissions. The so-called greenhouse gases have many sources. For example, water vapor is a greenhouse gas. But the Clinton Administration's action, if eventually approved by the U.S. Senate, will mainly affect emissions from fossil fuel (gasoline, coal, natural gas, etc.) combustion.

As the climate change debate has evolved, those who oppose action have argued mainly that signing such a treaty will place the U.S. at a competitive disadvantage with most other nations, and will be extremely expensive to implement. Much of the cost will be borne by American consumers who will pay higher prices for most energy and transportation.

The climate change theory being advanced by the treaty supporters is based primarily on forecasting models with a very high degree of uncertainty. In fact, it not known for sure whether (a) climate change actually is occurring, or (b) if it is, whether humans really have any influence on it.

Despite these weaknesses in scientific understanding, those who oppose the treaty have done little to build a case against precipitous action on climate change based on the scientific uncertainty. As a result, the Clinton Administration and environmental groups essentially have had the field to themselves. They have conducted an effective public relations program to convince the American public that the climate is changing, we humans are at fault, and we must do something about it before calamity strikes.

The environmental groups know they have been successful. Commenting after the Kyoto negotiations about recent media coverage of climate change, Tom Wathen, executive vice president of the National Environmental Trust, wrote:

"...As important as the extent of the coverage was the tone and tenor of it. In a change from just six months ago, most media stories no longer presented global warming as just a theory over which reasonable scientists could differ. Most stories described predictions of global warming as the position of the overwhelming number of mainstream scientists. That the environmental community had, to a great extent, settled the scientific issue with the U.S. media is the other great success that began perhaps several months earlier but became apparent during Kyoto."

Strategies and Tactics

I. **National Media Relations Program: Develop and implement a national media relations program to inform the media about uncertainties in climate science; to generate national, regional and local media coverage on the scientific uncertainties, and thereby educate and inform the public, stimulating them to raise questions with policy makers.**

Tactics: These tactics will be undertaken between now and the next climate meeting in Buenos Aires, Argentina, in November 1998, and will be continued thereafter, as appropriate. Activities will be launched as soon as the plan is approved, funding obtained, and the necessary resources (e.g., public relations counsel) arranged and deployed. In all cases, tactical implementation will be fully integrated with other elements of this action plan, most especially Strategy II (National Climate Science Data Center).

- Identify, recruit and train a team of five independent scientists to participate in media outreach. These will be individuals who do not have a long history of visibility and/or participation in the climate change debate. Rather, this team will consist of new faces who will add their voices to those recognized scientists who already are vocal.

- Develop a global climate science information kit for media including peer-reviewed papers that undercut the "conventional wisdom" on climate science. This kit also will include understandable communications, including simple fact sheets that present scientific uncertainties in language that the media and public can understand.

- Conduct briefings by media-trained scientists for science writers in the top 20 media markets, using the information kits. Distribute the information kits to daily newspapers nationwide with offer of scientists to brief reporters at each paper. Develop, disseminate radio news releases featuring scientists nationwide, and offer scientists to appear on radio talk shows across the country.

- Produce, distribute a steady stream of climate science information via facsimile and e-mail to science writers around the country.

- Produce, distribute via syndicate and directly to newspapers nationwide a steady stream of op-ed columns and letters to the editor authored by scientists.

- Convince one of the major news national TV journalists (e.g., John Stossel) to produce a report examining the scientific underpinnings of the Kyoto treaty.

- Organize, promote and conduct through grassroots organizations a series of campus/community workshops/debates on climate science in 10 most important states during the period mid-August through October, 1998.

- Consider advertising the scientific uncertainties in select markets to support national, regional and local (e.g., workshops/debates), as appropriate.

National Media Program Budget — $600,000 plus paid advertising

II. Global Climate Science Information Source: Develop and implement a program to inject credible science and scientific accountability into the global climate debate, thereby raising questions about and undercutting the "prevailing scientific wisdom." The strategy will have the added benefit of providing a platform for credible, constructive criticism of the opposition's position on the science.

Tactics: As with the National Media Relations Program, these activities will be undertaken between now and the next climate meeting in Buenos Aires, Argentina, in November 1998, and will continue thereafter. Initiatives will be launched as soon as the plan is approved, funding obtained, and the necessary resources arranged and deployed.

- Establish a Global Climate Science Data Center. The GCSDC will be established in Washington as a non-profit educational foundation with an advisory board of respected climate scientists. It will be staffed initially with professionals on loan from various companies and associations with a major interest in the climate issue. These executives will bring with them knowledge and experience in the following areas:
  - Overall history of climate research and the IPCC process;
  - Congressional relations and knowledge of where individual Senators stand on the climate issue;
  - Knowledge of key climate scientists and where they stand;
  - Ability to identify and recruit as many as 20 respected climate scientists to serve on the science advisory board;
  - Knowledge and expertise in media relations and with established relationships with science and energy writers, columnists and editorial writers;
  - Expertise in grassroots organization; and
  - Campaign organization and administration.

  The GCSDC will be led by a dynamic senior executive with a major personal commitment to the goals of the campaign and easy access to business leaders at the CEO level. The Center will be run on a day-to-day basis by an executive director with responsibility for ensuring targets are met. The Center will be funded at a level that will permit it to succeed, including funding for research contracts that may be deemed appropriate to fill gaps in climate science (e.g., a complete scientific critique of the IPCC research and its conclusions).

- The GCSDC will become a one-stop resource on climate science for members of Congress, the media, industry and all others concerned. It will be in constant contact with the best climate scientists and ensure that their findings and views receive appropriate attention. It will provide them with the logistical and moral support they have been lacking. In short, it will be a sound scientific alternative to the IPCC. Its functions will include:
  - Providing as an easily accessible database (including a website) of all mainstream climate science information.
  - Identifying and establishing cooperative relationships with all major scientists whose research in this field supports our position.
  - Establishing cooperative relationships with other mainstream scientific organizations (e.g., meteorologists, geophysicists) to bring their perspectives to bear on the debate, as appropriate.
  - Developing opportunities to maximize the impact of scientific views consistent with ours with Congress, the media and other key audiences.
  - Monitoring and serving as and early warning system for scientific developments with the potential to impact on the climate science debate, pro and con.
  - Responding to claims from the scientific alarmists and media.
  - Providing grants for advocacy on climate science, as deemed appropriate.

Global Climate Science Data Center Budget — $5,000,000 (spread over two years minimum)

III. National Direct Outreach and Education: Develop and implement a direct outreach program to inform and educate members of Congress, state officials, industry leadership, and school teachers/students about uncertainties in climate science. This strategy will enable Congress, state officials and industry leaders will be able to raise such serious questions about the Kyoto treaty's scientific underpinnings that American policy-makers not only will refuse to endorse it, they will seek to prevent progress toward implementation at the Buenos Aires meeting in November or through other ways. Informing teachers/students about uncertainties in climate science will begin to erect a barrier against further efforts to impose Kyoto-like measures in the future.

Tactics: Informing and educating members of Congress, state officials and industry leaders will be undertaken as soon as the plan is approved, funding is obtained, and the necessary resources are arrayed and will continue through Buenos Aires and for the foreseeable future. The teachers/students outreach program will be developed and launched in early 1999. In all cases, tactical implementation will be fully integrated with other elements of this action plan.

- Develop and conduct through the Global Climate Science Data Center science briefings for Congress, governors, state legislators, and industry leaders by August 1998.

- Develop information kits on climate science targeted specifically at the needs of government officials and industry leaders, to be used in conjunction with and separately from the in-person briefings to further disseminate information on climate science uncertainties and thereby arm these influentials to raise serious questions on the science issue.

- Organize under the GCSDC a "Science Education Task Group" that will serve as the point of outreach to the National Science Teachers Association (NSTA) and other influential science education organizations. Work with NSTA to develop school materials that present a credible, balanced picture of climate science for use in classrooms nationwide.

- Distribute educational materials directly to schools and through grassroots organizations of climate science partners (companies, organizations that participate in this effort).

National Direct Outreach Program Budget — $300,000

IV. Funding/Fund Allocation: Develop and implement program to obtain funding, and to allocate funds to ensure that the program it is carried out effectively.

Tactics: This strategy will be implemented as soon as we have the go-ahead to proceed.

- Potential funding sources were identified as American Petroleum Institute (API) and its members; Business Round Table (BRT) and its members, Edison Electric Institute (EEI) and its members; Independent Petroleum Association of America (IPAA) and its members; and the National Mining Association (NMA) and its members.

- Potential fund allocators were identified as the American Legislative Exchange Council (ALEC), Committee For A Constructive Tomorrow (CFACT), Competitive Enterprise Institute, Frontiers of Freedom and The Marshall Institute.

Total Funds Required to Implement Program through November 1998 — $2,000,000 (A significant portion of funding for the GCSDC will be deferred until 1999 and beyond)

Measurements

Various metrics will be used to track progress. These measurements will have to be determined in fleshing out the action plan and may include:

- Baseline public/government official opinion surveys and periodic follow-up surveys on the percentage of Americans and government officials who recognize significant uncertainties in climate science.

- Tracking the percent of media articles that raise questions about climate science.

- Number of Members of Congress exposed to our materials on climate science.

- Number of communications on climate science received by Members of Congress from their constituents.

- Number of radio talk show appearances by scientists questioning the "prevailing

- Number of school teachers/students reached with our information on climate science.
- Number of science writers briefed and who report upon climate science uncertainties.
- Total audience exposed to newspaper, radio, television coverage of science uncertainties.

EXHIBIT 33

United Nations
Framework Convention on
Climate Change

Status of Ratification of the Kyoto Protocol

The Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the third session of the Conference of the Parties (COP 3) in Kyoto, Japan, on 11 December 1997. In accordance with Article 24, it was open for signature from 16 March 1998 to 15 March 1999 at United Nations Headquarters, New York. By that date the Protocol had received 84 signatures.

Pursuant to Article 22, the Protocol is subject to ratification, acceptance, approval or accession by Parties to the UNFCCC. Parties to the UNFCCC that have not signed the Protocol may accede to it at any time.

The Protocol entered into force on 16 February 2005 in accordance with Article 23, that is the ninetieth day after the date on which not less than 55 Parties to the UNFCCC, incorporating Parties included in Annex I which accounted in total for at least 55 % of the total carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession.

Currently, there are 192 Parties (191 States and 1 regional economic integration organization) to the Kyoto Protocol to the UNFCCC.

The list below contains the latest information concerning dates of signature and receipt of instruments of ratification by the Secretary-General of the United Nations, as Depositary of the Kyoto Protocol. The dates in the third column are those of the receipt of the instrument of ratification, acceptance (A), approval (AA) or accession (a). (For an explanation of these legal terms, visit the United Nations Treaty Collection Glossary of terms relating to Treaty actions).

Text of the Kyoto Protocol

- Arabic (538 kB)
- Chinese (243 kB)
- English (66 kb)
- French (51 kB)
- Russian (234 kB)
- Spanish (59 kB)

Kyoto Protocol to the United Nations Framework Convention on Climate Change

Kyoto, 11 December 1997

Entry into force: 16 February 2005, in accordance with article 25 (1) in accordance with article 25 (3) which reads as follows: "For each State or regional economic integration organization that ratifies, accepts or approves this Protocol or accedes thereto after the conditions set out in paragraph 1 above for entry into force have been fulfilled, this Protocol shall enter into force on the ninetieth day following the date of deposit of its instrument of ratification, acceptance, approval or accession."

Registration: 16 February 2005, No. 30822.

Status: Signatories: 83. Parties: 192

Note: The Protocol was adopted at the third session of the Conference of the Parties to the 1992 United Nations Framework Convention on Climate Change ("the Convention"), held at Kyoto (Japan) from 1 to 11 December 1997. The Protocol shall be open for signature by States and regional economic integration organizations which are Parties to the Convention at United Nations Headquarters in New York from 16 March 1998 to 15 March 1999 in accordance with its article 24 ***(1)***.

Participant	Signature	Ratification Acceptance (A) Accession (a) Approval (AA)	Entry into force
AFGHANISTAN		25 March 2013 a	23 June 2013
ALBANIA		1 Apr 2005 a	30 Jun 2005
ALGERIA		16 Feb 2005 a	17 May 2005
ANGOLA		8 May 2007 a	6 Aug 2007
ANTIGUA AND BARBUDA	16 Mar 1998	3 Nov 1998	16 Feb 2005
ARGENTINA	16 Mar 1998	28 Sep 2001	16 Feb 2005
ARMENIA		25 Apr 2003 a	16 Feb 2005
AUSTRALIA*	29 Apr 1998	12 Dec 2007	11 Mar 2008

AUSTRIA*	29 Apr 1998	31 May 2002	16 Feb 2005
AZERBAIJAN		28 Sep 2000 a	16 Feb 2005
BAHAMAS		9 Apr 1999 a	16 Feb 2005
BAHRAIN		31 Jan 2006 a	1 May 2006
BANGLADESH		22 Oct 2001 a	16 Feb 2005
BARBADOS		7 Aug 2000 a	16 Feb 2005
BELARUS*		26 Aug 2005 a	24 Nov 2005
BELGIUM*	29 Apr 1998	31 May 2002	16 Feb 2005
BELIZE		26 Sep 2003 a	16 Feb 2005
BENIN		25 Feb 2002 a	16 Feb 2005
BHUTAN		26 Aug 2002 a	16 Feb 2005
BOLIVIA	9 Jul 1998	30 Nov 1999	16 Feb 2005
BOSNIA AND HERZEGOVINA		16 Apr 2007 a	15 Jul 2007
BOTSWANA		8 Aug 2003 a	16 Feb 2005
BRAZIL	29 Apr 1998	23 Aug 2002	16 Feb 2005
BRUNEI DARUSSALAM		20 Aug 2009 a	18 Nov 2009
BULGARIA*	18 Sep 1998	15 Aug 2002	16 Feb 2005
BURKINA FASO		31 Mar 2005 a	29 Jun 2005
BURUNDI		18 Oct 2001 a	16 Feb 2005
CABO VERDE		10 Feb 2006 a	11 May 2006
CAMBODIA		22 Aug 2002 a	16 Feb 2005
CAMEROON		28 Aug 2002 a	16 Feb 2005
CANADA*	[29 Apr 1998]	[17 Dec 2002]	16 Feb 2005 [15 Dec 2012 w]
CENTRAL AFRICAN REPUBLIC		18 Mar 2008 a	16 Jun 2008
CHAD		18 Aug 2009 a	17 Nov 2009
CHILE	17 Jun 1998	26 Aug 2002	16 Feb 2005
CHINA	29 May 1998	30 Aug 2002 AA *(2)*	16 Feb 2005
COLOMBIA		30 Nov 2001 a	16 Feb 2005
COMOROS		10 Apr 2008 a	9 Jul 2008
CONGO		12 Feb 2007 a	13 May 2007
COOK ISLANDS	16 Sep 1998	27 Aug 2001	16 Feb 2005
COSTA RICA	27 Apr 1998	9 Aug 2002	16 Feb 2005

COTE D'IVOIRE		23 Apr 2007 a	22 Jul 2007
CROATIA*	11 Mar 1999	30 May 2007	28 Aug 2007
CUBA	15 Mar 1999	30 Apr 2002	16 Feb 2005
CYPRUS		16 Jul 1999 a	16 Feb 2005
CZECH REPUBLIC*	23 Nov 1998	15 Nov 2001 AA	16 Feb 2005
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA		27 Apr 2005 a	26 Jul 2005
DEMOCRATIC REPUBLIC OF CONGO		23 Mar 2005 a	21 Jun 2005
DENMARK*	29 Apr 1998	31 May 2002 *(3)*	16 Feb 2005
DJIBOUTI		12 Mar 2002 a	16 Feb 2005
DOMINICA		25 Jan 2005 a	25 Apr 2005
DOMINICAN REPUBLIC		12 Feb 2002 a	16 Feb 2005
ECUADOR	15 Jan 1999	13 Jan 2000	16 Feb 2005
EGYPT	15 Mar 1999	12 Jan 2005	12 Apr 2005
EL SALVADOR	8 Jun 1998	30 Nov 1998	16 Feb 2005
EQUATORIAL GUINEA		16 Aug 2000 a	16 Feb 2005
ERITREA		28 Jul 2005 a	26 Oct 2005
ESTONIA*	3 Dec 1998	14 Oct 2002	16 Feb 2005
ETHIOPIA		14 Apr 2005 a	13 Jul 2005
EUROPEAN UNION*	29 Apr 1998	31 May 2002 AA	16 Feb 2005
FIJI	17 Sep 1998	17 Sep 1998	16 Feb 2005
FINLAND*	29 Apr 1998	31 May 2002	16 Feb 2005
FRANCE*	29 Apr 1998	31 May 2002 AA	16 Feb 2005
GABON		12 Dec 2006 a	12 Mar 2007
GAMBIA		1 Jun 2001 a	16 Feb 2005
GEORGIA		16 Jun 1999 a	16 Feb 2005
GERMANY*	29 Apr 1998	31 May 2002	16 Feb 2005
GHANA		30 May 2003 a	16 Feb 2005
GREECE*	29 Apr 1998	31 May 2002	16 Feb 2005
GRENADA		6 Aug 2002 a	16 Feb 2005
GUATEMALA	10 Jul 1998	5 Oct 1999	16 Feb 2005
GUINEA		7 Sep 2000 a	16 Feb 2005
GUINEA-BISSAU		18 Nov 2005 a	16 Feb 2005
GUYANA		5 Aug 2003 a	

			16 Feb 2005
HAITI		6 Jul 2005 a	4 Oct 2005
HONDURAS	25 Feb 1999	19 Jul 2000	16 Feb 2005
HUNGARY*		21 Aug 2002 a	16 Feb 2005
ICELAND*		23 May 2002 a	16 Feb 2005
INDIA		26 Aug 2002 a	16 Feb 2005
INDONESIA	13 Jul 1998	3 Dec 2004	3 Mar 2005
IRAN (ISLAMIC REPUBLIC OF)		22 Aug 2005 a	20 Dec 2005
IRAQ		28 Jul 2009 a	26 Oct 2009
IRELAND*	29 Apr 1998	31 May 2002	16 Feb 2005
ISRAEL	16 Dec 1998	15 Mar 2004	16 Feb 2005
ITALY*	29 Apr 1998	31 May 2002	16 Feb 2005
JAMAICA		28 Jun 1999 a	16 Feb 2005
JAPAN*	28 Apr 1998	4 Jun 2002 A	16 Feb 2005
JORDAN		17 Jan 2003 a	16 Feb 2005
KAZAKHSTAN**	12 Mar 1999	19 Jun 2009	17 Sep 2009
KENYA		25 Feb 2005 a	26 May 2005
KIRIBATI		7 Sep 2000 a	16 Feb 2005
KUWAIT		11 Mar 2005 a	9 Jun 2005
KYRGYZSTAN		13 May 2003 a	16 Feb 2005
LAO PEOPLE'S DEMOCRATIC REPUBLIC		6 Feb 2003 a	16 Feb 2005
LATVIA*	14 Dec 1998	5 Jul 2002	16 Feb 2005
LEBANON		13 Nov 2006 a	11 Feb 2007
LESOTHO		6 Sep 2000 a	16 Feb 2005
LIBERIA		5 Nov 2002 a	16 Feb 2005
LIBYA		24 Aug 2006 a	22 Nov 2006
LIECHTENSTEIN*	29 Jun 1998	3 Dec 2004	3 Mar 2005
LITHUANIA*	21 Sep 1998	3 Jan 2003	16 Feb 2005
LUXEMBOURG*	29 Apr 1998	31 May 2002	16 Feb 2005
MADAGASCAR		24 Sep 2003 a	16 Feb 2005
MALAWI		26 Oct 2001 a	16 Feb 2005
MALAYSIA	12 Mar 1999	4 Sep 2002	16 Feb 2005

MALDIVES	16 Mar 1998	30 Dec 1998	16 Feb 2005
MALI	27 Jan 1999	28 Mar 2002	16 Feb 2005
MALTA*	17 Apr 1998	11 Nov 2001	16 Feb 2005
MARSHALL ISLANDS	17 Mar 1998	11 Aug 2003	16 Feb 2005
MAURITANIA		22 Jul 2005 a	20 Oct 2005
MAURITIUS		9 May 2001 a	16 Feb 2005
MEXICO	9 Jun 1998	7 Sep 2000	16 Feb 2005
MICRONESIA (FEDERATED STATES OF)	17 Mar 1998	21 Jun 1999	16 Feb 2005
MONACO*	29 Apr 1998	27 Feb 2006	28 May 2006
MONGOLIA		15 Dec 1999 a	16 Feb 2005
MONTENEGRO		4 Jun 2007 a	2 Sep 2007
MOROCCO		25 Jan 2002 a	16 Feb 2005
MOZAMBIQUE		18 Jan 2005 a	18 Apr 2005
MYANMAR		13 Aug 2003 a	16 Feb 2005
NAMIBIA		4 Sep 2003 a	16 Feb 2005
NAURU		16 Aug 2001 a	16 Feb 2005
NEPAL		16 Sep 2005 a	15 Dec 2005
NETHERLANDS*	29 Apr 1998	31 May 2002 A *(4)*	16 Feb 2005
NEW ZEALAND*	22 May 1998	19 Dec 2002 *(5)*	16 Feb 2005
NICARAGUA	7 Jul 1998	18 Nov 1999	16 Feb 2005
NIGER	23 Oct 1998	30 Sep 2004	16 Feb 2005
NIGERIA		10 Dec 2004 a	10 Mar 2005
NIUE	8 Dec 1998	6 May 1999	16 Feb 2005
NORWAY*	29 Apr 1998	30 May 2002	16 Feb 2005
OMAN		19 Jan 2005 a	19 Apr 2005
PAKISTAN		11 Jan 2005 a	11 Apr 2005
PALAU		10 Dec 1999 a	16 Feb 2005
PANAMA	8 Jun 1998	5 Mar 1999	16 Feb 2005
PAPUA NEW GUINEA	2 Mar 1999	28 Mar 2002	16 Feb 2005
PARAGUAY	25 Aug 1998	27 Aug 1999	16 Feb 2005
PERU	13 Nov 1998	12 Sep 2002	16 Feb 2005
PHILIPPINES	15 Apr 1998	20 Nov 2003	16 Feb 2005

POLAND*	15 Jul 1998	13 Dec 2002	16 Feb 2005
PORTUGAL*	29 Apr 1998	31 May 2002 AA	16 Feb 2005
QATAR		11 Jan 2005 a	11 Apr 2005
REPUBLIC OF KOREA	25 Sep 1998	8 Nov 2002	16 Feb 2005
REPUBLIC OF MOLDOVA		22 Apr 2003 a	16 Feb 2005
ROMANIA*	5 Jan 1999	19 Mar 2001	16 Feb 2005
RUSSIAN FEDERATION*	11 Mar 1999	18 Nov 2004	16 Feb 2005
RWANDA		22 Jul 2004 a	16 Feb 2005
SAINT KITTS AND NEVIS		8 Apr 2008 a	7 Jul 2008
SAINT LUCIA	16 Mar 1998	20 Aug 2003	16 Feb 2005
SAINT VINCENT AND THE GRENADINES	19 Mar 1998	31 Dec 2004	31 Mar 2005
SAMOA	16 Mar 1998	27 Nov 2000	16 Feb 2005
SAN MARINO		28 April 2010	27 Jul 2010
SAO TOME AND PRINCIPE		25 Apr 2008 a	24 Jul 2008
SAUDI ARABIA		31 Jan 2005 a	1 May 2005
SENEGAL		20 Jul 2001 a	16 Feb 2005
SERBIA		19 Oct 2007 a	17 Jan 2008
SEYCHELLES	20 Mar 1998	22 Jul 2002	16 Feb 2005
SIERRA LEONE		10 Nov 2006 a	8 Feb 2007
SINGAPORE		12 Apr 2006 a	11 Jul 2006
SLOVAKIA*	26 Feb 1999	31 May 2002	16 Feb 2005
SLOVENIA*	21 Oct 1998	2 Aug 2002	16 Feb 2005
SOLOMON ISLANDS	29 Sep 1998	13 Mar 2003	16 Feb 2005
SOMALIA		26 July 2010	24 Oct 2010
SOUTH AFRICA		31 Jul 2002 a	16 Feb 2005
SPAIN*	29 Apr 1998	31 May 2002	16 Feb 2005
SRI LANKA		3 Sep 2002 a	16 Feb 2005
SUDAN		2 Nov 2004 a	16 Feb 2005
SURINAME		25 Sep 2006 a	24 Dec 2006
SWAZILAND		13 Jan 2006 a	13 Apr 2006
SWEDEN*	29 Apr 1998	31 May 2002	16 Feb 2005
SWITZERLAND*	16 Mar 1998	9 Jul 2003	16 Feb 2005
SYRIAN ARAB REPUBLIC		27 Jan 2006 a	27 Apr 2006

TAJIKISTAN		29 Dec 2008 a	29 Mar 2009
THAILAND	2 Feb 1999	28 Aug 2002	16 Feb 2005
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA		18 Nov 2004 a	16 Feb 2005
TIMOR-LESTE		14 Oct 2008 a	12 Jan 2009
TOGO		2 Jul 2004 a	16 Feb 2005
TONGA		14 Jan 2008 a	13 Apr 2008
TRINIDAD AND TOBAGO	7 Jan 1999	28 Jan 1999	16 Feb 2005
TUNISIA		22 Jan 2003 a	16 Feb 2005
TURKEY*		28 May 2009 a	26 Aug 2009
TURKMENISTAN	28 Sep 1998	11 Jan 1999	16 Feb 2005
TUVALU	16 Nov 1998	16 Nov 1998	16 Feb 2005
UGANDA		25 Mar 2002 a	16 Feb 2005
UKRAINE*	15 Mar 1999	12 Apr 2004	16 Feb 2005
UNITED ARAB EMIRATES		26 Jan 2005 a	26 Apr 2005
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND*	29 Apr 1998	31 May 2002 ***(6)*** ***(7)***	16 Feb 2005
UNITED REPUBLIC OF TANZANIA		26 Aug 2002 a	16 Feb 2005
UNITED STATES OF AMERICA*	12 Nov 1998		
URUGUAY	29 Jul 1998	5 Feb 2001	16 Feb 2005
UZBEKISTAN	20 Nov 1998	12 Oct 1999	16 Feb 2005
VANUATU		17 Jul 2001 a	16 Feb 2005
VENEZUELA		18 Feb 2005 a	19 May 2005
VIET NAM	3 Dec 1998	25 Sep 2002	16 Feb 2005
YEMEN		15 Sep 2004 a	16 Feb 2005
ZAMBIA	5 Aug 1998	7 Jul 2006	5 Oct 2006
ZIMBABWE		30 Jun 2009 a	28 Sep 2009

* indicates an Annex I Party to the United Nations Framework Convention on Climate Change
** indicates an Annex I Party for the purposes of the Kyoto Protocol by virtue of Article 1, paragraph 7, of the Kyoto Protocol.

"w" indicates withdrawal

End Note:

(1) For the purpose of entry into force of the [Convention/Protocol], any instrument of ratification, acceptance, approval or accession deposited by a regional economic integration organization shall not be counted as additional to those deposited by member States of that Organization.

(2) In a communication received on 30 August 2002, the Government of the People's Republic of China informed the Secretary-General of the following:

In accordance with article 153 of the Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China of 1990 and article 138 of the Basic Law of the Macao Special Administrative Region of the People's Republic of China of 1993, the Government of the People's Republic of China decides that the Kyoto Protocol to the United Nations Framework Convention on Climate Change shall provisionally not apply to the Hong Kong Special Administrative Region and the Macao Special Administrative Region of the People's Republic of China.

Further, in a communication received on 8 April 2003, the Government of the People's Republic of China notified the Secretary-General of the following:

"In accordance with the provisions of Article 153 of the Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China of 1990, the Government of the People's Republic of China decides that the United Nations Framework Convention on Climate Change and the Kyoto Protocol to the United Nations Framework Convention on Climate Change shall apply to the Hong Kong Special Administrative Region of the People's Republic of China.

The United Nations Framework Convention on Climate Change continues to be implemented in the Macao Special Administrative Region of the People's Republic of China. The Kyoto Protocol to the United Nations Framework Convention on Climate Change shall not apply to the Macao Special Administrative Region of the People's Republic of China until the Government of China notifies otherwise."

In a communication received on 14 January 2008, the Government of the People's Republic of China notified the Secretary-General of the following: In accordance with Article 138 of the Basic Law of the Macao Special Administrative Region of the People's Republic of China, the Government of the People's Republic of China decides that the Kyoto Protocol to the United Nations Framework Convention on Climate Change shall apply to the Macao Special Administrative Region of the People's Republic of China.

(3) With a territorial exclusion to the Faroe Islands.

(4) For the Kingdom in Europe.

(5) With the following declaration:

".....consistent with the constitutional status of Tokelau and taking into account the commitment of the Government of New Zealand to the development of self-government for Tokelau through an act of self-determination under the Charter of the United Nations, this ratification shall not extend to Tokelau unless and until a Declaration to this effect is lodged by the Government of New Zealand with the Depositary on the basis of appropriate consultation with that territory."

(6) By a communication received on 27 March 2007, the Government of Argentina notified the Secretary-General of the following:

The Argentine Republic objects to the extension of the territorial application to the Kyoto Protocol to the United Nations Framework Convention on Climate Change of 11 December 1997 with respect to the Malvinas Islands, which was notified by the United Kingdom of Great Britain and Northern Ireland to the Depositary of the Convention on 7 March 2007.

The Argentine Republic reaffirms its sovereignty over the Malvinas Islands, the South Georgia and South Sandwich Islands and the surrounding maritime spaces, which are an integral part of its national territory, and recalls that the General Assembly of the United Nations adopted resolutions 2065 (XX), 360 (XXVIII), 31/49, 37/9, 38/12, 39/6, 40/21, 41/40, 42/19 and 43/25, which recognize the existence of a dispute over sovereignty and request the Governments of the Argentine Republic and the United Kingdom of Great Britain and Northern Ireland to initiate negotiations with a view to finding the means to resolve peacefully and definitively the pending problems between both countries, including all aspects on the future of the Malvinas Islands, in accordance with the Charter of the United Nations.

(7) On 4 April 2006, the Government of the United Kingdom informed the Secretary-General that the Protocol shall apply to the Bailiwick of Guernsey and the Isle of Man. On 2 January 2007: in respect of Gibraltar. On 7 March 2007: in respect of Bermuda, Cayman Islands, Falkland Islands (Malvinas) and the Bailiwick of Jersey.

EXHIBIT 34

The New York Times | http://nyti.ms/1WzznSi

SCIENCE

Exxon Mobil Investigated for Possible Climate Change Lies by New York Attorney General

By JUSTIN GILLIS and CLIFFORD KRAUSS NOV. 5, 2015

The New York attorney general has begun an investigation of Exxon Mobil to determine whether the company lied to the public about the risks of climate change or to investors about how such risks might hurt the oil business.

According to people with knowledge of the investigation, Attorney General Eric T. Schneiderman issued a subpoena Wednesday evening to Exxon Mobil, demanding extensive financial records, emails and other documents.

The investigation focuses on whether statements the company made to investors about climate risks as recently as this year were consistent with the company's own long-running scientific research.

The people said the inquiry would include a period of at least a decade during which Exxon Mobil funded outside groups that sought to undermine climate science, even as its in-house scientists were outlining the potential consequences — and uncertainties — to company executives.

Kenneth P. Cohen, vice president for public affairs at Exxon Mobil, said on Thursday that the company had received the subpoena and was still deciding how to respond.

"We unequivocally reject the allegations that Exxon Mobil has suppressed climate change research," Mr. Cohen said, adding that the company had funded mainstream climate science since the 1970s, had published dozens of scientific papers on the topic and had disclosed climate risks to investors.

Mr. Schneiderman's decision to scrutinize the fossil fuel companies may well open a new legal front in the climate change battle.

The people with knowledge of the New York case also said on Thursday that, in a separate inquiry, Peabody Energy, the nation's largest coal producer, had been under investigation by the attorney general for two years over whether it properly disclosed financial risks related to climate change. That investigation was not previously reported, and has not resulted in any charges or other legal action against Peabody.

Vic Svec, a Peabody senior vice president, said in a statement, "Peabody continues to work with the New York attorney general's office regarding our disclosures, which have evolved over the years."

The Exxon inquiry might expand further to encompass other oil companies, according to the people with knowledge of the case, though no additional subpoenas have been issued to date.

The people spoke on the condition of anonymity, saying they were not authorized to speak publicly about investigations that could produce civil or criminal charges. The Martin Act, a New York state law, confers on the attorney general broad powers to investigate financial fraud.

To date, lawsuits trying to hold fuel companies accountable for damage they are causing to the climate have failed in the courts, but most of those have been pursued by private plaintiffs.

Attorneys general for other states could join in Mr. Schneiderman's efforts, bringing far greater investigative and legal resources to bear on the issue. Some

experts see the potential for a legal assault on fossil fuel companies similar to the lawsuits against tobacco companies in recent decades, which cost those companies tens of billions of dollars in penalties.

"This could open up years of litigation and settlements in the same way that tobacco litigation did, also spearheaded by attorneys general," said Brandon L. Garrett, a professor at the University of Virginia School of Law. "In some ways, the theory is similar — that the public was misled about something dangerous to health. Whether the same smoking guns will emerge, we don't know yet."

In the 1950s and '60s, tobacco companies financed internal research showing tobacco to be harmful and addictive, but mounted a public campaign that said otherwise and helped fund scientific research later shown to be dubious. In 2006, the companies were found guilty of "a massive 50-year scheme to defraud the public."

The history at Exxon Mobil appears to differ, in that the company published extensive research over decades that largely lined up with mainstream climatology. Thus, any potential fraud prosecution might depend on exactly how big a role company executives can be shown to have played in directing campaigns of climate denial, usually by libertarian-leaning political groups.

For several years, advocacy groups with expertise in financial analysis have been warning that fossil fuel companies might be overvalued in the stock market, since the need to limit climate change might require that much of their coal, oil and natural gas be left in the ground.

The people with knowledge of the case said the attorney general's investigation of Exxon Mobil began a year ago, focusing initially on what the company had told investors about the risks that climate change might pose to its business.

News reporting in the last eight months added impetus to the investigation, they said. In February, several news organizations, including The New York Times, reported that a Smithsonian researcher who had published papers questioning established climate science, Wei-Hock Soon, had received extensive funds from

fossil fuel companies, including Exxon Mobil, without disclosing them. That struck some experts as similar to the activities of tobacco companies.

More recently, Inside Climate News and The Los Angeles Times have reported that Exxon Mobil was well aware of the risks of climate change from its own scientific research, and used that research in its long-term planning for activities like drilling in the Arctic, even as it funded groups from the 1990s to the mid-2000s that denied serious climate risks.

Mr. Cohen, of Exxon, said on Thursday that the company had made common cause with such groups largely because it agreed with them on a policy goal of keeping the United States out of a global climate treaty called the Kyoto Protocol.

"We stopped funding them in the middle part of the past decade because a handful of them were making the uncertainty of the science their focal point," Mr. Cohen said. "Frankly, we made the call that we needed to back away from supporting the groups that were undercutting the actual risk" of climate change.

"We recognize the risk," Mr. Cohen added. He noted that Exxon Mobil, after an acquisition in 2009, had become the largest producer of natural gas in the United States.

Because natural gas creates far less carbon dioxide than coal when burned for electricity, the company expects to be a prime beneficiary of President Obama's plan to limit emissions. Exxon Mobil has also endorsed a tax on emissions as a way to further reduce climate risks.

Whether Exxon Mobil began disclosing the business risks of climate change as soon as it understood them is likely to be a major focus of the New York case. The people with knowledge of the case said the attorney general's investigators were poring through the company's disclosure filings made since the 1970s, but were focusing in particular on recent statements to investors.

Exxon Mobil has been disclosing such risks in recent years, but whether those disclosures were sufficient has been a matter of public debate.

Last year, for example, the company warned investors of intensifying efforts by governments to limit emissions. "These requirements could make our products more expensive, lengthen project implementation times and reduce demand for hydrocarbons, as well as shift hydrocarbon demand toward relatively lower-carbon sources such as natural gas," the company said at the time.

But in another recent report, Exxon Mobil essentially ruled out the possibility that governments would adopt climate policies stringent enough to force it to leave its reserves in the ground, saying that rising population and global energy demand would prevent that. "Meeting these needs will require all economic energy sources, especially oil and natural gas," it said.

Wall Street analysts on Thursday were uncertain whether the case would inflict long-term damage on the company, which has already suffered from a plunge in commodity prices.

"This is not good news for Exxon Mobil or Exxon Mobil shareholders," said Fadel Gheit, a senior oil company analyst at Oppenheimer & Company. "It's a negative, though how much damage there will be to reputation or performance is very hard to say."

John Schwartz contributed reporting.

A version of this article appears in print on November 6, 2015, on page A1 of the New York edition with the headline: Inquiry Weighs Whether Exxon Lied on Climate.

EXHIBIT 35

Virgin Islands and Exxon Agree to Uneasy Truce Over Climate Probe

Subpoena withdrawal opens debate over who won and who lost, but legal experts say the bigger battleground is in New York and Massachusetts.

BY PHIL MCKENNA

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JUL 7, 2016

MOST POPULAR

GOP and Democratic Platforms Highlight Stark Differences

Exxon declared victory last week when the Virgin Islands attorney general withdrew a subpoena in its climate probe of the oil giant. Credit: Reuters

In the legal volleying between Exxon and the U.S. Virgin Islands Attorney General Claude Walker last week, both managed to claim victory. But several experts pegged it as more a ceasefire in a broader battle of investigating the oil giant's alleged efforts to disseminate misinformation on climate change.

Walker, who said his office continues to investigate Exxon for possible fraud, withdrew his subpoena for nearly 40 years of documents from Exxon. In exchange, the oil corporation agreed to withdraw its lawsuit against the attorney general for what it claims is a violation of its constitutional right to free speech. Both sides left open the possibility of reinstating their respective legal actions against the other in a **"joint stipulation of dismissal"** filed by both parties last Wednesday.

Several legal experts said Exxon got the better deal from the joint withdrawal. Some suggested that of the various probes underway, the Virgin Islands' investigation was the most vulnerable to Exxon's challenges. Had the Virgin Islands pursued its case and lost, it could have given Exxon legal momentum to combat investigations from both the New York and Massachusetts attorneys general.

"The Virgin Islands attorney general is really not capable of taking on Exxon and this quick retreat confirms that," said Pat Parenteau, an

on Energy and Climate
BY PHIL MCKENNA


EPA Clears the Way for Greenhouse Gas Rules on U.S. Airlines
BY JOHN H. CUSHMAN JR.


State AGs and Groups Defy Lamar Smith's Subpoena Over Exxon Climate Probes
BY DAVID HASEMYER

FOLLOW

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environmental law professor at the Vermont Law School. "It was a distraction. They were in over their head. They were going to get pounded and it's good they are off the field."

Walker said he is continuing his investigation of Exxon for potentially violating the territory's anti-racketeering law, and claimed Exxon's agreement to drop its lawsuit allows his office to continue with its investigation "without the distraction of this procedural litigation."

Exxon declined requests for comment. The Competitive Enterprise Institute, a conservative group also subpoenaed by Walker's office only to have the subpoena subsequently withdrawn, said last week's joint withdrawals were a victory for Exxon. "The clear conclusion to draw following [Walker's] withdrawal of the ExxonMobil subpoena is that these subpoenas were a baseless fishing expedition from the beginning," CEI president Kent Lassman said in a statement.

The joint withdrawals came after the attorneys general of Texas and Alabama **intervened on Exxon's behalf in its lawsuit against Walker**, which may have influenced Walker's decision to withdraw his subpoena. "It clearly made it more difficult for the Virgin Islands AG to proceed without investing a lot more resources in a higher stakes fight," said Tracy Hester, an environmental law professor at the University of Houston. "To a certain extent there was a point where you had to put your chips all on the table or hold your hand and wait for the next deal."

Walker is part of a **coalition of 17 attorneys general** organized by New York State Attorney

RELATED


Exxon Loses Bid to Fight Virgin Islands Climate Subpoena in State Court
BY DAVID HASEMYER


Exxon Sues a Second Attorney General To Fight Off Climate Fraud Probe
BY DAVID HASEMYER


Exxon and Its Allies Invoke First Amendment to Fight Climate Fraud Probes
BY NEELA BANERJEE

General Eric Schneiderman. They have vowed to hold fossil fuel companies accountable for their conduct on climate change. Of the 17, only three—Schneiderman, Walker and Maura Healey of Massachusetts—have subpoenaed Exxon. When the coalition was announced on March 29, Walker described the Virgin Islands' fight against Exxon as one of David versus Goliath and pledged to do something "transformational" to end reliance on fossil fuels. So far, he is the only attorney general to say he is investigating the company for racketeering, and he also widened the probe by subpoenaing CEI, tactics that some now say were overreaching.

Had Walker continued with his subpoena against Exxon and Exxon continued its lawsuit against the attorney general, some said it could have undermined the entire coalition.

"He [Walker] gets out of a case which could have threatened the game plan of the attorney general coalition that he belongs to," said Robert Collings an energy and environmental attorney with the law firm Schnader Harrison Segal & Lewis LLP. "If one federal court looks at the Virgin Islands' subpoena and decides that it is faulty, then you could have a case created that establishes at least an influence on other state litigation, if not a precedent, that would control their ability to bring their own actions and subpoenas in the future."

Daniel Riesel, an attorney with New York based environmental law firm Sive, Paget & Riesel, said the damage may have already been done.

"You have the attorney general from the Virgin Islands doing this grandstand act where he has

made statements about pushing the law to new horizons, it just leaves the whole cause of this investigation under a cloud," Riesel said.

"I don't think anybody will lose sleep over whether or not the Virgin Islands attorney general has lost some tactical or strategic advantage, but it would be a shame if the inquiry into Exxon or other energy companies gets a black eye from this effort."

Others offered a different interpretation of Walker's strategy.

Sharon Eubanks, a former U.S. Department of Justice attorney who prosecuted and won the racketeering case against the tobacco industry, said Walker may have come out ahead by agreeing to withdraw the subpoena.

Walker avoided a court battle with Exxon over the company's lawsuit to block the subpoena as well as getting an insight into Exxon's legal strategy, Eubanks said.

"All parties just packed their briefcases and walked away from the ledge," said Eubanks, who underscored that she has no inside knowledge of the case.

"It can all be litigated another day, and from the V.I.'s perspective, kicking that can down the road doesn't look so bad."

There may have been some conditions agreed to between Exxon and Walker, a sort of uneasy truce, which remain confidential, she speculated.

For example, any closed-door negotiations might have centered on voluntary cooperation by Exxon or an agreement that Walker would scale back the scope of any future demands, Eubanks said.

Hester said the Virgin Islands can continue its investigation without subpoenaing documents from Exxon.

"The AG has the capacity just like any other law enforcement or attorney general to access the public record or discovery produced in other proceedings," Hester said. "If another attorney general proceeds with a subpoena and succeeds they'll have access to that information. To the extent that there is congressional testimony, they can access those documents as well."

Exxon has turned over more than 700,000 pages of documents to the New York attorney general's office and is continuing to cooperate with that investigation, said Eric Soufer, a spokesman for Schneiderman.

Investigators have begun reviewing the documents, Soufer said, but he declined to characterize what the records reveal.

The New York attorney general's office has not, however, shared any of the documents with other attorneys general and has no plans to do so, according to Soufer. He did not comment on whether that was because of an agreement with Exxon.

Healey also subpoenaed Exxon for documents going back 40 years and Exxon has subsequently sued Healey in an attempt to

derail her investigation. That suit strikes the same themes as the one against Walker, claiming violation of the company's First and Fourth Amendment rights that protect free speech and prohibit unreasonable searches.

A judge has ordered both sides to file briefs between August and October in that case.

It is New York's case, however, that has the strongest legal footing, according to Parenteau.

The probe is based on New York's powerful shareholder-protection statute, the Martin Act, a 1921 statute, which forbids "**any fraud, deception, concealment, suppression, false pretense**" or "any representation or statement which is false" and gives the state broad powers of discovery.

"No other state has a law quite like the Martin Act, not Massachusetts, not California and certainly not the Virgin Islands," Parenteau said. "It's so critical for New York to be lead state because the argument that this is an attempt to intimidate Exxon or interfere on First Amendment rights of corporate speech can gain traction. It's just critical that the subpoena be on the most solid legal ground that it can be."

Parenteau said Exxon is likely cooperating with the New York attorney general's office because of that legal basis, but predicted the cooperation won't last.

"At some point Exxon will take New York on as well, I'm quite sure," Parenteau said.

Parenteau stressed that the recent withdrawals by the Virgin Islands and Exxon are early skirmishes in what will be a long, protracted fight.

"Exxon scored in the first round but there are many, many rounds to go," he said.

David Hasemyer contributed reporting for this story

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EXXON: THE ROAD NOT TAKEN

PRINTER-FRIENDLY VERSION

ABOUT THE AUTHOR

Phil McKenna

Phil McKenna is a Boston-based reporter for InsideClimate News. Before joining ICN in 2016, he was a freelance writer covering energy and the environment for publications including The New York Times, Smithsonian, Audubon and WIRED. Uprising, a story he wrote about gas leaks under U.S. cities, won the AAAS Kavli Science Journalism Award and the 2014 NASW Science in Society Award. Phil has a master's degree in science writing from the Massachusetts Institute of Technology and was an Environmental Journalism Fellow at Middlebury College.

EXHIBIT 36

U.S. Department of Justice

Office of Legislative Affairs

Office of Assistant Attorney General *Washington, D.C. 20530*

January 12, 2016

The Honorable Ted W. Lieu
U. S. House of Representatives
Washington, DC 20515

The Honorable Mark DeSaulnier
U. S. House of Representatives
Washington, DC 20515

Dear Congressman Lieu and Congressman DeSaulnier:

This responds to your letter to the Attorney General dated October 14, 2015, requesting that the Department of Justice (the Department) open an investigation into whether ExxonMobil may have violated the Racketeer Influenced and Corrupt Organizations Act and related laws for failing to disclose truthful information to investors and the public regarding climate science.

As a courtesy, we have forwarded your correspondence to the Federal Bureau of Investigation (FBI). The FBI is the investigative arm of the Department, upon which we rely to conduct the initial fact finding in federal cases. The FBI will determine whether an investigation is warranted. If you have any additional information, or if you would like to follow up with the FBI, you can call (202) 324-3000, or write to:

Mr. Joseph S. Campbell
Assistant Director
Criminal Investigative Division
Federal Bureau of Investigation
935 Pennsylvania Avenue NW
Washington, DC 20535.

We hope this information is helpful. Please do not hesitate to contact this office if we may provide any additional assistance regarding this or any other matter.

Sincerely,

Peter J. Kadzik
Assistant Attorney General

EXHIBIT 37

CLIMATE:

Fossil fuel backers accused of 'calculated disinformation'

Amanda Reilly, E&E reporter

Published: Thursday, June 23, 2016

Progressive Democrats this week fired the latest shot in the monthslong war over what and when fossil fuel companies knew about climate change and whether they tried to hide the information.

At a forum yesterday on Capitol Hill, the Congressional Progressive Caucus accused the fossil fuel industry and its advocates of using the same "calculated disinformation" tactics of the tobacco industry to block investigations of whether smoking caused cancer.

"The fossil fuel industry's concerted effort to confuse the public on the certainty of climate science is endangering nearly everyone on this planet, born or yet to be born," Rep. Keith Ellison (D-Minn.), co-chairman of the Congressional Progressive Caucus, alleged. "All for one simple reason: money."

While most of the action has taken place in the states, members of Congress have increasingly weighed in on whether Exxon Mobil Corp. and other fossil fuel companies misled the public on climate change.

Along with trying to make the case that Big Oil is the new Big Tobacco, Democrats have stood behind state attorneys general who are investigating Exxon's past climate change statements.

"Companies can mislead consumers, but if they mislead investors, that's a crime," said Rep. Ted Lieu (D-Calif.), who has asked the Justice Department and the Securities and Exchange Commission to launch its own investigations into Exxon over its past climate change statements.

Republicans, on the other hand, in both the House and Senate have called on the federal government to halt any potential investigation into oil and gas companies over their work in the area of climate change.

They've also sought to paint the climate activities of state attorneys general and their investigations into Exxon as part of a well-funded plot by environmentalists to stifle the free speech of those who do not believe in man-made global warming.

Don't expect this to end anytime soon, predicted Mike McKenna, a Republican energy strategist.

"One side's got a good villain. The other side's got a good conspiracy," McKenna said in a recent interview.

Efforts to link Big Oil and Big Tobacco

For its part, Exxon has denied that it's tried to cover up information about climate change risks from the public and investors.

"The great irony here is that we've acknowledged the risks of climate change for more than a decade," a company spokesman said last week, "have supported a carbon tax as the better policy option and spent more than $7 billion on research and technologies to reduce emissions."

Yesterday, progressive Democrats enlisted environmental and scientific experts to help them make linkages between oil and tobacco companies. Speaking at the forum were Kathy Mulvey of the Union of Concerned Scientists, former Exxon researcher Ed Garvey, Harvard professor and author of the book "Merchants of Doubt" Naomi Oreskes, and Natasha Lamb, director of equity research and shareholder engagement at Arjuna Capital.

"Internal documents show that some of the largest fossil fuel companies have worked behind the scenes for years to deceive the public about the reality of global warming, long after they knew the truth about climate science," Mulvey said, citing reports issued by the Union of Concerned Scientists over the past few years.

Oreskes told the forum about her work that led to the her book, which alleges that the same individuals and organizations who defended tobacco companies as they were investigated by the government helped sow doubt about man-made climate change.

This is not the first time that Democrats have tried to link fossil fuel companies to the tobacco industry.

In May of last year, months before news articles starting pointing fingers at Exxon for allegedly misleading the

public and shareholders on climate change, Sen. Sheldon Whitehouse (D-R.I.) wrote an opinion piece in *The Washington Post* accusing fossil fuel companies and their allies of running a "massive and sophisticated campaign to mislead the American people about the environmental harm caused by carbon pollution."

He charged that fossil fuel companies were following the "Big Tobacco playbook."

"The Big Tobacco playbook looked something like this," Whitehouse wrote. "(1) pay scientists to produce studies defending your product; (2) develop an intricate web of PR experts and front groups to spread doubt about the real science; (3) relentlessly attack your opponents."

In the opinion piece, Whitehouse raised the possibility of a lawsuit against the industry using the federal Racketeer Influenced and Corrupt Organizations, or RICO, Act, the same law that the government successfully used to litigate against tobacco companies.

Whitehouse served as a U.S. attorney during the Clinton administration. In an interview in his office last month, Whitehouse said the opinion piece arose partly out of his experience as an "inside-the-organization bystander" in the federal government's litigation against tobacco companies.

As a senator, Whitehouse said he began paying attention to the work of Oreskes and others who were making links between the tobacco and fossil fuel industry.

"The more I studied the climate denial operation, the more it reminded me of the tobacco [case]," Whitehouse said. "So at one point I asked my staff to dredge out the tobacco complaint that DOJ filed to read it again, and I thought, 'Wow, that's pretty compelling.'"

The Rhode Island senator said that the response to a recent Judiciary Committee hearing in March, in which Attorney General Loretta Lynch testified, reinforced his thinking. At the hearing, Whitehouse questioned Lynch about the status of requests for investigations of Exxon.

Whitehouse was concerned, he told *E&E Daily*, that the Justice Department was attempting to bury requests for a civil investigation -- similar to the government's investigation of tobacco companies -- at the FBI, which deals more with criminal cases.

Lynch confirmed that the Justice Department had discussed the matter and that the FBI was determining whether or not an investigation was warranted.

Dozens of conservative columnists and some editorial boards have cited that exchange since then, many arguing that Whitehouse was attempting to block free speech. One piece goes as far as to compare Whitehouse to the Torquemada, the Grand Spanish Inquisitor. And last month, a group of Senate Republicans used the exchange in calling for the Justice Department to stop looking into fossil fuel companies' climate disclosures.

The similarity of the responses -- none of which mention the tobacco industry -- is telling, Whitehouse said.

"Groups organized around the fossil fuel industry coordinate very well with each other, and they've moved from just simply creating phony climate science and creating phony doubt about climate science to having more of a pushback operation," he told *E&E Daily*, "and it's particularly triggered by concerns about investigating their patrons."

GOP, allies brace for defense

But Republican allies of the fossil fuel industry in Congress are accusing green groups and their friends on the state and federal level of a well-funded and well-organized conspiracy to go after oil and gas companies using the same strategy that brought down Big Tobacco.

They've largely focused on reconstructing a timeline of when environmental groups first aimed to target fossil fuel companies with federal and state fraud and racketeering litigation.

In recent weeks, Republican members of the House Science, Space and Technology Committee homed in on a 2012 workshop as proof that environmentalists have been conspiring for years.

In June of that year, the Climate Accountability Institute and Union of Concerned Scientists held a workshop in California to explore strategies to fight the fossil fuel industries in the courts.

The workshop produced a document titled "Establishing Accountability for Climate Change Damages: Lessons from Tobacco Control" that in part called for working with state attorneys general to subpoena documents on climate change.

The letter from Republicans went on to charge that members of that 2012 workshop worked closely with state

attorneys general who in March announced a multistate coalition to hold fossil fuel companies accountable for climate change risks.

"The strategy decided upon by workshop participants appears clear .... to act under color of law to persuade attorneys general to use their prosecutorial powers to stifle scientific discourse, intimidate private entities and individuals, and deprive them of their First Amendment rights and freedoms," GOP members of the House Science panel wrote in a series of letters to state AGs who are part of the coalition formed in March.

Industry and right-leaning organizations have been making the same arguments for months.

Katie Brown, a spokesperson for industry group Energy in Depth, yesterday wrote that comparing oil companies to the tobacco industry was a "ridiculous apples-and-snickers bars comparison" and that an "overwhelming majority of neutral and even left leaning legal experts agree."

The Competitive Enterprise Institute, subpoenaed by the Virgin Islands attorney general as part of its probe of Exxon, has also said that the investigations of the fossil fuel industry are "totally different" from the past tobacco litigation.

"The tobacco investigation, the tobacco litigation all involved the sale of a product," CEI general counsel Sam Kazman said last week. "This involves a policy debate. This involves an attempt to shut down dissent."

Advocacy group Environment & Energy Legal Institute, which is opposed to climate change regulation, has meanwhile filed information requests seeking the emails of 20 climate scientists who published a public letter in support of Whitehouse's request that the federal government consider a RICO lawsuit against fossil fuel companies, as well as requests for more information about coordination between state AGs and environmentalists.

Rep. Paul Tonko (D-N.Y.) yesterday slammed his GOP colleagues for focusing on the state attorneys general and not on the allegations that they are investigating. He asked speakers at yesterday's forum to be upfront about when and if they've met with state attorneys general on the issue.

Oreskes revealed that she was first invited about a year ago to speak with the staff of the New York attorney general's office about her book. She told *E&E Daily* in a recent interview that the 2012 workshop arose out of questions she received in public lectures about her research for "Merchants of Doubt."

For their part, environmentalists say that they have been open about what they call campaigns to expose climate change misinformation. The document from the workshop, for example, is posted publicly online.

"That 2012 convening was important because it really started moving away from just calling out the conduct to talking about what can we actually do about it," said Union of Concerned Scientists President Ken Kimmell in a recent interview. "I think by that time we were starting to become convinced that the parallels between certain members of the fossil fuel industry and tobacco industry were getting more and more apparent."

Mulvey said that she hoped yesterday's forum would be a "defining moment in congressional scrutiny" on climate change. Tonko urged everyone involved to move forward with "great integrity."

"I think if indeed a fossil-based industry has conducted themselves in a disingenuous manner and has moved along with a misinformation campaign, if indeed that's the fact, that's truly regrettable," Tonko said.

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EXHIBIT 38

A.G. Schneiderman, Former Vice President Al Gore And A Coalition Of Attorneys General From Across The Country Announce Historic State-Based Effort To Combat Climate Change

Unprecedented Coalition Vows To Defend Climate Change Progress Made Under President Obama And To Push The Next President For Even More Aggressive Action

Attorneys General From California, Connecticut, District Of Columbia, Illinois, Iowa, Maine, Maryland, Massachusetts, Minnesota, New Mexico, New York, Oregon, Rhode Island, Virginia, Vermont, Washington State And The US Virgin Islands Agree To Coordinate Efforts

Schneiderman: Climate Change Is The Most Consequential Issue Of Our Time. This Unprecedented State-To-State Coordination Will Use All The Tools At Our Disposal To Fight For Climate Progress

NEW YORK – Attorney General Eric T. Schneiderman today joined Attorneys General from across the nation to announce an unprecedented coalition of top law enforcement officials committed to aggressively protecting and building upon the recent progress the United States has made in combatting climate change.

Attorneys General Schneiderman, William Sorrell of Vermont, George Jepsen of Connecticut, Brian E. Frosh of Maryland, Maura Healey of Massachusetts, Mark Herring of Virginia, and Claude Walker of the US Virgin Islands were joined by former Vice President Al Gore for the announcement in New York City. Today's announcement took place during a one-day Attorneys General climate change conference, co-sponsored by Schneiderman and Sorrell.

The participating states are exploring working together on key climate change-related initiatives, such as ongoing and potential investigations into whether fossil fuel companies misled investors and the public on the impact of climate change on their businesses. In 2015, New York State reached a historic settlement with Peabody Energy – the world's largest publicly traded coal company – concerning the company's misleading financial statements and disclosures. New York is also investigating ExxonMobil for similar alleged conduct.

Many of the states in the coalition have worked together on previous multi-state environmental efforts, including pressing the EPA to limit climate change pollution from fossil-fueled electric power plants, defending federal rules controlling climate change emissions from large industrial facilities, and pushing for federal controls on emissions of the potent greenhouse gas methane emissions from the oil and natural gas industry.

All of the members of the new coalition are part a coalition of 25 states, cities and counties led by Attorney General Schneiderman that intervened to defend the federal Environmental Protection Agency's "Clean Power Plan" against legal challenge. Today, the interveners filed a brief with the DC Circuit Court defending President Obama's Clean Power Plan rule, which establishes a nationwide framework to achieve meaningful and cost effective reductions of carbon-dioxide emissions from power plants—the largest single source of greenhouse gas emissions in the nation—and provides states and power plants flexibility to decide how best to achieve these reductions.

"With gridlock and dysfunction gripping Washington, it is up to the states to lead on the generation-defining issue of climate change. We stand ready to defend the next president's climate change agenda, and vow to fight any efforts to roll-back the meaningful progress we've made over the past eight years," said **Attorney General Schneiderman**. "Our offices are seriously examining the potential of working together on high-impact, state-level initiatives, such as investigations into whether fossil fuel companies have misled investors about how climate change impacts their investments and business decisions."

"We cannot continue to allow the fossil fuel industry or any industry to treat our atmosphere like an open sewer or mislead the public about the impact they have on the health of our people and the health of our planet. Attorneys General and law enforcement officials around the country have long held a vital role in ensuring that the progress we have made to solve the climate crisis is not only protected, but advanced. The first-of-its-kind coalition announced today is another key step on the path to a sustainable, clean-energy future," said **Vice President Al Gore**.

Vermont Attorney General William Sorrell said, "We are happy to have worked closely with New York to organize this meeting. As we all know, global warming, if not reversed, will be catastrophic for our planet. We, the states, have a role to play in this endeavor and intend to do our part."

"The states represented here today have long been working 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," said **Massachusetts Attorney General Maura Healey**. "In Massachusetts, we're a leader in clean energy and together we're taking a thoughtful, aggressive approach to ensuring our planet's health for generations to come."

Connecticut Attorney General George Jepsen, said "I am delighted to meet with so many thoughtful

leaders to strategize on ways we can protect our citizens from the greatest threat we collectively face, climate change. I am proud to have worked with them and others in defending the Obama Administration's action to combat global warming, and look forward to discussing how we can best further that important work. I also appreciate the opportunity to discuss potential future efforts, including the merits of possible joint investigations in this important area."

U.S. Virgin Islands Attorney General Claude Earl Walker said, "The Virgin Islands, which is especially vulnerable to environmental threats, has a particular interest in making sure that companies are honest about what they know about climate change. We are committed to ensuring a fair and transparent market where consumers can make informed choices about what they buy and from whom. If ExxonMobil has tried to cloud their judgment, we are determined to hold the company accountable."

Maryland Attorney General Brian E. Frosh said, "Climate changes poses an existential threat to Maryland and to the nation. I am proud to join with my colleagues across the country in this important collaboration, and am willing to use every tool at our collective disposal to protect our air, our water and our natural resources. The pledge we are making today can help insure a cleaner and safer future."

Virginia Attorney General Mark Herring said, "As a Commonwealth and as a nation, we can't just put our heads in the sand because we are already confronting the realities of climate change. Hampton Roads is our Commonwealth's second most populated region, it's our second biggest economy, and it is the second most vulnerable area in the entire country as climate change drives continued sea-level rise. State government, local governments, and the military are spending millions to prepare for this challenge, and even more significant investment and resiliency measures will be required. I'm proud to have Virginia included in this first-of-its-kind coalition, which recognizes the reality and the pressing threat of manmade climate change and sea level rise. I'm looking forward to working with my colleagues to explore opportunities to address climate change, encourage the growth of our clean energy sectors, and build a cleaner, more sustainable future."

"Taking additional steps to reduce carbon pollution will keep us moving toward cleaner air, a healthier environment, and more affordable energy," said **Illinois Attorney General Lisa Madigan**. "I look forward to continuing to work with other states to advance the Clean Power Plan, as well as to advocate for a comprehensive portfolio of renewable energy sources and enhancements to energy efficiency programs."

"Climate change has real and lasting impacts on our environment, public health, and the economy," said **California Attorney General Kamala D. Harris**. "California has been a national leader in fighting to reduce greenhouse gas emissions, and I am proud to join this effort to preserve and protect our natural resources for future generations to come."

Maine Attorney General Janet Mills said, "Our natural resources are the lifeblood of our state's economy and our quality of life. Global climate change demands immediate action and I am committed to using the authority of my office to address the problem in a meaningful way by defending important EPA regulations against attacks led by the coal industry and exploring litigation options that will hold the worst polluters accountable for their actions."

"Washington is mired by political gridlock. We cannot sit back and watch the dysfunction while nothing gets done, or worse, Washington rolls back the progress we have made in the recent past to address the issue of climate change. If Washington is not going to step up and recognize the crisis and find meaningful solutions, then it will be up to the states to do so," said **Rhode Island Attorney General Peter F. Kilmartin**. "As a state that will incur significant negative impacts from global climate change, including sea-level rise and increased flooding, Rhode Island is committed to continuing the fight for common-sense regulation of greenhouse gas emissions from power plants and other large emitters."

"Washington State has long made protecting our environment a top priority," **Washington State Attorney General Bob Ferguson** said. "A problem like climate change is bigger than any one state. I look forward to working with the coalition on innovative solutions to combat and reverse the harmful effects of climate change."

"Our office has a mandate to protect the public interest, and this includes ensuring that our community is not negatively affected by preventable climate change. We welcome this crucial state-to-state cooperation to ensure that we do everything we can to fight the causes of climate change regardless of whether the federal government continues to partner with us in these efforts or not," said **District of Columbia Attorney General Karl Racine.**

"We have been impacted by climate change, and we see its drastic effects in New Mexico---extreme drought, increased risk of severe forest fires, and the ruin of our wildlife and natural habitats," Attorney General Balderas said. "Our efforts will ensure that progress is made on climate change and that the public is fully aware of the effects on the health and well-being of New Mexico families," said **New Mexico Attorney General Hector Balderas**.

Español

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A.G. Schneiderman Announces Indictment Of Political Consultant Steven Pigeon And Guilty Plea Of State Supreme Court Justice John A. Michalek

EXHIBIT 39

Congress of the United States
Washington, DC 20515

August 3, 2016

The Honorable Lamar Smith
Chairman
Committee on Science, Space, and Technology
2321 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Smith:

We are writing to express our extreme disappointment in your decision to use the subpoena authority of the Committee on Science, Space, and Technology (the "Science Committee") as a political tool in an ongoing effort to ignore or deny the causes of global climate change.

On July 13, you issued subpoenas to Massachusetts Attorney General Maura Healey, New York Attorney General Eric Schneiderman, and eight environmental organizations, claiming the existence of a coordinated environmentalist plot to deprive companies and organizations of their First Amendment rights. These subpoenas and the accompanying demand letters are an unprecedented, invalid exercise of Congressional authority, they exceed the bounds of the Science Committee's jurisdiction, they materially mischaracterize the actions of the Massachusetts and New York Attorneys General, and the claims they make are patently false.

The subpoenas violate the principle of state sovereignty. The Constitution grants states "substantial sovereign authority" over matters not expressly delegated to the federal government.[1] Moreover, Congress' oversight powers are attached to its power to legislate. It has been well-established by the courts that Congress may not investigate matters over which it has no legislative authority.[2] The official actions of state government law enforcement officials—including state attorneys general—performing state duties, are not within Congressional legislative control, and thus are not within its investigatory scope.

The Massachusetts and New York Attorneys General are investigating whether the Exxon Mobil Corporation violated state fraud laws by intentionally misleading the public—including investors—with respect to the impacts of climate change in order to avoid government intervention. Your intrusion into state attorneys general investigations of potential state law violations plainly infringes upon state law functions and oversteps the jurisdiction granted to Congress in the Constitution.

Furthermore, the decision to send these subpoenas is unprecedented. Our research and the research of the Congressional Research Service has identified no other example– in

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[1] *Gregory v. Ashcroft*, 501 U.S. 452, 457 (1991).
[2] *Barenblatt v. U.S.*, 360 U.S. 109, 111(1959).

over 240 years of United States history – of a Congressional committee subpoenaing a state attorney general working in their official capacity to investigate potential state law violations. Even in those circumstances where Congress appropriately could exercise subpoena power, past Committee Chairs have used subpoenas only as a last resort – avoiding invoking them in the middle of ongoing cases and rulemakings, and working to compromise to address legal concerns raised by the targets of subpoenas. By contrast, you appear to have acted with haste and with little effort to address legitimate concerns.

Aside from the matter of state sovereignty, this investigation is outside of the Science Committee's purview. The Science Committee lacks jurisdiction over any of the relevant issues raised in this case, including state securities laws and your purported concerns about the "First Amendment rights of companies."[3] The dispute in question is not a scientific one; it is a legal question about whether Exxon misled its investors and consumers. This dispute has no relevance to the Science Committee or its legislative or oversight jurisdiction.

Finally, your letters inaccurately represent the attorneys' general investigations. It has long been settled by the courts that fraudulent speech is not protected by the First Amendment.[4] Companies may not deceive the public into believing that something dangerous is safe, and then hide behind the Constitution when the deception becomes apparent. That behavior should offend anyone concerned with public health and safety, regardless of political affiliation.

The Science Committee should function as a forum for crafting policies that will make the United States healthier and safer, and ensure that we remain the world leader in scientific research and innovation. State and federal courts – not the Science Committee – are the proper arbiters of legal disputes between state attorneys general and private corporations. Congressional subpoenas should not be used as a vehicle for misguided and unconstitutional political tactics that could permanently harm the reputation of this body and undermine states' abilities to carry out necessary functions.

We urge you to drop this damaging and pointless exercise in Congressional overreach.

Sincerely,

Katherine Clark
Member of Congress

Elizabeth Warren
United States Senator

[3] Press Release, Committee on Science, Space & Technology, *Smith Subpoenas MA, NY Attorneys General, Environmental Groups* (Jul 13, 2016), available at: https://science.house.gov/news/press-releases/smith-subpoenas-ma-ny-attorneys-general-environmental-groups.

[4] *Illinois v. Telemarketing Associates, Inc.*, 538 U.S. 600, 612 (2003).

Edward Markey
United States Senator

Richard E. Neal
Member of Congress

Jim P. McGovern
Member of Congress

Michael E. Capuano
Member of Congress

Stephen F. Lynch
Member of Congress

Niki Tsongas
Member of Congress

William Keating
Member of Congress

Joseph Kennedy III
Member of Congress

Seth Moulton
Member of Congress

EXHIBIT 40

19 senate Democrats call out Exxon, fossil fuel industry on climate change denial

Posted by James Osborne Date: July 11, 2016

Senator Elizabeth Warren, a Democrat from Massachusetts, in 2015. (Photographer: Andrew Harrer/Bloomberg)

A coalition of 19 top Democrats took the senate floor Monday afternoon to call for an end to what they referred to as the fossil fuel industry's "web of denial" on climate change, calling out companies including Irving-based Exxon Mobil.

Among those speaking were Virginia Senator Tim Kaine and Massachusetts Senator Elizabeth Warren, both reported to be on the short list as Hillary Clinton's vice presidential running mate.

"We have to be open to different points of view, but when the science is settled and people who know better are fighting against it we should know better," Kaine said.

For years a handful of Senate Democrats like Rhode Island Senator Sheldon Whitehouse have called on companies including Exxon and Koch Industries to cease funding to think tanks and trade groups that question research showing temperatures on earth are rising.

But a resolution introduced Monday by Whitehouse and Rep. Ted Lieu, D-California, claimed fossil fuel companies had used a "misinformation campaign to mislead the public and cast doubt in order to protect their financial interest." The measure drew support from a wide cast of senators that also included Senate Minority Leader Harry Reid and veteran New York Senator Chuck Schumer.

Kent Lassman, president of the Competitive Enterprise Institute, a libertarian think tank, sharply criticized the resolution and Whitehouse's attacks on the fossil fuel industry.

"Apparently, Senator Sheldon Whitehouse is the new Senator Joe McCarthy and green is the new blacklist," Lassman said in a statement. " It is unhealthy for democracy and abusive when members of Congress create an enemies list based on policy positions."

In a statement, an Exxon spokesman said, "To suggest that we had reached definitive conclusions, decades before the world's experts and while climate science was in an early stage of development, is not credible."

These latest attacks on Exxon come as the company seeks to separate itself from past public relations campaigns and statements questioning climate change research. Lately, the company has offered support for a carbon tax to account for the environmental cost of carbon dioxide and other greenhouse gas emissions.

But a coalition of state attorneys general continues to investigate Exxon and other fossil fuel companies as to whether they misled the public and their investors over the threat of climate change.

"It's inspiring to see senators join the movement to hold the likes of Exxon accountable for their decades of deception. Big oil robbed us of a generation's worth of climate action, and to this day are still sowing doubt and misinformation," Jamie Henn, spokesman for the environmental group 350.org, said in a statement.

About The Author

James Osborne

View Comments

EXHIBIT 41

114TH CONGRESS
2D SESSION

S. CON. RES. 45

Expressing the sense of Congress relating to the disapproval of certain activities of certain companies, trade associations, foundations, and organizations.

IN THE SENATE OF THE UNITED STATES

JULY 11, 2016

Mr. WHITEHOUSE (for himself, Mr. MARKEY, Mr. SCHATZ, Mrs. BOXER, Mr. MERKLEY, Ms. WARREN, Mr. SANDERS, and Mr. FRANKEN) submitted the following concurrent resolution; which was referred to the Committee on Commerce, Science, and Transportation

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CONCURRENT RESOLUTION

Expressing the sense of Congress relating to the disapproval of certain activities of certain companies, trade associations, foundations, and organizations.

Whereas in the case of tobacco companies and allied organizations—

(1) according to peer-reviewed scientific research and Federal court findings, tobacco companies knew about the harmful health effects of their products; and

(2) contrary to the scientific findings of the tobacco companies and of others about the danger tobacco poses to human health, tobacco companies, directly and through their trade associations, and foundations—

(A) developed a sophisticated and deceitful campaign that funded think tanks and front groups, and paid public relations firms to deny, counter, and obfuscate peer-reviewed science; and

(B) used that misinformation campaign to mislead the public and cast doubt in order to protect their financial interest;

Whereas in the case of lead-related manufacturers and allied organizations—

(1) according to peer-reviewed scientific research and State court findings, the paint industry, gasoline manufacturers, and lead producers knew about the harmful health effects of lead in paint and other products throughout the 20th century; and

(2) contrary to the scientific findings of the paint industry, gasoline manufacturers, lead producers, and others about the danger lead poses to human health, those companies, directly and through their trade associations, and foundations—

(A) developed a sophisticated and deceitful campaign that funded think tanks and front groups, and paid public relations firms to deny, counter, and obfuscate peer-reviewed research; and

(B) used that misinformation campaign to mislead the public and cast doubt in order to protect their financial interest; and

Whereas in the case of fossil fuel companies and allied organizations—

(1) according to peer-reviewed scientific research and investigative reporting, fossil fuel companies have long known about climate change and the harmful climate effects of their products; and

(2) contrary to the scientific findings of the fossil fuel companies and of others about the danger fossil fuels pose to the climate, fossil fuel companies, directly and through their trade associations, and foundations—

(A) developed a sophisticated and deceitful campaign that funded think tanks and front groups, and paid public relations firms to deny, counter, and obfuscate peer-reviewed research; and

(B) used that misinformation campaign to mislead the public and cast doubt in order to protect their financial interest: Now, therefore, be it

Resolved by the Senate (the House of Representatives concurring), That Congress—

(1) disapproves of activities by certain corporations, trade associations, foundations, and organizations funded by those corporations—

(A) to deliberately mislead the public and undermine peer-reviewed scientific research about the dangers of their products; and

(B) to deliberately cast doubt on science in order to protect their financial interests; and

(2) urges fossil fuel companies and allied organizations to cooperate with active or future investigations into—

(A) their climate-change related activities;

(B) what they knew about climate change and when they knew that information;

(C) what they knew about the harmful effects of fossil fuels on the climate; and

(D) any activities to mislead the public about climate change.

○

EXHIBIT 42

Mobil

Where to buy Mobil™ motor oil

Enter your address or ZIP code to search for retailers, service centers or Mobil 1 Lube Express™ locations near you.

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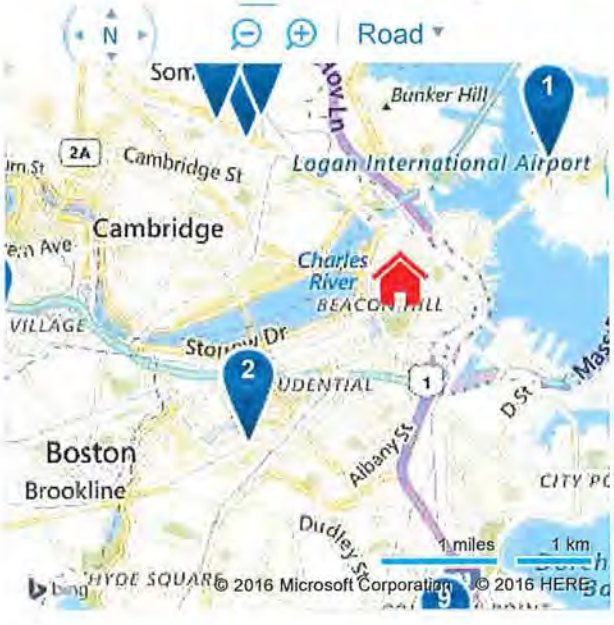

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☐ Motor oil Get specific

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Sort by Distance

AutoZone

1 - AutoZone (1.8 mi)

- 184 BORDER ST
- EAST BOSTON, MA 21281

Save on Mobil 1™ synthetic motor oil
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Advance Auto Parts

2 - Advance Auto Parts (1.8 mi)

- 393 Cambridge St
- Allston, MA 2134

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Advance Auto Parts

3 - Advance Auto Parts (1.95 mi)

- 196 Somerville Ave
- Somerville, MA 21433405

Get store directions See all products available Check in-store availability

AutoZone

4 - AutoZone (2.01 mi)

- 160 WASHINGTON ST
- SOMERVILLE, MA 21430

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5 - Target (2.24 mi)

- WASHINGTON STREET & SOMERVILLE AVE
- SOMERVILLE, MA 02143

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6 - Napa (2.5 mi)

- 625 McGrath Highway
- Sommerville, MA 02145
- 617-666-1733

Save up to $60 on Mobil Delvac™ engine oils Get up to $15 off Mobil™ motor oils
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7 - Costco (2.79 mi)

- #2 MYSTIC VIEW ROAD
- EVERETT, MA 02149
- 617-544-4806

Get store directions See all products available Check in-store availability

8 - Target (2.93 mi)

- 1 MYSTIC VIEW ROAD
- EVERETT, MA 02149
- 617-420-0000

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9 - Advance Auto Parts (3.24 mi)

- 1190 Massachusetts Ave
- Dorchester, MA 2125

Get store directions See all products available Check in-store availability

10 - Pep Boys (3.25 mi)

- 1848-1850 REVERE BCH PKY
- EVERETT, MA 02149

Get store directions See all products available Check in-store availability

11 - AutoZone (3.36 mi)

- 1691 REVERE BEACH
- EVERETT, MA 21490

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12 - AutoZone (3.61 mi)

- 55 BRIGHTON AVE
- ALLSTON, MA 21340

Save on Mobil 1™ synthetic motor oil
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AutoZone

13 - AutoZone (3.66 mi)

- 337 MYSTIC AVE
- MEDFORD, MA 21550

Save on Mobil 1™ synthetic motor oil
Get store directions See all products available Check in-store availability

AutoZone

14 - AutoZone (3.72 mi)

- 1404 DORCHESTER AV
- DORCHESTER, MA 21222

Save on Mobil 1™ synthetic motor oil
Get store directions See all products available Check in-store availability

Advance Auto Parts

15 - Advance Auto Parts (3.79 mi)

- 1432 Dorchester Ave
- Dorchester, MA 2122

Get store directions See all products available Check in-store availability

Advance Auto Parts

16 - Advance Auto Parts (3.87 mi)

- 1052 Revere Beach Pkwy
- Chelsea, MA 21501454

Get store directions See all products available Check in-store availability

17 - Advance Auto Parts (4.01 mi)

- 291 Middlesex Ave
- Medford, MA 21555056

Get store directions See all products available Check in-store availability

18 - BJ's Wholesale Club (4.02 mi)

- 278 Middlesex Avenue
- Medford, MA 02155
- 781-396-0235

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19 - Advance Auto Parts (4.16 mi)

- 321 Ferry St
- Everett, MA 2149

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20 - Napa (4.28 mi)

- 175 Broadway
- Revere, MA 02151
- 781-286-4311

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21 - Napa (4.52 mi)

- 20 Goodenough Street
- Brighton, MA 02135
- 617-787-1257

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AutoZone

22 - AutoZone (4.93 mi)

- 366 EASTERN AVE
- MALDEN, MA 21480

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Get store directions See all products available Check in-store availability

AutoZone

23 - AutoZone (4.96 mi)

- 450 ARSENAL ST
- WATERTOWN, MA 24722

Save on Mobil 1™ synthetic motor oil
Get store directions See all products available Check in-store availability

Advance Auto Parts

24 - Advance Auto Parts (5 mi)

- 9A Everett St
- Revere, MA 2151

Get store directions See all products available Check in-store availability

AutoZone

25 - AutoZone (5.06 mi)

- 756 GALLIVAN BLVD
- DORCHESTER, MA 21223

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☐ Show only Mobil 1 Lube Express™ locations

Found 25 locations

Sort by Distance

1 - US AUTO CARE (3.33 mi)

- 1245 DORCHESTER AVE
- DORCHESTER, MA 02125
- 617-282-1800

Get store directions

2 - AAA AUTO TECH (3.42 mi)

- 1271 DORCHESTER AVE
- DORCHESTER, MA 02122
- 617-514-3531

Get store directions

3 - TECH AUTO REPAIR (3.46 mi)

- 1287 DORCHESTER AVENUE
- BOSTON, MA 02122
- 617-750-7947

Get store directions

4 - BOSTON AUTO TECH (3.68 mi)

- 1388-1390 DORCHESTER AVE
- DORCHESTER, MA 02122
- 617-436-6400

Get store directions

5 - TECH LUBE - DORCHESTER (4.03 mi)

- 316 ADAMS STREET
- DORCHESTER, MA 02122
- 617-290-4300

Get store directions

6 - HONDA VILLAGE (6.3 mi)

- 371 WASHINGTON STREET
- NEWTON, MA 02458
- 888-946-4607

Get store directions

7 - PLEASANT CAR CARE WATERTOWN (6.43 mi)

- 106 PLEASANT ST
- WATERTOWN, MA 02472
- 617-393-3439

Get store directions

8 - PLEASANT CAR CARE (7.06 mi)

- 441 WATERTOWN ST
- NEWTON, MA 02458
- 508-630-4254

Get store directions

9 - MIRAK CHEV INC (7.13 mi)

- 1125 MASSACHUSETTS AVE
- ARLINGTON, MA 02476
- 781-643-8000

GM Mobil 1™ promotion
Get store directions

10 - MCCRACKEN AUTOMOTIVE (7.49 mi)

- 107 SPRING ST
- WEST ROXBURY, MA 02132
- 617-325-2200

Get store directions

11 - MCCRACKEN EXPRESS (8.1 mi)

- 145 SPRING ST
- WEST ROXBURY, MA 02312
- 617-325-1646

Get store directions

12 - PRIDE CHEV-PONTIAC INC. (8.31 mi)

- 715 LYNNWAY
- LYNN, MA 01905
- 781-599-1200

GM Mobil 1™ promotion
Get store directions

13 - PRIME HYUNDAI SOUTH (8.66 mi)

- 479 WASHINGTON
- ST. QUINCY, MA 02169
- 617-774-1300

Get store directions

Mobil 1
Lube
Express

14 - BURKES AUTOMOTIVE SERVICE (8.77 mi)

- 71 MAIN ST
- WOBURN, MA 01801
- 781-933-9866

Get store directions

15 - MUZI CHEV-GEO (9.11 mi)

- 56 TV PL
- NEEDHAM HEIGHTS, MA 02494
- 781-449-4360

GM Mobil 1™ promotion
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16 - R C OLSEN CAD INC (9.46 mi)

- 201 CAMBRIDGE RD
- WOBURN, MA 01801
- 781-935-7000

GM Mobil 1™ promotion
Get store directions

17 - QUIRK CHEVROLET INC (9.64 mi)

- 444 QUINCY AVE
- BRAINTREE, MA 02184
- 781-843-4800

GM Mobil 1™ promotion
Get store directions

18 - LANNAN CHEV OLDS INC (9.72 mi)

- 40 WINN ST
- WOBURN, MA 01801
- 781-935-2000

GM Mobil 1™ promotion
Get store directions

19 - FAHEY TIRE (10.34 mi)

- 28 NEW SALEM ST
- WAKEFIELD, MA 01880
- 781-245-2020

Get store directions

20 - TOYOTA #20087 (10.53 mi)

- 394 WASHINGTON STREET
- WOBURN, MA 01801
- 339-645-2270

Get store directions

21 - MCCRACKEN AUTOMOTIVE (10.59 mi)

- WESTWOOD
- WESTWOOD, MA 02090
- 781-769-0600

Get store directions

22 - RANDOLPH AUTO SERVICE (10.99 mi)

- 1245 NORTH MAIN STREET
- RANDOLPH, MA 02368
- 781-961-3627

Get store directions

23 - LARSONS SERVICE INC. (11.19 mi)

- 289 LYNN ST.
- PEABODY, MA 01960
- 978-530-1111

Get store directions

24 - LIBERTY CHEVROLET (11.84 mi)

- 90 BAY STATE RD
- WAKEFIELD, MA 01880
- 781-246-1919

GM Mobil 1™ promotion
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25 - CLAY CHEVROLET-HYUNDAI (12.6 mi)

- 391 BOSTON PROVIDENCE TPKE STE 1
- NORWOOD, MA 02062
- 781-762-8300

GM Mobil 1™ promotion
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.COM

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O'Reilly AUTO PARTS®

Pep Boys

Mobil 1™ Racing oil distributors and dealers

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Please check in-store availability, as products may not be in stock. Do you see incorrect product or location information? Let us know.

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EXHIBIT 43

(http://corporate.exxonmobil.com/?query=http%3a%2f%2fwww.exxon.com%2fen%2fgas-stations#global-websites)

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Stations List

This is a list of all Esso, Exxon, and/or Mobil stations throughout Massachusetts, United States. Click on a station name to view details for each station, including the station's address, telephone number, opening hours, and amenities. You can also find driving directions and a regional map.

United States (http://www.exxonmobilstations.com/station-locations/united-states) -> Massachusetts

- Abington (1) (Http://Www.exxonmobilstations.com/23489-Abington-Mobil-Abington)
- Acton (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Acton)
- Amesbury (1) (Http://Www.exxonmobilstations.com/18118-Amesbury-Mobil-Amesbury)
- Amherst (1) (Http://Www.exxonmobilstations.com/263-Rens-Mobil-Service-Amherst)
- Andover (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Andover)
- Arlington (1) (Http://Www.exxonmobilstations.com/28057-Brown-Automotive-Arlington)
- Ashburnham (1) (Http://Www.exxonmobilstations.com/24184-Mr-Mikes-23-Ashburnham)
- Ashby (1) (Http://Www.exxonmobilstations.com/24189-Mr-Mikes-7-Ashby)
- Ashfield (1) (Http://Www.exxonmobilstations.com/1884416-Ashfield-Neighbors-Ashfield)
- Ashland (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Ashland)
- East Boston (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/East-Boston)
- East Bridgewater (1) (Http://Www.exxonmobilstations.com/2238611-Hilo-Gas-Rte18-East-Bridgewater)
- East Brookfield (1) (Http://Www.exxonmobilstations.com/364-East-Brookfield-Mobil-East-Brookfield)
- East Longmeadow (1) (Http://Www.exxonmobilstations.com/28071-Pride-E-Longmeadow-East-Longmeadow)
- Easton (1) (Http://Www.exxonmobilstations.com/23471-Easton-Mobil-Easton)
- East Wareham (1) (Http://Www.exxonmobilstations.com/23356-Cranberry-Plaza-Mobil-East-Wareham)
- Edgartown (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Edgartown)
- Essex (1) (Http://Www.exxonmobilstations.com/18467-Essex-2120-Essex)
- Everett (1) (Http://Www.exxonmobilstations.com/18431-Everett-Quick-To-Go-Everett)
- Fall River (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Fall-River)
- Littleton (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Littleton)
- Longmeadow (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Longmeadow)
- Lowell (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Lowell)
- Ludlow (1) (Http://Www.exxonmobilstations.com/93-Convenience-Plus-11-Ludlow)
- Lunenburg (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Lunenburg)
- Lynn (1) (Http://Www.exxonmobilstations.com/23378-Lynn-Fuel-Inc-Lynn)
- Lynnfield (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Lynnfield)
- Malden (1) (Http://Www.exxonmobilstations.com/28066-Wash-Depot-Malden)
- Mansfield (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Mansfield)
- Marlborough (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Marlborough)
- Orleans (1) (Http://Www.exxonmobilstations.com/23478-Orleans-Mobil-Orleans)
- Osterville (1) (Http://Www.exxonmobilstations.com/28060-Midway-Garage-Osterville)
- Oxford (1) (Http://Www.exxonmobilstations.com/23382-Honey-Farms-83-Oxford)
- Peabody (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Peabody)
- Pembroke (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Pembroke)
- Pittsfield (5) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Pittsfield)
- Plainville (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Plainville)
- Plymouth (4) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Plymouth)
- Quincy (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Quincy)
- Randolph (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Randolph)
- Sudbury (1) (Http://Www.exxonmobilstations.com/23288-Sudbury-Mobil-Sudbury)
- Swampscott (1) (Http://Www.exxonmobilstations.com/23502-Swampscott-Mobil-Swampscott)
- Swansea (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Swansea)
- Taunton (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Taunton)
- Tewksbury (4) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Tewksbury)
- Townsend (1) (Http://Www.exxonmobilstations.com/168-Mr-Mikes-Mobil-Townsend)
- Tyngsboro (1) (Http://Www.exxonmobilstations.com/23488-Tyngsboro-Mobil-Tyngsboro)
- Uxbridge (1) (Http://Www.exxonmobilstations.com/23367-Honey-Farms-82-Uxbridge)
- Wakefield (1) (Http://Www.exxonmobilstations.com/24199-Pump-N-Pantry-48-Wakefield)
- Walpole (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Walpole)

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- Athol (1) (Http://Www.exxonmobilstations.com/24185-Mr-Mikes-Mobil-10-Athol)
- Attleboro (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Attleboro)
- Ayer (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Ayer)
- Bellingham (1) (Http://Www.exxonmobilstations.com/23293-Bellingham-Mobil-Bellingham)
- Belmont (1) (Http://Www.exxonmobilstations.com/1396-Concord-Avenue-Service-Belmont)
- Berlin (1) (Http://Www.exxonmobilstations.com/2121221-Berlin-Energy-North-2121-Berlin)
- Beverly (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Beverly)
- Billerica (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Billerica)
- Bolton (1) (Http://Www.exxonmobilstations.com/349-Main-Street-Mobil-Bolton)
- Boston (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Boston)
- Bourne (1) (Http://Www.exxonmobilstations.com/28076-Bourne-Bridge-Mobil-Bourne)
- Braintree (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Braintree)
- Brewster (1) (Http://Www.exxonmobilstations.com/23291-Brewster-Mobil-Brewster)
- Falmouth (1) (Http://Www.exxonmobilstations.com/3528-Falmouth-Mobil-Mart-Falmouth)
- Fitchburg (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Fitchburg)
- Foxboro (1) (Http://Www.exxonmobilstations.com/23435-Foxboro-Mobil-Foxboro)
- Framingham (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Framingham)
- Franklin (1) (Http://Www.exxonmobilstations.com/23452-Franklin-Mobil-Franklin)
- Georgetown (1) (Http://Www.exxonmobilstations.com/23436-Jef-Auto-Repair-Inc-Georgetown)
- Gill (1) (Http://Www.exxonmobilstations.com/24157-Gill-Mobil-Gill)
- Gloucester (1) (Http://Www.exxonmobilstations.com/1878965-Gloucester-2114-Gloucester)
- Great Barrington (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Great-Barrington)
- Greenfield (1) (Http://Www.exxonmobilstations.com/131-Mobil-Food-Tobacco-Greenfield)
- Groton (1) (Http://Www.exxonmobilstations.com/1580-Mr-Mikess-14-Groton)
- Halifax (1) (Http://Www.exxonmobilstations.com/557-Halifax-Mobil-Halifax)
- Hanover (1) (Http://Www.exxonmobilstations.com/23404-Hanover-Mobil-Hanover)
- Mashpee (1) (Http://Www.exxonmobilstations.com/23493-Mashpee-Mobil-Mashpee)
- Mattapan (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Mattapan)
- Mattapoisett (1) (Http://Www.exxonmobilstations.com/23372-Mattapoisett-Service-Center-Mattapoisett)
- Maynard (1) (Http://Www.exxonmobilstations.com/23304-Maynard-Mobil-Maynard)
- Medford (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Medford)
- Medway (1) (Http://Www.exxonmobilstations.com/23310-Medway-Mobil-Medway)
- Melrose (1) (Http://Www.exxonmobilstations.com/23448-Melrose-Mobil-Melrose)
- Methuen (4) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Methuen)
- Middleboro (1) (Http://Www.exxonmobilstations.com/2556845-New-England-Farms-S-Midd-Middleboro)
- Middleton (1) (Http://Www.exxonmobilstations.com/24195-Pump-N-Pantry-Middleton)
- Milford (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Milford)
- Millis (1) (Http://Www.exxonmobilstations.com/23455-Main-Street-Center-Millis)
- Nantucket (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Nantucket)
- Raynham (1) (Http://Www.exxonmobilstations.com/23475-Raynham-Mobil-Raynham)
- Reading (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Reading)
- Rehoboth (1) (Http://Www.exxonmobilstations.com/1666158-Gabriels-Auto-Repair-Rehoboth)
- Revere (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Revere)
- Rockland (1) (Http://Www.exxonmobilstations.com/23319-Stm-Associates-Inc-Rockland)
- Rockport (1) (Http://Www.exxonmobilstations.com/584-Sandy-Bay-Services-Rockport)
- Roxbury (1) (Http://Www.exxonmobilstations.com/23490-Roxbury-Mobil-Roxbury)
- Rutland (1) (Http://Www.exxonmobilstations.com/28075-Colonial-Convenience-Rutland)
- Salem (1) (Http://Www.exxonmobilstations.com/1586-Sams-Market-Salem)
- Salisbury (1) (Http://Www.exxonmobilstations.com/24200-Fast-Freddies-Salisbury)
- Saugus (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Saugus)
- Seekonk (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Seekonk)
- Sheffield (1) (Http://Www.exxonmobilstations.com/28070-Guiotta-Brothers-Inc-Sheffield)
- Waltham (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Waltham)
- Wareham (1) (Http://Www.exxonmobilstations.com/585-New-England-Farms-Wareham-Wareham)
- Warren (1) (Http://Www.exxonmobilstations.com/2877398-West-Warren-Warren)
- Watertown (1) (Http://Www.exxonmobilstations.com/23444-Mt-Auburn-Mobil-Watertown)
- Wayland (1) (Http://Www.exxonmobilstations.com/23292-Wayland-Mobil-Wayland)
- Webster (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Webster)
- Wellesley (1) (Http://Www.exxonmobilstations.com/23499-Wellesley-Mobil-Wellesley)
- Wellfleet (1) (Http://Www.exxonmobilstations.com/23395-Wellfleet-Village-Center-Wellfleet)
- West Barnstable (1) (Http://Www.exxonmobilstations.com/610-Midcape-Mobil-West-Barnstable)
- Westborough (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Westborough)
- West Bridgewater (1) (Http://Www.exxonmobilstations.com/23433-Mason-Road-Food-Mart-Inc-West-Bridgewater)
- Westfield (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Westfield)
- Westford (1) (Http://Www.exxonmobilstations.com/23498-Westford-Mobil-Westford)

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- Bridgewater (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Bridgewater)
- Brockton (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Brockton)
- Brookline (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Brookline)
- Burlington (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Burlington)
- Buzzards Bay (1) (Http://Www.exxonmobilstations.com/600-N-E-Farms-Buzzards-Bay-Buzzards-Bay)
- Cambridge (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Cambridge)
- Canton (1) (Http://Www.exxonmobilstations.com/23432-Franks-Petroleum-Canton)
- Carver (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Carver)
- Centerville (1) (Http://Www.exxonmobilstations.com/23470-Centerville-Mobil-Centerville)
- Charlton (1) (Http://Www.exxonmobilstations.com/23425-Honey-Farms-88-Charlton)
- Chelmsford (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Chelmsford)
- Cohasset (1) (Http://Www.exxonmobilstations.com/23300-Global-Montello-Group-Corp-Cohasset-Cohasset)
- Concord (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Concord)
- Harwich (1) (Http://Www.exxonmobilstations.com/28077-Harwich-Public-Market-Harwich)
- Haverhill (5) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Haverhill)
- Hingham (1) (Http://Www.exxonmobilstations.com/421236-Apache-Hingham-Hingham)
- Holden (1) (Http://Www.exxonmobilstations.com/23325-Holden-Mobil-Holden)
- Holliston (1) (Http://Www.exxonmobilstations.com/23286-Holliston-Mobil-Holliston)
- Holyoke (1) (Http://Www.exxonmobilstations.com/503-Jims-Auto-Center-Holyoke)
- Hopkinton (1) (Http://Www.exxonmobilstations.com/23344-Hopkinton-Mobil-Hopkinton)
- Hudson (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Hudson)
- Hyannis (1) (Http://Www.exxonmobilstations.com/23418-Hyannis-Mobil-Hyannis)
- Hyde Park (1) (Http://Www.exxonmobilstations.com/23352-Readville-Petromart-Inc-Hyde-Park)
- Kingston (1) (Http://Www.exxonmobilstations.com/23339-Kanchi-Gas-Inc-Kingston)
- Lanesboro (1) (Http://Www.exxonmobilstations.com/83-Lanesboro-Mobil-Lanesboro)
- Lee (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Lee)
- Natick (1) (Http://Www.exxonmobilstations.com/28054-Boydnatick-Auto-Natick)
- Needham (1) (Http://Www.exxonmobilstations.com/23389-Great-Plain-Ave-Gas-Inc-Needham)
- New Bedford (1) (Http://Www.exxonmobilstations.com/407-Ashley-Blvd-Mobil-New-Bedford)
- Newburyport (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Newburyport)
- Newton (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Newton)
- Newton Highlands (1) (Http://Www.exxonmobilstations.com/28065-Newton-Tire-Auto-Newton-Highlands)
- Norfolk (1) (Http://Www.exxonmobilstations.com/643-Daleys-Service-Center-Norfolk)
- North Andover (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/North-Andover)
- North Attleboro (1) (Http://Www.exxonmobilstations.com/23386-Economy-Car-Wash-North-Attleboro)
- Northborough (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Northborough)
- North Dartmouth (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/North-Dartmouth)
- North Dighton (1) (Http://Www.exxonmobilstations.com/211-Dighton-Mobil-North-Dighton)
- North Grafton (1) (Http://Www.exxonmobilstations.com/826207-Mikes-Auto-Service-North-Grafton)
- Shelburne (1) (Http://Www.exxonmobilstations.com/24155-Davenports-Shelburne)
- Shrewsbury (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Shrewsbury)
- Somerset (1) (Http://Www.exxonmobilstations.com/421231-Reds-Somerset)
- Somerville (1) (Http://Www.exxonmobilstations.com/2859055-Somerville-Somerville)
- Southborough (1) (Http://Www.exxonmobilstations.com/23375-Southborough-Mobil-Southborough)
- Southbridge (1) (Http://Www.exxonmobilstations.com/2874227-Southbridge-Main-Street-Southbridge)
- South Dartmouth (1) (Http://Www.exxonmobilstations.com/921424-Prestige-Car-Wash-Dartmouth-South-Dartmouth)
- South Deerfield (1) (Http://Www.exxonmobilstations.com/24172-Conway-Road-Store-South-Deerfield)
- South Dennis (1) (Http://Www.exxonmobilstations.com/23398-South-Dennis-Mobil-South-Dennis)
- South Hadley (1) (Http://Www.exxonmobilstations.com/90-Convenience-Plus-12-South-Hadley)
- Southwick (1) (Http://Www.exxonmobilstations.com/28073-Scibellis-Mobil-Southwick)
- South Yarmouth (1) (Http://Www.exxonmobilstations.com/23479-South-Yarmouth-Mobil-South-Yarmouth)
- Springfield (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Springfield)
- Weston (1) (Http://Www.exxonmobilstations.com/23459-Weston-Mobil-Weston)
- Westport (1) (Http://Www.exxonmobilstations.com/2954829-Gri-Westport-Westport)
- West Roxbury (1) (Http://Www.exxonmobilstations.com/1884413-One-Energy-West-Roxbury)
- West Springfield (1) (Http://Www.exxonmobilstations.com/519-Westside-Mobil-West-Springfield)
- West Tisbury (1) (Http://Www.exxonmobilstations.com/568-Up-Island-Automotive-West-Tisbury)
- Westwood (1) (Http://Www.exxonmobilstations.com/23492-Westwood-Westwood)
- West Yarmouth (1) (Http://Www.exxonmobilstations.com/23283-Route-28-Auto-Service-West-Yarmouth)
- Weymouth (1) (Http://Www.exxonmobilstations.com/23316-Main-Street-Mobil-Weymouth)
- Wilmington (1) (Http://Www.exxonmobilstations.com/23326-Sonnys-Mobil-Wilmington)
- Winchendon (1) (Http://Www.exxonmobilstations.com/24186-Mr-Mikes-20-Winchendon)
- Winchester (1) (Http://Www.exxonmobilstations.com/247-Theater-Service-Station-Winchester)
- Winthrop (1) (Http://Www.exxonmobilstations.com/28059-Fazio-Mobil-Winthrop)
- Woburn (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Woburn)

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- Danvers (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Danvers)
- Dorchester (1) (Http://Www.exxonmobilstations.com/23296-Gb-Mobil-Dorchester)
- Dover (1) (Http://Www.exxonmobilstations.com/23392-Dover-Mobil-Dover)
- Dracut (1) (Http://Www.exxonmobilstations.com/215-Dracut-Mobil-Dracut)
- Lenox (1) (Http://Www.exxonmobilstations.com/28047-Lipton-Mart-Lennox-Lenox)
- Leominster (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Leominster)
- Lexington (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Lexington)
- Lincoln (1) (Http://Www.exxonmobilstations.com/28063-Dohertys-Garage-Lincoln)
- North Oxford (1) (Http://Www.exxonmobilstations.com/371-North-Oxford-Xtra-Mart-North-Oxford)
- Norwell (1) (Http://Www.exxonmobilstations.com/23297-Norwell-Mart-Norwell)
- Norwood (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Norwood)
- Oak Bluffs (1) (Http://Www.exxonmobilstations.com/438-Nj-Debettencourt-Sons-Oak-Bluffs)
- Stockbridge (1) (Http://Www.exxonmobilstations.com/106-Convenience-Plus-3-Stockbridge)
- Stoneham (3) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Stoneham)
- Stoughton (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Stoughton)
- Sturbridge (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Sturbridge)
- Worcester (6) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Worcester)
- Wrentham (2) (Http://Www.exxonmobilstations.com/Station-Locations/United-States/Massachusetts/Wrentham)

EXHIBIT 44

Mobil Gas Station in Boston, Massachusetts

Feedback (/feedback?stationId=2567875)
Find Another Station (/)

Mobil

COMM AVE GAS AND SERVICE, INC

850 COMMONWEALTH AVE
BOSTON, MASSACHUSETTS 02215
UNITED STATES
(617) 232-1188 (tel:(617) 232-1188)

Feedback (/feedback?stationId=2567875) Find Another Station (/)

Features

- Convenience Store
- Cappuccino
- Coffee
- Cold Beverages
- Milk
- Fountain Drinks
- 24 Hour Pay at the Pump
- Major Credit Cards
- Exxon and Mobil Fleet Cards Accepted
- Speedpass at Pump
- Speedpass at Register
- UBER MasterCard
- Air Tower
- ATM
- Restroom
- Full Service
- Motor Oil
- Plenti Participating

Hours of Operation

Gas

Mon - Sat 7:00 AM - Midnight

Sun 8:00 AM - 10:00 PM

Convenience Store

Mon - Sat 7:00 AM - Midnight

Sun 8:00 AM - 10:00 PM

Rewards

Plenti

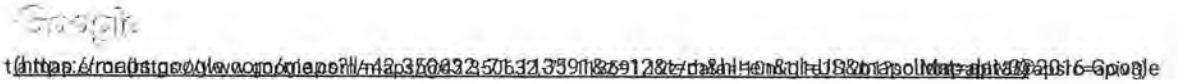


EXHIBIT 45

ExxonMobil Pipeline

Northeast and Midwest assets

Northeast products maps

Midwest products maps

Northeast products

The East Providence to Springfield system is an 84 mile refined products system originating in East Providence, Rhode Island, and terminating in ExxonMobil's Springfield, Massachusetts, terminal.

ExxonMobil Pipeline Company also operates a distribution terminal in Everett, Massachusetts. This terminal receives barge deliveries across its proprietary docks.

Midwest products

ExxonMobil Pipeline Company operates distribution terminals at Lockport, Illinois, Des Plaines, Illinois, and Hammond, Indiana. These facilities are supplied by either West Shore Pipeline or Wolverine Pipeline.

ExxonMobil Pipeline Company operates distribution terminals in Memphis and Nashville, Tennessee. The Nashville terminal is supplied by Explorer pipeline and Memphis is supplied by Valero.

EXHIBIT 46

Branded Wholesaler

Partnering for success.

Energize your business with ExxonMobil

We have been exploring and innovating to provide energy across North America for 135 years. Today, ExxonMobil is one of the world's largest integrated refiners of petroleum products and the largest publicly traded international oil and gas company.

Our success comes from our ability to develop and deliver differentiated products and to partner with enterprising business people who share our commitment to provide consumers with a flawless experience.

Team up with a proven leader

ExxonMobil is an established global brand with a proven business model built for your success. We bring together best-in-the-business consumer research, exceptional products, and innovative offers and programs to attract consumers to your stations and

add value to your bottom line.

Partner with us and take advantage of:

- Your choice of two of the most nationally recognized brands with approximately 10,000 gas stations in the U.S. and growing
- Access to competitively priced, world-class products including TOP TIER® Exxon- and Mobil-branded gasoline and Mobil 1™ – the world's leading synthetic motor oil brand
- Our dependable and extensive network of terminals and pipelines across the country, delivering more than 10 billion gallons of branded fuel every year
- Advanced payment and card options like Speedpass, the Speedpass+ app, the ExxonMobil Smart Card and an array of gift cards and commercial credit cards
- Revolutionary consumer pull programs such as the Plenti rewards program

Committed to your success

When you become an ExxonMobil Branded Wholesaler, you not only have access to premier fuel products and innovative consumer pull programs, you will have best-in-class marketing and advertising support and dedicated sales expertise at your fingertips.

We're here for you with:

- Consumer-tested and proven effective promotions and incentives that increase traffic to your stations
- Local and national advertising support – investing in the Exxon and Mobil brands builds our business, and yours
- Easy access to advertising materials, signage, training information and other helpful tools through our proprietary online resource center
- A dedicated team of sales professionals ready to help you with everything from site selection to growth opportunities

Contact

If you're interested in becoming a Branded Wholesaler and distributing Exxon- and Mobil-branded fuel, please contact us at 1-800-243-9966 or email us at Customer.Relations.e-mail@exxonmobil.com (mailto:Customer.Relations.e-mail@exxonmobil.com) to get started.

EXHIBIT 47

Fuels News, Prices & Analysis > Fuels Technology & Equipment

ExxonMobil Launches New U.S. Retail Fuels Platform

New technology platform EM1 enables loyalty programs, mobile payments

January 24, 2014

FAIRFAX, Va. --ExxonMobil is launching a new retail fuels technology platform in the United States as an upgrade to current retail sites technology and as a way to provide motorists with discounts and offers to reward their loyal customers.

Called "EM1," the platform will also enable Exxon- and Mobil-branded stations to introduce new payment options, including mobile.

"The new EM1 technology platform is a significant upgrade that is designed to enable Exxon- and Mobil-branded stations to attract more customers by offering a wider variety of payment options and the ability to implement innovative offers and loyalty programs," said Grant Doescher, U.S. branded wholesale manager at ExxonMobil, Fairfax, Va. "This upgrade will provide branded wholesalers the technology and infrastructure they will need to help take a leadership position in each of their markets.

The EM1 platform consists of three elements including a "Card Site Device-enabled" point-of-sale (POS) that will connect each site to ExxonMobil's new card processing network. The installation of firmware will also be required to be able to offer instant consumer discounts at the pump. Lastly, a broadband connection will position each site to maximize ExxonMobil's new technology and access new consumer programs.

"The real winner here will be the consumer," said Doescher. "Exxon- and Mobil-branded stations will be able to offer their loyal consumers innovative discounts and rewards programs that will lead to even greater savings. Our stations will also benefit from repeat business, operational improvements and cost efficiencies."

Irving, Texas, and Fairfax, Va.-based ExxonMobil, one of the world's largest publicly traded international oil and gas companies, is a refiner and marketer of petroleum products.

Today's Top Stor

What Speedway Means to M

EXHIBIT 48

ExxonMobil Partners With Massachusetts State Police

Mobil 1 Advanced Fuel Economy™ motor oil to be used in entire fleet of vehicles

- 2,500 Massachusetts State Police vehicles will benefit from protection and performance of world's leading synthetic motor oil brand.
- Mobil 1 Advanced Fuel Economy will help fleet efficiency, provide a positive environmental impact, and support annual cost savings.
- Annually, fleet is estimated to use 7,000 fewer gallons of motor oil and 5,000 fewer oil filters

June 14, 2012 09:19 AM Eastern Daylight Time

FAIRFAX, Va.--(BUSINESS WIRE)--ExxonMobil Lubricants and Petroleum Specialties, a division of Exxon Mobil Corporation, announced today a six-year partnership with the Massachusetts State Police to become the sole lubricant provider for the entire 2,500-vehicle fleet. Since March 1, 2012, all Massachusetts State Police vehicles have been using Mobil 1 Advanced Fuel Economy.

The Massachusetts State Police's decision to establish the new fleet efficiency program stemmed from over four years of work with various ExxonMobil personnel who executed a comprehensive vehicle profile and oil analysis. In tandem with the Massachusetts State Police, ExxonMobil engineers examined the department's equipment and vehicles, recommending the appropriate lubricants for each vehicle and providing the Mobil 1 limited warranty for their use, which is valid for up to 10,000 mile oil change intervals.

"Mobil 1 Advanced Fuel Economy was formulated to deliver outstanding engine protection and improved fuel economy," said Joe Moceri, Northeast District Sales Manager for ExxonMobil Lubricants and Petroleum Specialties. "This partnership with the Massachusetts State Police will showcase how Mobil 1 Advanced Fuel Economy helps improve efficiency in modern gasoline engines in areas such as the oil pump, valve train, pistons, cylinders and crankshaft."

ExxonMobil will use this partnership as a live testing ground to demonstrate exceptional protection against engine wear, even under the extreme conditions that the Massachusetts State Police encounter each day.

To help save tax-payer dollars, the Massachusetts State Police explored a more efficient fleet that would have a positive environmental impact. The switch to Mobil 1 Advanced Fuel Economy is estimated annually to help the department use 7,000 fewer gallons of lubricant and 5,000 fewer oil filters. Ultimately, it is believed that Mobil 1 Advanced Fuel Economy will provide savings to the fleet's total annual costs.

Mobil 1 Advanced Fuel Economy builds on a tradition that goes back more than 30 years of providing outstanding protection against engine wear. At the same time, it provides better fuel economy that comes from using a lower viscosity oil, since less energy is required to circulate the oil. That leaves more energy to drive a vehicle forward.

For the everyday driver, Mobil 1 Advanced Fuel Economy oils deliver up to 2 percent fuel economy improvement and can save drivers over $400 on gasoline over the life of their vehicles. That's a savings of about six cents per gallon of fuel.[1]

About Mobil 1

The world's leading synthetic motor oil brand, Mobil 1 features anti-wear technology that provides performance beyond conventional motor oils. This technology allows Mobil 1 to meet the toughest standards of car builders and to provide exceptional protection against engine wear under normal or even some of the most extreme conditions. Mobil 1 flows quickly in extreme temperatures to protect critical engine parts and is designed to maximize engine performance and help extend engine life. Additional information about Mobil 1 and other ExxonMobil lubricants can be found at Mobil1.us.

[1] Comparison based upon 2% potential fuel economy improvement obtained by switching from higher viscosity oils to a 0W-20 or 0W-30 grade. Actual savings are dependent upon vehicle/engine type, outside temperature, driving conditions and your current engine oil viscosity. Savings estimates are based on a gallon cost of $3 per gallon, average fuel economy of 27.3 mpg, annual mileage of 11,413, and lifetime mileage of 182,608.

Contacts
ExxonMobil Media Line
Claire Hassett, 703-846-4467
or
Weber Shandwick
Sean Hixson, 314-552-6764

EXHIBIT 49

COMMONWEALTH OF MASSACHUSETTS - STANDARD CONTRACT FORM

This form, to be used for New Contracts and Contract Amendments/Renewals, is jointly issued and published by the *Executive Office for Administration and Finance (ANF)*, the *Office of the Comptroller (CTR)* and the *Operational Services Division (OSD)* for use by all Commonwealth Departments. Any changes to the official printed language of this form shall be void. Additional non-conflicting terms may be added by Attachment. Contractors should only complete sections marked with a "→". For instructions and hyperlinks (italics), please view this form at: *www.mass.gov/osc* under *Guidance For Vendors - Forms* or at *www.mass.gov/osd* under *OSD Forms*.

→ *Contractor Legal Name* (and d/b/a): ExxonMobil Oil Corporation	*Department MMARS Alpha Code and Name:* pe-ma state police
→ *Legal Address* (from W-9): 800 Bell Street, Houston, TX 77002	*Business Mailing Address:* 470 Worcester Rd.
→ *Payment Remittance Address* (from W-9): P.O. Box 8500 K-120, Philadelphia, PA 19178	*Billing Address* (if different): Framingham, MA 01702
→ *Contract Manager:* Joe C Mocerl	*Contract Manager:* Cheri Lee
→ *E-Mail Address:* joe.c.mocerl@exxonmobil.com; → Phone: 703-617-6992	*E-Mail Address:* cheri.lee@pol.state.ma.us; Phone: 508-820-2148
→ Fax: 908-665-0166; → TTY:	Fax: 508-820-2165; TTY:
→ *State of Incorporation* (if a corporation) or "N/A":	*MMARS Doc ID(s):* PC mobil oil
→ *Vendor Code:* VC6000216132	*RFR/Procurement or Other ID Number* (if applicable): spill-synoil-F81
MMARS Object Code: F24	*Account(s) Funding Contract:* 8162-0200

X NEW CONTRACT

COMPENSATION (*Check only one*):

___ Total *Maximum Obligation* of this Contract $ _____.

X *Rate Contract* (Attach details of rate(s) units and any calculations):

The following *COMMONWEALTH TERMS AND CONDITIONS* for this Contract has been executed and filed with CTR (*Check only one*):

X Commonwealth Terms And Conditions

___ Commonwealth Terms And Conditions For Human And Social Services

PROCUREMENT OR EXCEPTION TYPE (*Check one option only*):

___ Single Department Procurement/Single Department User Contract

X Single Department Procurement/Multiple Department User Contract

___ Multiple Department Procurement/Limited Department User Contract

___ Statewide Contract (OSD or an OSD-designated Department)

___ Grant (as defined by *815 CMR 2.00*)

___ Emergency Contract (attach justification)

___ Contract Employee (Complete *Employment Status Form*)

___ Collective Purchase (attach OSD approval)

___ Legislative/Legal Exemption (attach authorizing language)

___ Other (Specify and attach documentation):

ANTICIPATED START DATE: 5-16-11 (Enter the Date Contract Obligations may begin. Review Certification for Effective Date Below prior to entry.)

CONTRACT END DATE: 6-30-14

___ CONTRACT AMENDMENT/RENEWAL

ENTER *CURRENT* CONTRACT START and END DATES (prior to amendment)

Current Start Date: _____ Current End Date: _____.

COMPENSATION: (Check Either, "No Compensation Change"; "Maximum Obligation" or "Rate change". ATTACH Amended Scope and Budget to support Amendment.)

___ NO Compensation Change (Skip to "OTHER" section below and select change)

___ Redistribute Budget Line Items (No Maximum Obligation Change)

___ Maximum Obligation Change.

a) *Current* Total Contract Maximum Obligation: $ _____
(Total Contract Maximum Obligation, including all prior amendments).

b) Amendment Amount ("+" or "-"): $ _____

c) *NEW TOTAL CONTRACT MAXIMUM OBLIGATION:* $ _____

___ Rate Changes to Rate Contract

OTHER: (Check option, explain under "Brief Description" below, and attach documentation.)

___ Amend Duration Only (No Compensation or Performance Change)

___ Amend Scope of Services/Performance Only (no budget impact)

___ Interim Contract (Temporary Extension to complete new Procurement)

___ Other: (Describe Details and Attach documentation):

ANTICIPATED START DATE: _____ (Enter the Date Amendment Obligations may begin. Review Certification for Effective Date Below prior to entry.)

NEW CONTRACT END DATE: _____

→ *PROMPT PAYMENT DISCOUNTS*. Contractor has agreed to the following Prompt Pay Discounts for the listed Payment Issue Dates. See *Prompt Payment Discount Policy*.

1 % Within 10 Days 0 % Within 15 Days 0 % Within 20 Days 0 % Within 30 Days OR, Check off the following if:

___ Contractor either claims hardship, or chooses not to provide PPD, or compensation is not subject to prompt pay discounts (grants, non-commodity or non-service compensation)

BRIEF DESCRIPTION OF CONTRACT PERFORMANCE OR REASON FOR AMENDMENT (*Reference to attachments is insufficient*):

To provide synthetic oil and other fluids to the MSP, per OSP specifications + bidders response.

CERTIFICATIONS: Notwithstanding verbal or other representations by the parties, or an earlier Start date listed above, the "Effective Date" of this Contract or Amendment shall be the latest date this Contract or Amendment has been executed by an authorized signatory of the Contractor, the Department, a later Contract or Amendment Start Date specified above, or the date of any required approvals. By executing this Contract/Amendment, the Contractor makes, under the pains and penalties of perjury, all certifications required under the attached *Contractor Certifications*, and has provided all required documentation noted with a "→", or shall provide any required documentation upon request, and the Contractor agrees that all terms governing performance of this Contract and doing business in Massachusetts are attached or incorporated by reference herein, including the terms of the applicable Commonwealth Terms and Conditions available at *www.mass.gov/osc* under *Guidance For Vendors - Forms* or at www.mass.gov/osd under *OSD Forms*, the terms of the attached *Instructions*, the Request for Response (RFR), solicitation (if applicable) or other authorization, the Contractor's response to the RFR or solicitation (if applicable), and any additional negotiated performance or budget provisions. The terms of this Contract shall survive its termination for the purpose of resolving any claim, dispute or other Contract action, or for effectuating any negotiated representations and warranties. THE PARTIES HEREBY ALSO CERTIFY THAT (*Check one option only*):

1. X the Contractor has NOT incurred any obligations triggering a payment obligation for dates *prior* to the Effective Date of this Contract or Amendment; OR
2. ___ any obligations incurred by the Contractor *prior* to the Effective Date of this Contract or Amendment (for which a payment obligation has been triggered) are intended to be part of this Contract/Amendment and shall be considered a final Settlement and Release of these obligations which are incorporated herein, and upon payment of these obligations, the Contractor forever releases the Commonwealth from any further claims related to these obligations.

AUTHORIZING SIGNATURE FOR THE CONTRACTOR:	AUTHORIZING SIGNATURE FOR THE DEPARTMENT:
→ X: _____ Date: Jan 31, 2011	X: _____ Date: 5-12-11
(Signature and Date Must Be Handwritten At Time of Signature)	(Signature and Date Must Be Handwritten At Time of Signature)
→ Print Name: Jim R. Sweet	Print Name: John E. Flynn
→ Print Title: Sales Manager	Print Title: Chief Admin Offcr

Issued May 2004

COMMONWEALTH OF MASSACHUSETTS
CONTRACTOR AUTHORIZED SIGNATORY LISTING

CONTRACTOR LEGAL NAME :
CONTRACTOR VENDOR/CUSTOMER CODE:

INSTRUCTIONS: Any Contractor (other than a sole-proprietor or an individual contractor) must provide a listing of individuals who are authorized as legal representatives of the Contractor who can sign contracts and other legally binding documents related to the contract on the Contractor's behalf. In addition to this listing, any state department may require additional proof of authority to sign contracts on behalf of the Contractor, or proof of authenticity of signature (a notarized signature that the Department can use to verify that the signature and date that appear on the Contract or other legal document was actually made by the Contractor's authorized signatory, and not by a representative, designee or other individual.)

NOTICE: *Acceptance of any payment under a Contract or Grant shall operate as a waiver of any defense by the Contractor challenging the existence of a valid Contract due to an alleged lack of actual authority to execute the document by the signatory.*

For privacy purposes **DO NOT ATTACH** any documentation containing personal information, such as bank account numbers, social security numbers, driver's licenses, home addresses, social security cards or any other personally identifiable information that you do not want released as part of a public record. The Commonwealth reserves the right to publish the names and titles of authorized signatories of contractors.

AUTHORIZED SIGNATORY NAME	TITLE
Pat M. Brown	Sales Director
Jim R. Sweet	Sales Manager

I certify that I am the President, Chief Executive Officer, Chief Fiscal Officer, Corporate Clerk or Legal Counsel for the Contractor and as an authorized officer of the Contractor I certify that the names of the individuals identified on this listing are current as of the date of execution below and that these individuals are authorized to sign contracts and other legally binding documents related to contracts with the Commonwealth of Massachusetts on behalf of the Contractor. I understand and agree that the Contractor has a duty to ensure that this listing is immediately updated and communicated to any state department with which the Contractor does business whenever the authorized signatories above retire, are otherwise terminated from the Contractor's employ, have their responsibilities changed resulting in their no longer being authorized to sign contracts with the Commonwealth or whenever new signatories are designated.

Susan L Diaz
Signature

Date: January 31, 2011

Title: Assistant Secretary Telephone: 703-846-3892

Fax: 703-846-3919 Email: SUSAN.L.DIAZ@EXXONMOBIL.COM

[Listing can not be accepted without all of this information completed.]
A copy of this listing must be attached to the "record copy" of a contract filed with the department.

EXHIBIT 50

Exxon Mobil Corporation Institutional Ownership

XOM $85.77* 3.18 3.58%

*Delayed - data as of Aug. 1, 2016 15:46 ET - Find a broker to begin trading XOM now

Ownership Summary as reported in the most recent 13F filings

Institutional Ownership	50.86%
Total Shares Outstanding (millions)	4,147
Total Value of Holdings (millions)	$187,611

Active Positions

	HOLDERS	SHARES
Increased Positions	1,025	90,039,858
Decreased Positions	927	79,723,320
Held Positions	242	1,939,405,999
Total Institutional Shares	2,194	2,109,169,177

New and Sold Out Positions

	HOLDERS	SHARES
New Positions	75	3,645,667
Sold Out Positions	69	7,852,164

Total Shares **New** **Increased** **Decreased** **Activity** **Sold Out**

2,194 Institutional Holders
2,109,169,177 Total Shares Held

Click on the column header links to resort ascending (▲) or descending (▼).

Owner Name	Date	Shared Held	Change (Shares)	Change (%)	Value (in 1,000s)
VANGUARD GROUP INC	03/31/2016	267,429,715	5,476,451	2.09	23,787,873
STATE STREET CORP	03/31/2016	186,787,601	3,163,951	1.72	16,614,757
BLACKROCK INSTITUTIONAL TRUST COMPANY, N.A.	03/31/2016	111,095,583	1,455,454	1.33	9,881,952
BANK OF NEW YORK MELLON CORP	03/31/2016	61,502,607	(2,276,785)	(3.57)	5,470,657
BLACKROCK FUND ADVISORS	03/31/2016	59,669,140	814,931	1.39	5,307,570
NORTHERN TRUST CORP	03/31/2016	53,685,738	(96,981)	(0.18)	4,775,346
WELLINGTON MANAGEMENT GROUP LLP	03/31/2016	51,597,424	(4,513,325)	(8.04)	4,589,591
BANK OF AMERICA CORP /DE/	03/31/2016	50,965,416	6,416,383	14.40	4,533,374
STATE FARM MUTUAL AUTOMOBILE INSURANCE CO	03/31/2016	37,126,800	0	0.00	3,302,429
GEODE CAPITAL MANAGEMENT, LLC	03/31/2016	35,360,347	879,369	2.55	3,145,303
NORGES BANK	12/31/2015	35,225,433	1,733,929	5.18	3,133,302
BLACKROCK GROUP LTD	03/31/2016	34,632,830	759,438	2.24	3,080,590
JPMORGAN CHASE & CO	03/31/2016	31,803,780	(4,683,109)	(12.84)	2,828,946
PRICE T ROWE ASSOCIATES INC /MD/	03/31/2016	31,318,344	(3,445,582)	(9.91)	2,785,767
DIMENSIONAL FUND ADVISORS LP	03/31/2016	26,828,800	(124,028)	(0.46)	2,386,422

Institutional Holdings information for this company is filed by major institutions on form 13-F with the Securities and Exchange Commission.
Learn more about Institutional Holdings

EXHIBIT 51

Fidelity® Independence Fund

FDFFX | No Transaction Fee [1]

Buy/Trade

Add to Watch List | Compare

Summary | Performance & Risk | Ratings | Composition | Fees and Distributions | Commentary | View All Tabs

Morningstar® Snapshot*

AS OF 7/31/2016: MORNINGSTAR CATEGORY: LARGE GROWTH

Overall Rating	Returns	Expenses	Risk of this Category
★	LOW AVG HIGH	LOW AVG HIGH	LOWER HIGHER

*Data provided by Morningstar.

Performance [2]

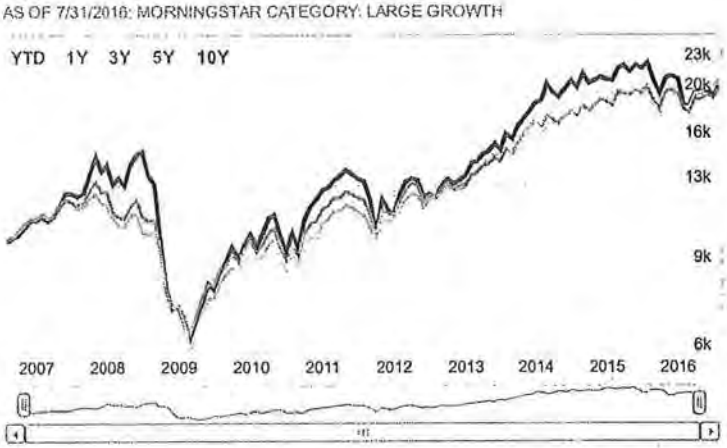
AS OF 7/31/2016

	Average Annual Returns			
YTD (Daily)*	1 Yr	3 Yr	5 Yr	10 Yr
-3.28%	-10.33%	+7.77%	+9.27%	+7.47%

*AS OF 8/4/2016. Value is cumulative

Hypothetical Growth of $10,000 [3, 4]

AS OF 7/31/2016: MORNINGSTAR CATEGORY: LARGE GROWTH



Fidelity® Independence Fund ✓ S&P 500 ✓ Large Growth

Compare Chart | Fund Facts Search

The performance data featured represents past performance, which is no guarantee of future results. Investment return and principal value of an investment will fluctuate; therefore, you may have a gain or loss when you sell your shares. Current performance may be higher or lower than the performance data quoted.

Fund Manager(s)

Robert Bertelson since 11/9/2006

Fund Overview

Objective

Seeks capital appreciation.

Strategy

Normally investing primarily in common stocks. Investing in either "growth" stocks or "value" stocks or both.

Details

Morningstar Category	Large Growth
Fund Inception	3/25/1983
NAV 8/4/2016	$34.80
Exp Ratio (Gross) 1/29/2016	0.86% ($8.60 per $1000)
Exp Ratio (Net) 1/29/2016	0.86% ($8.60 per $1000)
Minimum to Invest [5]	$2,500.00
Turnover Rate 5/31/2016	66%
Portfolio Net Assets ($M) 7/31/2016	$3,790.84
Share Class Net Assets ($M) 7/31/2016	$3,402.24
12 Month Low-High 7/31/2016	$29.21 - $41.55

Chart Fund Price (NAV)

Top 10 Holdings [6]

AS OF 6/30/2016

APPLE INC
GILEAD SCIENCES INC
CELGENE CORP
MEDIVATION INC
MICHAEL KORS HOLDINGS LTD
SOUTHWEST AIRLINES CO
AT&T INC
EXXON MOBIL CORP
ALEXION PHARMACEUTICALS INC
MONSTER BEVERAGE CORP NEW
% of Total Portfolio **25.95%**

Total # of holdings: 110 as of 6/30/2016
Total # of issuers: 110 as of 6/30/2016

Find a mutual fund

Search by Fund Name, Fund Symbol, Fund Family, or Top 10 Holding

Go

Similar Funds

Morningstar Category: Large Growth

Fund Related Information

Quarterly Fund Review

Portfolio Manager Q&A

Chairman's Message

Investment Approach

My Mutual Funds

In order to view funds in your portfolio, you must first log in. Please note this feature requires that you have a specific type of Fidelity account, such as a brokerage account, IRA, or other non-workplace account.

Risk

Stock markets, especially foreign markets, are volatile and can decline significantly in response to adverse issuer, political, regulatory, market, or economic developments. Foreign securities are subject to interest rate, currency exchange rate, economic, and political risks.

Additional Disclosures

This description is only intended to provide a brief overview of the mutual fund. Read the fund's prospectus for more detailed information about the fund.

Quarter-End Average Annual Total Returns [3, 2]

AS OF 6/30/2016; FUND INCEPTION 3/25/1983

EXPENSE RATIO (GROSS): 0.86% AS OF 1/29/2016

	1 Yr	3 Yr	5 Yr	10 Yr	Life
Before Taxes					
Fidelity® Independence Fund	-12.44%	8.63%	7.93%	6.68%	11.14%
S&P 500	3.99%	11.66%	12.10%	7.42%	10.91%
Large Growth	-2.33%	10.58%	9.98%	7.20%	--
After Taxes on Distributions					
Fidelity® Independence Fund	-13.80%	7.60%	7.30%	6.30%	--
Large Growth	-5.29%	7.96%	8.20%	6.17%	--
After taxes on distributions and sale of fund shares					
Fidelity® Independence Fund	-5.80%	6.75%	6.28%	5.43%	--
Large Growth	-0.45%	7.69%	7.56%	5.64%	--

The "Mutual Funds" area at the top of each page allows access to mutual fund holdings with individual and joint Fidelity non-retirement accounts. Individual stock positions, ETFs and 529 funds are not available through this view. For the full list of your holdings visit Portfolio Summary.

Mutual Funds are priced as of the previous business day's market close when the market is open. Mutual fund positions are priced as of the official market close (typically 4p.m.) and prices are generally available between 5 p.m. and 6p.m.

Watch a brief video to learn about using the new mutual fund library to evaluate funds

1. No Transaction Fee Fidelity funds are available without paying a trading fee to Fidelity or a sales load to the fund. However, the fund may charge a short-term trading or redemption fee to protect the interests of long-term shareholders of the fund. Shares are subject to the fund's management and operating expenses. See Expenses & Fees for more information.

2. Total returns are historical and include change in share value and reinvestment of dividends and capital gains, if any. Cumulative total returns are reported as of the period indicated. Life of fund figures are reported as of the commencement date to the period indicated and are cumulative if the fund is less than one year old. Total returns do not reflect the fund's [%] sales charge. If sales charges were included, total returns would have been lower.

3. The Morningstar Category Average is the average return for the peer group based on the returns of each individual fund within the group, for the period shown. This average assumes reinvestment of dividends.

4. This chart illustrates the performance of a hypothetical $10,000 investment made in this investment product (and a benchmark or category average, if shown) from the beginning date shown or on the inception date of the product (whichever is later). The inception date used for products with underlying funds, or multiple shares classes, or are offered as a separate account, strategy or sub account, may be the inception date of the underlying fund, the earliest share class of the product, or the date composite performance for the product was first made available. The product's returns may not reflect all its expenses. Any fees not reflected would lower the returns. Benchmark returns include reinvestment of capital gains and dividends, if any, but do not reflect any fees or expenses. It is not possible to invest in an index. Past performance is no guarantee of future results. This chart is not intended to imply any future performance of the investment product.

5. Initial minimum investments into group retirement accounts such as Fidelity Simplified Employee Pension-IRA, Keogh, Self-Employed 401(k), and Non-Fidelity Prototype Retirement accounts are $500 or higher. There is no minimum for additional investments in any type of Fidelity fund you already own.

6. Any holdings, asset allocation, diversification breakdowns or other composition data shown are as of the date indicated and are subject to change at any time. They may not be representative of the fund's current or future investments. The Top Ten holdings do not include money market instruments or futures contracts, if any. Depository receipts are normally combined with the underlying security. Some breakdowns may be intentionally limited to a particular asset class or other subset of the fund's entire portfolio, particularly in multi-asset class funds where the attributes of the equity and fixed income portions are different.

Under the asset allocation section, international (or foreign) assets may be reported differently depending on how an investment option reports its holdings. Some do not report international (or foreign) holdings here, but instead report them in a "Regional Diversification" section. Some report them in this section in addition to the equity, bond and other allocation shown. Others report international (or foreign) holding as a subset of the equity and bond allocations shown. If the allocation without the foreign component equals (or rounds to) 100%, then international (or foreign) is a subset of the

equity and bond percentage shown.

Generally, data on Fidelity mutual funds is provided by FMR, LLC, Morningstar ratings and data on non-Fidelity mutual funds is provided by Morningstar, Inc., and data on non-mutual fund products is provided by the product's investment manager, trustee or issuer or the plan sponsor whose plan is offering the product to participants. Although Fidelity believes the data gathered from these third-party sources is reliable, it does not review such information and cannot warrant it to be accurate, complete or timely. Fidelity is not responsible for any damages or losses arising from any use of this third-party information.

Before investing, consider the investment objectives, risks, charges and expenses of the fund or annuity and its investment options. Contact Fidelity for a free prospectus and, if available, summary prospectus containing this information. Read it carefully.

EXHIBIT 52

Seeking Alpha

Exxon Mobil's (XOM) CEO Rex Tillerson Hosts Annual Shareholder Meeting (Transcript)

May 29, 2014 5:59 AM ET2 comments
by: SA Transcripts

Exxon Mobil Corporation (NYSE:XOM)

Annual Shareholder Meeting Conference Call

May 28, 2014 10:30 ET

Executives

Rex Tillerson - Chairman and Chief Executive Officer

David Rosenthal - Vice President, Investor Relations and Secretary

Marco Vargas

Fr. Michael Crosby

Shawn Gilchrist

Patricia Daly

Malcolm Shaw

Analysts

Frank Rauscher - Aquinas Associates

Julian Martinez - SER-Jobs for Progress National

David Martino

Jack Fuller

David Ridenour - National Center for Public Policy

Jim Markham

Rex Tillerson - Chairman and Chief Executive Officer

Good morning, ladies and gentlemen. You would please find your seats. I would ask that the meeting please come to order. I am Rex Tillerson, Chairman and Chief Executive Officer of the Exxon Mobil Corporation. And I am pleased that so many of you are here with us today in person, but I also want to welcome our shareholders around the world who are joining us by way of the internet on the simulcast. I hope that you have an opportunity while those of you that were here to meet some of our employees in person while visiting the various displays in the foyer this morning. These are just a small representation of the some 75,000 men and women of Exxon Mobil, men and women who are working on your behalf, 24 hours a day, 7 days a

week, 365 days a year. And many of them are working in very challenging locations and under challenging circumstances around the world. All with one objective in mind and that's to deliver the energy that the world's economies and people need to maintain their lifestyles in all corners of the world.

I will have the opportunity to report to you on our financial and operating results, but I am really reporting to you on their results. And that is the highest honor I have is to speak on their behalf to you today. David Rosenthal is seated to my right. He is the Vice President of Investor Relations and the Corporate Secretary. He will assist me in running the meeting today. I will introduce the members of the board to you later in the meeting.

As mentioned on Page 2 of the proxy statement, it is the policy of the corporation to provide shareholders an opportunity for privacy in voting. For shareholders who returned their proxy cards without written comments, the voted proxies have not been seen by nor reported to the corporation, except in aggregate numbers. Anyone turning in a proxy card at this meeting who wishes to keep his or her votes secret may obtain an envelope from the ushers. Proxy cards will be collected later in the meeting.

A list of shareholders entitled to vote at this meeting or at any adjournment thereof is available for inspection. If anyone wishes to examine this list, an usher will be pleased to direct you to the proper location. Charlie (indiscernible) and Lori Chamoun of Computershare Trust Company have been appointed inspectors of election for this meeting. They have taken an oath of office that has been delivered to the Secretary for filing with the Minutes of the Meeting. Notice of this meeting has been properly given and the inspectors of election have determined that a quorum is present. There are more than 97,000 shareholders represented at this meeting, holding at least 3.5 billion shares or approximately 82.9% of the issued and outstanding shares of stock of the corporation which are entitled to vote. I direct that the inspectors' written determination as to the number of shares entitled to vote at the meeting be filed with the minutes. I declare a quorum present and the meeting ready for business.

I would now like to explain our plan for conducting the meeting today. First, Secretary Rosenthal will outline the rules of conduct and how to gain recognition. Then I will make some brief comments about our business results and the future we see for your company. After that, the 8 items of business will be presented beginning with the election of directors, the ratification of independent auditors and the advisory vote to approve executive compensation, all of which are required by law. Then we will continue with the 5 shareholder proposals shown in the proxy statement, which was sent to all shareholders in advance.

As described in the annual meeting program, discussion on the 8 items of business will be deferred until all items have been presented. Time permitting, we will respond to some of the questions submitted ahead of time via proxy cards or the internet. Upon completion of the discussion on the items of business and voting, the polls will be closed. The formal business of this year's annual meeting will be concluded and the inspectors of election will prepare their preliminary voting report. While this is occurring, there should be some time for additional comments and questions about Exxon Mobil's business. When the inspectors are ready I will ask them to give us their voting report and we will then conclude the meeting.

At this time let me turn the podium to David Rosenthal to discuss the rules of conduct.

David Rosenthal - Vice President, Investor Relations and Secretary

Good morning. I would now like to cover several aspects of today's meeting. Before we continue I would like to take this opportunity to familiarize everyone with the safety features of this auditorium. In case of an emergency, we will be notified through the public address system. The emergency exits for the ground level as shown on the screen above me, are situated at the rear of the auditorium, where you entered, and down and front on either side. If we need to evacuate, just proceed to the nearest exit and Meyerson personnel will guide you to the best way out. In addition, for safety reasons, please do not stand in the aisles or at the back of the hall and do not block the exits.

To ensure that the meeting is conducted in the interest of all shareholders, there are certain rules of conduct governing this meeting. These rules are posted on signs at the entrances to the meeting, are located in the program and are shown on the screen above me. Let me now cover several of the rules.

The distribution of pamphlets and other literature, banners, signs and other displays is strictly prohibited in this hall. Anyone who intentionally obstructs or interferes with this lawful meeting by physical action or verbal utterance is in violation of Texas law. Any persons engaging in such conduct will be asked to cease. And if they refuse, they will be escorted from the meeting. The laws of New Jersey, where Exxon Mobil is incorporated, provide that no business can be brought up for a vote unless

proper notice has been given to all shareholders. Therefore, in fairness to other shareholders not in attendance, and in keeping with the laws that govern our annual meeting, formal business at today's meeting is restricted to the items that were included in this year's proxy statement. Additional proposals may not be introduced from the floor.

In order to present a proposal, you must have checked in at the admissions desk in the lobby and verified that you are the proponent or a duly authorized proxy under New Jersey law. Presenters whose credentials have been verified will be given a blue presenter's pass. If neither the proponent nor an authorized proxy has checked in and obtained a presenter's pass, we will presume the proponent is not present. And I will move the proposal for the purposes of the orderly conduct of the meeting and so that the shareholder votes cast may be recorded. However, I will not be acting as a representative of the proponent. The authorized presenter of a shareholder proposal will have up to 3 minutes to present the proposal. Time may not be shared with another speaker. No second to the motion is required. Discussion on all items of business will be deferred until the discussion period later in the meeting.

Only shareholders as of the record date or their properly appointed proxies are entitled to speak at this annual meeting of Exxon Mobil shareholders. Shareholders making comments during the meeting must speak or have their words translated into English so that the majority of shareholders present can understand what is being said.

Comments that are offensive or otherwise inappropriate will not be permitted. We would also ask that any issues of personal interest that are not relevant to all shareholders be raised directly with appropriate company representatives outside of the annual meeting. We request that individual shareholders respect the rights of others to speak and keep their comments as brief as possible. As noted in the proxy statement, the Chairman has broad authority to conduct the meeting in an orderly and timely manner.

If you wish to make comments, you must first fill out a speaker identification card that is included in the program that was provided to you as you entered the lobby. This card confirms that you meet the requirements to speak at this meeting. Give the completed card to the usher when you are recognized to address the meeting.

To ensure that as many shareholders as possible who want to address the meeting today have the opportunity to do so, we ask you to follow these additional instructions. If you would like to address the meeting, move to a reserved aisle seat, remain seated and raise your hand, holding your speaker identification card to indicate to the Chairman that you wish to speak. When recognized by the Chairman, give your completed speaker card to the usher and a microphone will be provided. Stand and begin by stating your name. Unless otherwise provided in these rules, you may speak for up to 2 minutes. Due to the large number of items on today's agenda and the need to conclude the meeting within a reasonable period of time, we cannot assure that every shareholder who wishes to speak will be able to do so. First priority will be given to those who have not yet had an opportunity to speak.

As we have done in the past, we have provided a timing system with lights that will help speakers manage their time. I would like to demonstrate the system at this time. When the Chairman recognizes a speaker and a microphone has been provided by the usher, a green light will come on at the displays on both sides of the stage. The hall microphones will be activated only after the speaker has been recognized by the Chairman. When the speaker's time remaining reaches 30 seconds, a yellow light will turn on. A red light will indicate the speaker is at the end of the time allowed.

Finally, as we typically note at the outset of similar meetings, I would like to draw your attention to our cautionary statement that is shown on the slide. This statement contains information regarding today's presentation and discussion. You may also refer to our website ExxonMobil.com for additional information on factors affecting future results as well as supplemental information to finding key terms that we will use throughout the meeting today. Thank you.

Rex Tillerson - Chairman and Chief Executive Officer

Thank you, David. Shortly, we will address our items of business. However, I will first share with you some highlights from 2013 financial and operating results, give a summary overview of our annual energy outlook, and provide you with a business and operational update. I will touch on several elements of our business approach that enable Exxon Mobil to deliver superior long-term shareholder results.

I will start with a review of our financial and operating performance. In reviewing 2013, the corporation sustained solid financial and operating performance despite global economic challenges at a wide range of uncertainties. We continued our strong safety and environmental performance. We delivered earnings of $32.6 billion, a return on average capital employed of 17.2%, and generated cash flow from operations and asset sales of $47.6 billion. We invested $42.5 billion in our various business lines. Total shareholder distributions were $25.9 billion.

For the 20th consecutive year, we added more oil and natural gas reserves than we produced with our proved reserve replacement ratio exceeding 100%. These results reflect the strength of our integrated business model and the diligence, expertise and dedication of the 75,000 men and women who work for Exxon Mobil throughout the world. Exxon Mobil's approach to business is built upon a commitment to integrity in all we do. Nowhere is that more evident than in our commitment to safe operations with a continued emphasis on both personnel and process safety.

As this chart shows our safety performance continues to improve and remains very strong in the industry, we believe that effectively managing risk will enable us to achieve our vision that nobody gets hurt. In 2013, Exxon Mobil was awarded the Green Cross for Safety medal by the National Safety Council in recognition of our performance and leadership in safety. At Exxon Mobil, we recognized that meeting the world's growing need for energy while managing the impacts on the environment is one of society's great challenges. We have implemented rigorous environmental management programs and results of our actions are significant, particularly in the area of energy efficiency and flare reduction.

As shown on this chart, we have reduced greenhouse gas emissions by nearly 11 million metric tons over the past five years. This is equivalent to taking almost 2 million cars off the road in United States. The investment in highly efficient code generation capacity to provide electric power and steam through our facilities is a key contributor to our efforts. We also continued to progress initiatives to reduce hydrocarbon flaring bringing our results over the past 10 years to the total reduction of 50%. We are also carefully managing freshwater consumption in our operations.

The chart on the left summarizes freshwater consumed in our upstream, downstream and chemicals segments. We experienced a 25% reduction across all business lines since our acquisition of XTO in 2011 or a decrease of almost 600 million barrels or to put that in metrics it may be relevant to you 25 billion gallons. Exxon Mobil has been active in industry initiatives to develop standards and tools for water resource management including mapping water use, screening potential water stress or scarcity of major facilities and identifying use and risk mitigation steps. We are actively involved in a number of research efforts individually as well as through partnerships to further enhance our understanding and capabilities to effectively manage water.

Let's now take a look at our 2013 financial metrics. Exxon Mobil continues to lead our peer group with earnings of $32.6 billion in 2013. The decrease of $12.3 billion compared to 2012 largely reflects the lower net gains from divestments of $8.6 billion and lower earnings in our upstream and downstream segments which were in line with general industry conditions. Our earnings performance continues to capture the value of our balance portfolio and our integrated business model. In 2013 Exxon Mobil's return on capital employed was 17.2% or about 3.5 percentage points higher than our nearest competitor. Over the past five years return on capital employed averaged 21% or about 5 percentage points higher than our nearest competitor.

Our industry leading ROCE performance has been maintained even through the recent period of intensive upstream capital investments which have been necessary to position the company to meet the world's growing energy needs. Our sustained leadership and capital efficiency reflects our consistent disciplined investment approach, our industry leading project execution capabilities as well as application of our innovative technologies.

In 2013 we invested $42.5 billion in capital expenditures to continue positioning the business for long-term growth and sustainability. Over the past five years we have invested $178 billion utilizing the corporation's financial strength and flexibility to invest through the business cycle and capture new opportunities.

As you can see on the graph most of the CapEx was associated with an intense recapitalization of our upstream business. We progressed several major projects and completed strategic acquisitions to strengthen our portfolio. Our future plans reflect ongoing significant albeit lower upstream spending and marginally higher spending in the downstream and chemical businesses which are targeted at advantage return projects. I will provide an update on a few of these projects later in the presentation. Our approach to investing is to advance all attractive opportunities that provide competitive returns when tested across a broad range of industry and market conditions. Maintaining capital efficiency and discipline underpins our long-term success.

Another measure the value created through strong financial and operating performance is the cash flow remaining after fully funding our attractive investment opportunities. Over the past five year Exxon Mobil generated $104 billion of free cash flow. This is more than two times the average of our competitors during the period of relatively high upstream capital intensity or the industry as a whole. Consistent, robust free cash flow provides capacity for unmatched shareholder distributions and underpins our strong financial position.

Exxon Mobil's disciplined capital allocation approach preserves the capacity for investments and industry leading shareholder distributions, while maintaining the flexibility and capacity of our strong balance sheet for longer term planning and execution. Since the beginning of 2009 Exxon Mobil has distributed $131 billion to our shareholders. During this five year period Exxon Mobil distributed 50% of the cash flow from operations and assets sales to shareholders.

As you can see from the chart, this payout ratio is double that of our nearest competitors during this period. Our dividend payouts are made with a view to building long-term shareholder value and providing reliable dividend growth through the ups and the downs of the business cycle. Over the past five years, we distributed $46.5 billion in dividends to you, our shareholders. We recently announced a second quarter 2014 dividend payable June 10 of $0.69 per share, a 9.5% increase over the previous quarterly rate. This is the 32nd consecutive year of dividend per share increases. Since 1982, shareholders have received annual per share dividend increases at an annualized growth rate of 6.3% more than double the rate of inflation.

Share purchases are an efficient and flexible way of returning cash to our shareholders. In 2013, distributions to shareholders to share purchases were $15 billion and just over $84 billion for the last five years. Purchases have reduced shares outstanding by 37% since the Exxon and Mobil merger, including the impact of shares issued for the merger of XTO.

An important benefit of our ongoing share purchase program is the enhanced per share interest in all of Exxon Mobil's assets. For example, each share of Exxon Mobil owns 16% more of the upstream oil and natural gas production volumes than it did in 2009. Since 2009, Exxon Mobil has delivered annualized production per share growth of 4%, nearly 4 percentage points higher than our nearest peer. As you can see, the competitor group is trending generally flat to down in per share production over the last five years.

This slide shows our all-in natural gas reserves replacement performance compared to competitors over the last five years. For the 20th consecutive year, we have replaced more than 100% of production. In 2013, we added proved oil and gas reserves totaling 1.6 billion oil equivalent barrels, of which nearly 76% are liquids. At year end 2013, proved reserves of oil and gas totaled 25.2 billion oil equivalent barrels comprised of 53% liquids and 47% natural gas. A broad diverse proved reserve base supports today's production volumes as well as positions us for new supplies in future.

Exxon Mobil has a resource base of nearly 91 billion oil equivalent barrels. The bar on the left shows the diversity of the resource base with substantial holdings in essentially all resource types. It is split equally between gas and liquids as shown in the middle bar. The bar on the right provides a description of commercial maturity. We currently have just over 25 billion oil equivalent barrels in proved reserves. There are an additional 28 billion barrels in various stages of appraisal, engineering design, and development. The remainder of the portfolio approximately 37 billion barrels contains resources for future developments.

Exxon Mobil's energy outlook, which we refresh and update annually guides our strategic investment programs necessary to meet the world's growing energy needs. These investments help provide the affordable energy needed to promote economic growth and improve living standards around the world. The picture you see illustrates the changing living standards in the Shanghai suburbs.

Exxon Mobil's 2014 energy outlook indicates that global energy demand is likely to grow by about 35%. Even taking into account, the offsetting impacts of significant energy efficiency gains, which we expect will capture the world over. Ensuring reliable and affordable energy supplies to support this growth safely and with minimum impact going in the environment, we will require broad-based economic solutions.

The bar chart on the left shows projected growth from 2010 to 2040 by energy type. Oil, gas and coal are the most widely used fuels today providing about 80% of supplies. Oil demand will remain most prominent with about two-thirds of its increase driven by expanding transportation needs. The use of natural gas will arise by about 65% and it will become the second most widely used source of energy surpassing coal. We expect global demand for the least carbon intensive fuels. Natural gas, nuclear, and renewables will rise at faster than average rates led by power generation requirements. We expect that oil and

other liquid fuels will remain the world's largest energy source even in the year 2040, meeting about one-third of the world's energy demand. While conventional crude oil production will remain the most significant source of supply through 2040 more of the world's demand will be met by emerging sources that only recently became available in significant quantities.

As you can see in the chart on the left, gains will be lead by deepwater production, which more than doubles to the year 2040. We also expect to see meaningful growth from all sands and tie all resources. And natural gas liquids supply will also increase as it benefits from techniques used to extract the unconventional shale gas. On the right, we see natural gas supply and demand. About 65% of the growth in natural gas supply is expected from unconventional resources, which will account for about one-third of global production in the year 2040. By 2040, we expect energy demand for the transportation sector to increase more than 40%.

As shown on the chart, we expect a continuing shift of the transportation fuel mix toward diesel with gasoline demand remaining flat to declining. In fact, we expect diesel will account to about 75% of the growth in liquid fuels for transportation. This reflects in part high growth rates in developing countries as economic activity expands and fosters greater truck, rail and marine transportation requirements. Natural gas will also contribute more significantly in the future to meet rising transportation needs.

We expect global chemical demand to grow at a faster pace than GDP as people seek higher standards of living and purchase more household and packaged goods manufactured with chemical products. We estimate two-thirds of chemical demand growth will be in the Asia-Pacific as the region acquired chemical feed-stock products to manufacture goods for both domestic and export markets. China alone is expected to represent over half of the global demand increase with its rapidly growing middle class and its expanding purchasing power. Like no other commodity energy touches every aspect of modern live and provides tremendous benefits to people everywhere. To sustain progress and further expand prosperity the world must increase the availability of reliable and affordable energy supplies. While the scale and complexity of the energy challenge are immense, practical and economically viable options to meet people's energy needs do continue to expand. Access to high quality resources is critical as is our ability to develop supplies and ways that are secure and environmentally responsible.

In this regard, technology advances are a key enabler to both safe and effective development of traditional and emerging energy sources. Substantial investments are required to meet growing demand, including the development and use of advanced technologies that are expanding and diversifying energy supplies. Free markets supported by sound and reliable public policies remain vital for future energy developments. This includes policies that promote free and open trade and which encourage private sector investments by reducing regulatory and fiscal uncertainty. And over time, our industry must effectively plan, develop and execute the technologically complex and capital intensive projects that provide the energy people need.

So, we will turn now to some of our operating highlights. And this is one of my favorite pictures, hopefully you saw in the booth upfront. It's just a gorgeous picture of the b Bakken area in North Dakota, where we are making a number of investments to grow unconventional liquids production. So, let me cover key elements of our corporate strategy as well as the business and operational update.

Exxon Mobil's strategy has been adopted to achieve our commitment to create long term shareholder value. As discussed earlier, our relentless attention to operational excellence supports safe, reliable and efficient operations. Our diversified balanced portfolio is a fundamental competitive advantage enabling us to manage a wider growth of chemical market and geopolitical risk and maximize profitability through changing business cycles. Continuing to capture the benefits our integrating business model, the complementary strings of each of our businesses allow us to maximize the value of molecules across the entire supply chain. Our integration and global perspective enables us to pursue, select and advance the most attractive business investment projects.

Continuing innovation in the pursuit of technology leadership across all business segments enables our expanding reach, project execution and our operational capabilities. At the very heart of our success are the talented men and women of Exxon Mobil and their drive to achieve premier business results. We must continue to attract, retain and develop outstanding employees. Our long term approach to managing the company has positioned each of our businesses to be at the top at their respective areas of competition enabling the delivery of superior returns to you our shareholders. Risk management is the core of our business is there are elements of risk in virtually everything we do. We take a systematic approach to risk management, guarded by comprehensive system known as the operations integrity management systems or in short OIMS.

OIMS provides a risk management framework with rigorously applied systems and processes to manage safety, security, help and environmental risk and to achieve excellence in our operating performance. OIMS guides the activities of each of our employees as well as our third party contractors around the world. Through OIMS, we focus on clearly defined policies to reinforce accountability and leadership and set expectations, measure performance and recognize progress. Bottom line OIMS helps us to sustain superior operational performance and ultimately maintain our liaisons through operations. Exxon Mobil is well positioned to deliver profitable growth. This chart summarizes key elements of our strategy that provides the financial flexibility required to fund our business and generate robust shareholder returns.

In the upstream, we are adding 1 million net oil equivalent barrels per day of new production volumes by the year 2017 through major projects start ups. Also improving the production with higher liquids and liquids price linked gas volumes, and increasing unit profitability through improved fiscal terms and the pursuit of better margins for each barrel we produce. In the downstream and chemical segments, we are diversifying feedstocks through our flexible and integrated system continuously pursuing operating efficiencies and maximizing sales of high value products. Our businesses also generate cash flow through active ongoing portfolio management and continued CapEx discipline with a clear focus on delivering the industry leading returns on capitals employed. Operational excellence, integration advantages and technology leadership across all of our businesses underpin our ability to grow cash flow.

I will now provide more insight into each of our businesses. In the upstream Exxon Mobil has a large high-quality portfolio with more than 120 projects including 21 new startups planned between now and the year 2017. This slide highlights 8 of the major projects that we plan to startup either this year in 2014 or next. These projects are representative of our geographic diversity ranging from North America to Russia, Southeast Asia and Australia to Africa and the Middle East. We are investing across a broad set of resource types, including the liquefied natural gas, the Arctic, the deepwater, conventional and all sands developments. These projects provide a strong foundation for profitable volume growth across a diverse resourced pipe with a broad set of technology approaches and attractive fiscal regimes. And in the near-term, grow liquids and liquids price linked production. So let me give you a brief insight of our Papua New Guinea LNG project.

The picture shows the LNG plant near Port Moresby. And you can also see the loading jetty in the background extending out into water. The successful completion of the project is unlocking the potential of a very high quality gas resource. The Papua New Guinea demonstrates again Exxon Mobil's world class project execution capabilities. Beginning with the construction of a 430 mile pipeline, the installation through mountainous jungle was accomplished while overcoming flooding, challenging volcanic soil conditions and steep pinnacle slopes. Because of the lack of preexisting infrastructure, we constructed supplemental roads, communication lines and build up a new airfield. A project requires substantial community and local travel outreach and engagement and effective relationships with the government and indigenous communities.

Despite the many challenges, the project progressed ahead of schedule with LNG production now having started up and the first cargo of LNG loaded in last few days on its way to Tokyo, Japan. We continue to assess potentials for expansion of this project. We are well positioned for a high margin liquid growth in North America, probably the most exciting story in the energy industry over the last 30 years. Our unconventional position totals more than 10 million acres including high quality tight oil, and liquids rich place in the Bakken, the Permian, the Woodford Ardmore, the Montney, Duvernay in Canada, and the Athabasca Oil Sands. And high quality shale positions in Hanesville and Marsalis basins. In addition we hold more than 10 million acres of conventional resource that will contribute to long term liquid production. The combination of XTO's execution capability and Exxon Mobil's research expertise is advancing improvements in both resource recovery and cost development. As shown in the lower left we are growing profitable liquid production from our North Amercian holdings to one million barrels per day by 2017 representing a 50% increase since 2012. While the gas production outlook in red reflects our current views of market demand, we do have a very deep ready to drill inventory of well locations, and the ability to quickly increase natural gas production if market conditions demand so.

Essential to our long term growth is developing and maintaining a very deep and diverse portfolio of resource discovery and development opportunities which are indicated on this map. The green color dots highlight conventional opportunities. These include activities in the established areas such as Nigeria, Papua New Guinea, The Gulf of Mexico and Tanzania as well as new areas where we have made significant additions to our portfolio including Brazil, Liberia, Gabon and South Africa. Red color dots highlight our unconventional portfolio. During the past year we had new opportunities in type and heavy oil in Canada. We also have significant activity in South America and soon in West Siberia. The audit portfolio we have shown with the blue dots, the audit section is our most recent and most substantial addition to our global portfolio with substantial new escalation acreage in the Russian audit. We are considering these long term opportunities we are well positioned to leverage the depth of our world wide experience.

Our global natural gas holdings are also extremely well positioned to capitalize on growing demands for LNG, which is expected to more than double by the year 2025. We are evaluating several potential new opportunities to supply this growing demand. Exxon Mobil has been a leading player in the development of the LNG industry through our existing equity interest and operating capacity in Qatar and in Indonesia which are shown in green. We also have interest in new LNG capacity indicated in yellow through our participation which I just described, Papua New Guinea and the Gorgon project in Australia. We are capitalizing on our world class experience technological capabilities and our marketing expertise as we progress a number of new exciting opportunities to grow the LNG portfolio as shown in the red box. These include Tanzania, Australia, Russia and North America.

So let's now turn to the downstream where we continue to strengthen the portfolio by selectively investing in our strategic assets and capitalizing on Exxon Mobil's technology, scale and integration. The picture you see is of our world scale Baytown refining and chemical complex down the Texas Gulf Coast. Lowering raw material costs continues to be a focus area particularly in North America where new light and heavy crude supplies are creating unique opportunities. During the last few years we have expanded our advantaged North American crude runs by 40%, given our installed capacity and feedstock flexibility, our investments in this area continue to be incremental and completed during maintenance turnarounds and which allows to a very rapid startup of these new facilities.

Many of our investments are focused on growing sales of high value products such as diesel, jet fuel and lubricants. For example, we recently commissioned a new Ultra Low Sulphur Diesel unit in Singapore and a new desulphurization plant in Saudi Arabia is nearing completion. We are also progressing plants to install a coker at our Antwerp refinery in Belgium to upgrade low value bunker fuel into higher value diesel which is in high demand.

In our lubricants business, we have projects underway to expand high performance base stocks and finished product manufacturing capacity. We are investing in logistics capabilities as highlighted by our joint venture rail terminal project in Edmonton, Alberta, Canada. This terminal would allow us to supply up to 100,000 barrels per day of crude from Alberta, Canada to our North American refining network.

Steps to reduce operating cost include investments in steam and electric cogeneration capacity that was recently completed in Augusta, Italy as well as a new cogeneration plant which is being progressed in Singapore. Our disciplined portfolio management process results in the best asset mix in the business. We continually upgrade the portfolio in possible ways to build shareholder value.

Since 2005 we have reduced our global refining capacity by more than 1 million barrels per day by divesting smaller, less competitive facilities. And we have completed the transition of our domestic retail fuels marketing to a more capital efficient and growing branded wholesale business model. Exxon Mobil's commitment to disciplined investment extends to our chemicals business where we are developing major projects in the United States, Saudi Arabia and Singapore.

To build on our competitive advantage, we continued to invest in the world scale projects to capture advantage feedstocks. In the U.S. we are progressing a multi-billion dollar project to capitalize on the abundance of low cost North American ethane. We plan to expand Baytown's capacity with 1.5 million ton per year ethylene plant and install associated polyethylene lines at the Mont Belvieu plastics plant which is shown in the picture. Projects are targeted to capture opportunities to reduce production cost by installing advanced process technologies that enhanced energy efficiency, achieved greater reliability and produce higher yields.

Continuing to invest on increasing production of high value products in an even ever changing market is important of the long-term success of the chemicals company. For example, a new 400,000 ton per year facility in Saudi Arabia will produce specialty elastomers to serve growing demand in the Kingdom, the broader Middle East and Asia. We also recently approved a world scale grassroots specialty polymers project in Singapore to produce synthetic rubber to support the growing tire market in Asia as well as premium resins for adhesive applications.

Integration of new projects with existing, refining and chemical units enables lower capital and production costs by leveraging the existing site feedstocks, the utilities, the infrastructure and the organization. Last year, we successfully completed the startup of a new world scale steam cracker at our Singapore complex. The site is now producing some of our most advanced plastics and synthetic rubbers and is well-positioned to serve the rapidly growing markets in Asia and beyond.

I am very proud of our operational performance and financial results of the past year. An example of our success is shown by the photo of modern LNG cargo vessels to parking Qatar is done to supply the world's need for reliable and affordable energy. Simple through our strengths and competitive advantages is a steadfast commitment to operate with the high standards of ethical behavior and corporate citizenship. Building strong relationships with the customers we serve and the communities where we operate as I want to touch on, on the next slide.

Exxon Mobil has many responsibilities to our shareholders, our neighbors, our customers, and our communities. We strive to be responsible corporate citizens and our success is underpinned by our technological expertise, our operational excellence, our safety performance and an unwavering commitment to ethical standards. Exxon Mobil views effective risk management and a commitment to safety as a business imperative. As you can see, we strive to continuously improve our safety and environmental performance.

Our business presence serves as a positive long-term economic driver in the communities where we live and work. We continue to make significant progress in hiring host country workers, which advances economic development and education in the communities where we operate. In Indonesia, for example, nearly 90% of employees are Indonesian nationals. Working through the Corporation's signature programs, promoting women as catalyst for economic development, fighting malaria and improving education, we promote social development in communities around the world. Last year alone, we invested more than $10 million in promoting economic opportunities for women, $13 million in the fight against malaria, and $100 million towards education initiatives worldwide.

As we have said for many years, financial results and stock market returns, particularly for highly capital intensive industries are best viewed over long time horizons. An industry like ours requires sustainable risk management of cash and capital and long cycle times for investments to deliver results. Exxon Mobil has generated greater shareholder returns in the broader market and greater returns in the average of our competitors over the last 10-year and 20-year periods. Over the last decade, the S&P annualized return was 7% versus Exxon Mobil's annualized return of 12%.

I will leave you with the key messages shown on the screen. In summary, Exxon Mobil, your corporation is well-positioned to provide the technological and industry leadership to meet the world's growing energy needs in a safe and responsible way. Our current portfolio of assets and long-term investments are laying the groundwork for extraordinary opportunities for investors and we will provide the energy needed to fuel global economic growth and advancement in a very dynamic time. So, I want to pause for a moment and take a look at a short video, where some of you may have seen running on the television stations.

(Video Presentation)

So, now I would like to turn to the formal business of the meeting today. To begin, let me make a few brief remarks on shareholder proposals and voting. Each year, the corporation receives a number of suggestions from our shareholders. Some of these are in the form of proposals to be presented at the Annual Meeting, but let me just share you each is given careful consideration. We seek dialogue with the sponsors prior to the meeting when there is more time to better understand each other's position and very often we find agreement.

Let me be clear on the conduct of the meeting. Recognizing that the majority of our shareholders have voted by proxy and are not present, we have established procedures to facilitate the meeting in an orderly way. We have setup the process for speakers to identify themselves and express their views and we welcome those views. In order that as many shareholders as possible can participate, as Mr. Rosenthal indicated, we have set some time limits and a system to simply help you manage your time.

We have 8 items to consider. As Secretary Rosenthal said earlier, discussion on all items of business will be deferred to the discussion period. This will enable us to have some time for general comments and questions as well and conclude the meeting at a reasonable timeframe. For those of you, who wish to leave the meeting at anytime, let me express my appreciation for your attendance. Since we have a number of items yet to be discussed on the program and you have been sitting for a while now, I would invite you to take a brief moment to stand, stretch your legs just for a moment I ask to not leave the hall unless you absolutely need to.

Okay, you please take your seats. The first item of business is the election of 12 directors. I nominate the 12 persons identified on Page 17 through 20 of the proxy statement. These 12 people are highly qualified to serve on the board. All of our nominees are currently serving as Exxon Mobil directors. All board nominees are present today.

So now, I would like to ask the nominees here seated to my right in the orchestra terrace to stand as their names are called and then I will close the nominations. Michael Boskin, Peter Brabeck-Letmathe, Ursula Burns, Larry Faulkner, Henrietta Fore, Jay Fishman, Ken Frazier, William George, Sam Palmisano, Steve Reinemund and William Weldon. Before moving on, I also would like to recognize one person that is retiring from the board today. Ed Whitacre served as a Director of your company since 2008. And I'd like to recognize Ed and thank him for his service.

I declare the polls open for all who want to vote in the election of directors and the 7 remaining items. If you wish to change your proxy instructions on the election of directors or any of the other 7 items or if you have not submitted a proxy and wish to vote by ballot, they are available from the ushers. Please raise your hand if you would like a ballot at anytime during the formal business, they will be collected after all items have been discussed.

The next item on the agenda is the ratification of PricewaterhouseCoopers as the independent auditors. The Audit Committee of the Board has appointed PricewaterhouseCoopers to audit Exxon Mobil's financial statements for 2014 and we are asking shareholders to ratify that appointment. PricewaterhouseCoopers is represented today by Mr. Alan Page. Alan, would you please stand? Thank you. The audit committee's reasons for recommending PricewaterhouseCoopers appear in the proxy statement. I move the adoption of the proposal shown on Page 60 of the proxy statement.

The next order of business is consideration of the board-sponsored proposal regarding executive compensation. This board proposal calls for a shareholder advisory vote to approve executive compensation as required by law. The Board recommends a vote for this proposal as outlined on Pages 60 to 62 of the proxy statement.

The next order of business is consideration of the 5 shareholder proposals in the proxy statement. The first shareholder proposal regarding majority vote for directors is shown on Page 63 of the proxy statement. I understand Mr. Marco Vargas will present the proposal. Mr. Vargas?

Marco Vargas

Thank you, Mr. Chairman. I am Marco Vargas representing the United Brotherhood of Carpenters Pension Fund. Our funds collectively holds approximately 1,400,500 shares of Exxon Mobil common stock. We are committed long time owners. We appreciate the opportunity to gain an introduction, a majority vote shareholder proposal that we believe advances an opportunity in corporate governors. The governors appreciate the constructive dialogue, which we have maintained with Exxon Mobil representatives over many years an important corporate governance and executive compensation issues.

Our proposal is designed to encourage Exxon Mobil Board of Directors to adopt the majority of vote standard for the director selections despite the Board's opposition to minority vote proposal receive 46% vote last year's meeting. A majority vote standard used in the uncontested director election provides shareholders meaningful voting rights. The combination of minority vote standard with the company's current director resignation policy would establish a strong election standard. The resignation policy provides for a post selection process in which the Board can exercise its judgment and make decisions on continued status on any unelected director. Nearly 90% of America's largest corporations and all of Exxon Mobil's peer companies have adopted the majority vote standard in compensation resignation policy. Exxon Mobil remains the largest American company that has not adopted to majority voting. We urge the Board to establish a majority vote standard and join the mainstream of America corporations on this important election reform. Thank you, Mr. Chairman.

Rex Tillerson - Chairman and Chief Executive Officer

Thank you. The Board recommends a vote against this proposal as outlined on Pages 63 and 64 of the proxy statement. The next shareholder proposal to limit directorships is shown on Page 64 of the proxy statement. I understand that Fr. Michael Crosby will present the proposal. Fr. Crosby?

Fr. Michael Crosby

Good morning, Mr. Tillerson and the rest of you on the Board and shareholders. I am here to on behalf of Kenneth Steiner of Great Neck, New York to move proposal 5, basically shareholders recommend that our board take the steps necessary to adopt a bylaw to limit our directors to a maximum of 3 board memberships in companies with sales in excess of $500 million annually. So that's the proposal. And since Mr. Cynor and John Shalagan asked me to move it, I'd just like to say other reasons why from my perspective, this is a good resolution to support. And I want to back to what Mr. Tillerson said about the dialogue the company has taken with shareholders. We have a very good an informative meeting in New York with executives

around the issue of climate change and other issues. And they were forthcoming. We had disagreements on some agreements on other. But that was in December and you all know we've been here before, our ongoing issue is that the company isn't doing enough to address the crisis around climate change.

Now that was December. In March the intergovernmental panel on climate change, of which this company has part in it, said in effect first paragraph climate change is already having sweeping effects on every continent and throughout the world's ocean. Scientists reported Monday. That was in March. Then earlier this year, I mean earlier this month, the Congress of the United States issued a mandated report where it's more of the same in fact the world is at the door.

The effects of human induced climate change are being felt in every corner of the United States, scientists reported Tuesday. Our concern is that the directors, if they have too many outside responsibilities aren't going to be able to address the crisis we are now in. Crisis is here. The world is at the door, every one of us is going to have to find creative ways to deal with how do we mitigate the risks? Even the company has said, it's going to do that. So for this reason I urge support of this resolution so that all our efforts can find alternative ways to keep that low from blown down the house.

Rex Tillerson - Chairman and Chief Executive Officer

Thank you. The board recommends the vote against this proposal as outlined on page 64 of the proxy statement. The next shareholder proposal deals with an amendment to the corporations EEO policy and has shown on Pages 64 and 65 of the proxy statement. I understand that Michael Crosby will present this proposal.

Fr. Michael Crosby

Again I am Michael Crosby, Capuchin Franciscan. I am here on behalf of the New York State Common Retirement Fund to urge you to support the resolution of the New York State Common Retirement Fund, which holds 12,987,000 shares of Exxon Mobil. It believes the companies have a competitive a competitive advantage in recruiting and retaining employees from the widest pool of talent and the discrimination based on non-job related criteria can lead to less efficient business operations. It say over the last seven year a number of major U.S. corporations including a large majority of the Fortune 500 have agreed to add formal and explicit commitments to buy our discrimination based on sexual orientation and gender identity to their employee policy statement, partly say Exxon Mobil unfortunately is not one of these Fortune 500 companies.

The New York State Common Retirement Fund believes that Exxon Mobil has changed its policy and joined with the overwhelming majority of major U.S. corporations and supporting both human rights and more efficient business operations. And therefore on its behalf I submit the resolution to prohibit discrimination based on sexual orientation and gender identity filed in the proxy materials.

Rex Tillerson - Chairman and Chief Executive Officer

Thank you the board recommends a vote against this proposal as outlined on pages 65 and 66 of the proxy statement. The next shareholder proposal calls for a report on lobbying and has shown on pages 66 and 67 of the proxy statement. I understand Mr. Shawn Gilchrist will present the proposal.

Shawn Gilchrist

Our shareholders, we encouraged transparency and accountability in the use staff time and corporate funds to influence legislation and regulation both directly and indirectly. Absent a system of accountability, company assets could be used for objectives contrary to Exxon Mobil's long-term interests. Exxon Mobil spent approximately $30 million in 2011 and 2012 on direct federal lobbying activities. These figures do not include lobbying expenditures to influence legislation in states. Exxon Mobil lobbied at state level with at least 286 lobbyists in 35 states between 2003 and 2011.

Exxon Mobil is listed as a member of the American Petroleum Institute and CEO, Rex Tillerson is a member of the Business Roundtable. In 2011 and 2012, the Business Roundtable spent more than $31 million on lobbying. Exxon Mobil does not disclose its memberships in, or payments to, trade associations, or the portions of amounts used for lobbying.

Corporate lobbying exposes our company to risks that could affect the company's stated goals, objectives, and ultimately shareholder value, and we rely on the information provided by our company to evaluate goals and objectives, and therefore, have a strong interest in full disclosure of our company's lobbying to assess whether our – whether our company's lobbying is consistent with its expressed goals and in the best interests of shareholders and long-term value. Therefore we encourage our board to prepare a comprehensive disclosure related to direct, indirect and grassroots lobbying. Thank you.

Rex Tillerson - Chairman and Chief Executive Officer

Thank you. The board recommends a vote against this proposal as outlined on page 67 of the proxy statement. The last shareholder proposal calls for Greenhouse Gas Emissions Goals and has shown on pages 67 and 68 of the proxy statement. I understand that Mr. Patricia Daly will present the proposal. Mr. Pat.

Patricia Daly

Thank you Mr. Tillerson, good to see you this morning Mr. (indiscernible), thanks again for that meeting, the Crosby referenced and continued dialogue. Good morning members of the Board of Directors, it's great to have you here and I appreciate these couple of minutes.

I represent my congregation the Dominican Sisters of Caldwell, New Jersey, also the American Baptist churches and about 40 institutional and individual shareholders, longtime shareholders in Exxon Mobil, some of them also longtime shareholders in Mobil. So I am here to move the resolution, we've been here for many years, about seven or eight years I think now asking our company to give us the business plan, to set goal to reduce screen definition in both operations and in product. Mr. Tillerson, I believe you started with Exxon in 1975 that is the year I entered the Dominican order, life has changed. That year ICCR members, we interface center on corporate responsibility, had shareholder resolutions about South Africa at both Exxon and Mobil.

We've been working with our company since 1996 on this issue, even longer with some other companies. Since then we have an additional 1.6 billion people on this planet. In 1996, there were 370 plus million of carbon in the atmosphere. Today we have well over 400 parts. Scientists tell us that 350 is the number to maintain a safe, loving environment. I think a lot of storms, right. But it's no longer about the storms, it's about food system on the planet, it's about water, it's about issues, it's about ocean life, it's about sea levels an incredible shift to this planet. Father Mike referenced the U.S. climate assessment report mandated by Congress how desperate that report now comes.

Back in 1997, our resolution that year asked for a report on climate risk, environmental liabilities. We are so grateful that our Board and our management has given us this report this spring. However, I am also concerned we took 17 years. So we have to report we are working on it, we work together, but our company continues to rely on a bid that the nations of the world will be nothing about climate change for the next 30 years.

I am working with the auto companies in the United States. They worked with the EPA to establish realistic new goal fuel standards, but they need the oil and gas industry to deliver the fuel, the cleaner fuels in order to make this happen. Our business plan impacts all businesses, not just in the United States, but around the world. It impacts people's lives around the world.

I am seeing now that investors, major investors around the planet are now shifting money into the clean technology, the new businesses that we need. I know some of your board members, Mr. Weldon we have worked together with JPMorgan Chase. Mr. Reinemund is on that board. The financial sector we are witnessing a massive shift into new technologies. We need to step up to the responsibility as the nations of the world next year prepare for a new climate treaty. Retirees today depend on our business in the next 20 years, but employees today depends on the success of our business for the next 15 years and is got to be making the right investment.

I have a cousin who is about to start an engineering degree. I haven't seen kids yet who are looking to go into the oil and gas business. The creators, engineers ongoing to the alternatives, we have got to be moving more money into the alternatives. Please give us the business plan to be able to pull that cost. Mr. Tillerson, thank you very much. Everybody, thanks so much for your time and patience today.

Rex Tillerson - Chairman and Chief Executive Officer

Thank you. The Board recommends a vote against this proposal as outlined on Pages 68 and 69 of the proxy statement. All items of business have now been introduced. I invite many of you that want to stand and stretch your legs for a minute and for those of you who wish to address the meeting in the discussion period this should be a good time to make your way towards one of the hall seat, so that you will have ready access to microphone. So, we will take a stretch for a minute.

Okay. If we could resume the meeting, you take your seats please? I now open the floor for discussion on the items of business presented. I would ask at this stage of the meeting that you limit your comments through the Board and shareholder proposals that are in the proxy statement as promised will have an opportunity for general comments or questions later. We received a number of questions on proxy cards and through our websites. And again, as I indicated as time permits, we will try to address some of those as well.

So, as described earlier, if you have not already done so, if you could get near an hall seat so that you are near the microphones and if you would remain seated until I call upon you, but simply raise your hand, holding your speaker identification card to indicate you like to address the meeting when I recognize you, please give your speaker card to the usher, stand and he will hand you a microphone and the microphone will be made live at that time. Again, I would ask that you keep your comments as brief as possible, so that we can allow as many people to speak and wish to do so. We will continue to use the lighting system just to help you manage your time. First priority will be given to those who have not spoken yet. So, let me begin over here.

Question-and-Answer Session

Frank Rauscher - Aquinas Associates

The topic is climate change. My name is Frank Rauscher. I am Senior Principal of Aquinas Associates in Dallas. I am here on behalf of the Christopher Reynolds Foundation. The foundation withdrew its resolution report on climate change assumptions is for strategic planning following constructive discussions of Corporate Secretary, David Rosenthal and his colleagues on December 17, 2013. And subsequent discussions and exchanges of letters have resulted in Exxon's energy and climate report posted on your website and what you also have available out in the lobby. Mr. Tillerson, you will recall that in your talk to the (indiscernible) June 12, 2012, you said we have to be efficient and we have to manage climate change, but we also need to look at the other side of the engineering solutions, which is how we are planning to adapt to it. And there are solutions it's not our problem we can't solve.

One year later at the City Club of Cleveland in June 14, 2013, you raised another issue, having climate change is a risk management problem, what am I going to do about it as it turns out that (indiscernible) mitigation steps make the difference, what's plan B. Plan B means you will start thinking about which kind of that (indiscernible) necessary of the consequences that people are concerned about present themselves. Since the December 2013 meeting, several significant reports have been released pointing to the urgency of addressing the methods between the energy and climate. As you know, these include the report of International Panel of Climate Change, the U.S. Climate Change Assessment and the CNA Military Advisory Board report on national security of accelerating risks of climate change. And we will also see the nexus of energy and climate change as important. Exxon Mobil's March 31, 2014 energy and climate report to shareowners prepared response to the Reynolds Foundation's resolution states that Exxon Mobil delays the changes to the earth's climate including those that may result in anthropogenic pauses of the risk. And in order to address this risk, we are starting to consider economically efficient policies that includes the mitigation and (indiscernible). And that balanced reduction in climate risk with other global developments will need including the need to sustain and provide glory in populations.

Mr. Tillerson, what are the steps that you and City of Exxon are going to mitigate their risk of climate change? If these steps are not sufficient, what is your plan B, which you observed at the Cleveland requires that you know? How is Exxon Mobil using its resources to address the world's biggest energy challenge how to meet global energy demand while addressing the potential disastrous impact to climate change on the global economy and/or generally in the whole global community? The March climate in energy report was a good beginning for a dialogue, but that may answer all these questions. We look forward to continuing dialogue, which we had agreed with your colleagues on these energy climate issues. And Mr. Tillerson, we look forward to hearing more directly from you on how we together can and will meet this challenge? You are the leader of the company and we expect your good participation sometime soon. Thank you for the opportunity to address today's meeting's first dialogue.

Rex Tillerson

Well, thank you Mr. Rauscher and thank you for being here on behalf of the Christopher Reynolds Foundation. As you indicated, we have published two reports and those are available to any of you who have not seen those, they are available in the print material that's out in the lobby area, but they are also available on the website. And we also appreciate the dialogue we have had. And I think as we have said for many, many years now and as you have properly characterized my comments in various forms, we do view this as a risk management problem. And I think for a long time all we were talking about whole conversation was about how are we going to stop greenhouse gas concentrations from reaching certain levels in the atmosphere. And my view of that was multiple fold and I have shared with this audience before in past shareholder meetings that achieving certain levels that some suggest had to be achieved. There is no one today that can map a viable pathway to achieve that, no one. No one has a viable pathway to get there. It doesn't mean we shouldn't strive.

And I think the steps we are taking as a corporation are enabling at least progress towards mitigation. Our expansion of natural gas portfolio to displace higher carbon intense forms of power generation fuels to the lower efficient to higher efficiency fuels that we are producing for transportation sectors, for industrial uses are lubricants, our manufacturing of lightweight high strength plastics that displace heavier weight materials, more efficient to produce lighter weight, improve energy efficiency. I think as we have long said that the first and important step to every consumer, whether it's an individual consumer and industrial consumer should be taking is to look at your ability to utilize energy more efficiently, smartly, because then you carry out your same activity and have a lower overall impact.

But even when you take all of those things in consideration in our energy outlook, we project what we think the effects of those are is still very difficult our map a viable pathway to certain concentrations that some people's models indicate or desirable. So, a few years ago, in recognition it's a risk management problem, the way you deal with risk is you take the steps you can to mitigate, but recognize you cannot eliminate the risk or certainly you can't eliminate all of it. So, you should be spending some time thinking about well, what if everything I am doing even it doesn't work or what if it turns out the reasons for all this happening aren't what we thought they were, but the end result is the same. How are we going to deal with that?

So, as part of prudent policy discussions, we have begun to promote the dialogue around we think you have to think about this problem with both of those areas in mind. So, that's the genesis of the conversation. And as we have looked at our own operations, we take a very broad view to where we can harden our assets, harden our facilities and we learned a lot through some of the terrible storms we have been through the Gulf Coast. And so where we see opportunities to do so we are hardening our own facilities and assets, but I think importantly we are also investing in those forms of energy delivery that we know will help with the mitigation as well.

I think you rightly acknowledged this is the most complex area of scientific and social conversation anyone is having today. It is extremely complex. And it is one that there is not going to be a ready set of solutions that are going to fit the world's peoples, because the world's peoples all have very needs at this stage of their development, which is why it makes it so complex. So, we all – we do support and engage in and we will continue to engage in active dialog. And we are going to continue our active engagement with UN's Intergovernmental Panel on Climate Change. We have been actively engaged in that panel now for almost two decades with our own scientist, peer reviewing their work. So we are keenly aware of what that work is indicating. We are going to maintain our engagement with that.

So, I think it's something that the ongoing dialogue is important. People need to be examining what the various pathways to mitigate are, but being realistic, if those don't produce the outcome, we won't – how we don't deal with it. And I am a – this is a technology driven company. And so we have enormous faith in the technological prowess of the human mind in the innovation, because we have seen what is producing all of our lifetimes. And I am as confident about the things we do today that I never dreamed we would do 30 years ago. I am just as confident that the solutions to a lot of these problems, the same technical innovative minds will deliver those as the problems present themselves. And people are actively working on that. So, I appreciate and take the dialogue important. We take it seriously. We appreciate the engagement and we intend to continue that dialogue and engagement. I wish there was a simple list of things, I can tell everybody to go do. It's just a little more complicated than that, but thank you for your comments. Yes, the lady in the blue right here.

Unidentified Analyst

Can you hear me?

Rex Tillerson

Yes, ma'am.

Unidentified Analyst

(Question Inaudible)

Rex Tillerson

Yes ma'am I think I know where you are going you would like some help.

Unidentified Analyst

Well, I need to tell you or (indiscernible).

Rex Tillerson

And this is the man who I hear that can help you.

Unidentified Analyst

Now he is not. I have contacted you. I have contacted everybody we have now gone through district court filing a case district court then said I had to do. I had probably give (indiscernible) agreement. And then that I was granted if I had to turnover this year to the district court then Exxon Mobil computer share through it out and next to the appellate court a lawsuit in appellate court (indiscernible) how many people and power taxes on the appellate court that we have connection with Exxon.

Rex Tillerson

I don't know.

Unidentified Analyst

And actually you signed out (indiscernible) anyways make a longer chat and no one pays my turn. I finally gave her let's say $21,000 to get those shares put into the chart. Then are we moving some right CE choices which we have encountered and that was a pullback situation as they moved me into the business and commerce I couldn't pull back will so I paid $21,000 to get 8000 shares that my mother bought.

Rex Tillerson

This gentleman right here, right down here.

Malcolm Shaw

Mr. Chairman I'm Malcolm Shaw from Dallas, Texas. This question, what is the minimum expected production per day that we would require before we drill a well?

Rex Tillerson

Well, that depends on the cost of the well, depends on the resource we would expect to recover and the physical regime, the taxes we would have to pay. So, it vary literally varies around the world and varies from state to state.

Malcolm Shaw

Well, a 100 barrels a day, would that be.

Rex Tillerson

If you had a 100 barrels per day but you're only – you're going to recover 1000 barrels, we probably wouldn't drill that well. So, I just want to say it's not a – it's much a production right alone if it is all those other factors. So, there is not a single, there is not a single answer.

Malcolm Shaw

Okay. This is second question. I'm noticing that Russia has signed a pack with Cuba to explore their fields and that's in our backyard. I see that we are in China and we're off the coast of Angola communist countries. If there any way that we can drill down in Cuba has to grow their share until the state department approves?

Rex Tillerson

Well, the current sanctioned law of United States will not allow us to participate in any activity in Cuba. There has been limited exploration wells drilled offshore Cuba, none of them have been successful. So, it's questionable as to what the resource potential offshore Cuba is, that's not been confirmed by anyone at this point.

Malcolm Shaw

My last question. On Page 3, of the Annual Report gives your picture, where did you get that green tie?

Rex Tillerson

I don't know if I had a green tie, maybe that would be Photoshop. I'm constantly wearing a wrong color of tie to the photo opportunity. So, they have learned to Photoshop my tie color. Yes, sir, right down here in the front.

Unidentified Analyst

Thank you. (indiscernible) I will be back here. First, I want to say is thanks to you and all of the companies for doing such a fine job with everything you do, I mean you make money that's in the game. So, thanks for doing that. However, I have few other comments, number one is I talked two years ago about having more females on the Board of Directors, you still have only two females, 17% that's not really very great. Mary Barra is now CEO at GM. We got people out there, there is a lot of females around. If you look at some of statistics I have some from the UK and so that companies with more woman than boys were found to outperform their vitals with the 42% high return out in sales, 66% higher return on invested capital, 52% higher on equity.

I'm not sure if the numbers are right but they're not 2%, 5%, they're big numbers. Also, I suggested two possible females for the Board of Directors to your company already, one of them is in Dallas, I have seen they're happy with that, I'm not sure we're going with it. I really think we got to have more females and not only for Board of Director but also to the management of the company. So, I hope you appreciate that and maybe we'll talk about this in future years.

The second thing is I also support the PVL policy having another 6, I think both for GE, LGVT people made progress with you in terms of now allow them to have benefits because they're part of them. So, we're somewhat there, yeah I was sort of shocked because I thought with that's ruling that you are forced to do certain things, you do certain things, did you did anything else besides there. So, we're going to so far not the other way. It so reminds me of the boys scouts that you and Bob made several years ago, they now have allowed girls in that girls scout in the troops so they made progress, I like to see that make more progress also. And I do here some other comments that you want to right now things on the proposals correct?

Rex Tillerson

Correct.

Unidentified Analyst

Thank you, sir. Appreciate it very much.

Rex Tillerson

Thank you. Right here. Yeah, you're right here now. Yeah.

Julian Martinez - SER-Jobs for Progress National

Thank you, Mr. Chairman. My name is Julian Martinez, now represent SER - Jobs for Progress National. SER organized 50 years ago in Texas to assist Hispanic community a careful and find the economic opportunities. SER has expanded their services in to many other areas and provides these service in a cross-air country serving over 1.3 million people a year. Exxon Mobil has been a part of SER and we would like to take this opportunity to thank you for SER and Hispanic community. A special appreciation recent participation in our 50th Annual Conference a few weeks ago here in Dallas.

They were often and SER has experience in a emblem. And changes right in client side. We have shared these moments in early 2014 as SER client American branch will allow us to Ad during the Super Bowl and Olympics they range above one voice over call than U.S. They do their market research and look their numbers, they know how fast the country is changing. As you may know, the Hispanic community is increasing dramatically. One in four children in the U.S. are now working home and the number of Hispanics home businesses grew by 44% compared to 15% for non-Hispanics firms. The combined Latina population of U.S. is greater than the total population of Canada and greater than any of Latin countries except Mexico and Brazil and would be the world's 14th largest economy.

We are not sure that Exxon Mobil gets there. You have no Hispanics on your Board of Directors and your involvement in the community has been rather limited. We welcome and we would ask that you consider having an Hispanic Board Member as your next opportunity. Thank you.

Rex Tillerson

Thank you. So, back here in the back. Yeah, first one, right there.

Unidentified Analyst

Hello, Mr. Tillerson and congratulations in fellow stock awards. And then would you admire from batteries of Louisiana. I like to make a few comments. The energy industry working through the API has been filed to work along the side the fab unions such as the billing trade to support sound pro-growth policy. We want the best trained and best qualified workforce in the world period. An on going action has been on improving job of training programs for industry, the challenges of the 21st century means that the business leaders must take their highest priority to technical labs of workers and the surrounding community. I hope these words now familiar as those were the mocks made by you in the speech on the March 11th in Russian DC at the North America's Billing Trades Legislative Conference.

In batteries, we would like you to encourage human resources to move to involve the union wealth the United States Steelworkers, United Steelworkers in training our employees to be the highest field in this competitive environment both in the refinery and the chem plant. The Union has important points on views on what it takes to work in this hazardous environment. Also, what is required to head with steel you needed to do the jobs they do. United Steelworkers shares your view on offering cooperative union management relationship, would like to assistance to emphasize both the needs to work together to improve the batteries facility. The employee those that would be skilled in required to work in the facility. They've been doing it and have been doing it for over a 100 years.

The Union wants to bring the mentality of safety and best trained employees as part of addressing the safety concerns in a cooperative joint health and safety committee where management views of the Union can work together to address the concerns of this aging facility. We would appreciate your help in getting the facility to become one of the best and safest workplace in this competitive environment. Thank you for your time.

Rex Tillerson

Thank you. Other comments on the shareholder proxies, any other shareholder proposals. Sister Pat.

Patricia Daley

Thank you. Pat Daley again from the Dominican. Mr. Tillerson, we chatted a couple of times that your support for carbon tax, and it doesn't surprise you that I revoted in favor of the report on logging. Could you tell us how, what kind of conversation you're having around carbon tax, I think it's probably a simpler option than carbon trading and other SKUs. But, again can you tell us how Exxon Mobil is spending lobbying dollars on, some kind of your solution to be able to deal with the policy around this?

Rex Tillerson

Well, the kind of dollars that would show up in our lobbying report is an allocation of – in terms of me my direct time. Any time I go to Washington and engage with any policymaker to whether they would be elected legislators in the Congress, the executive branch and whatever form we log that time and that goes into the report. So, the conversations that I've had really over the last several years have been with a variety of congressional leaders, leaders of both parties, chairs of the relevant committees, I've had conversations with state department, energy department, the interior department, around policy choices to deal with the issue.

And my view has remained unchanged. I always preface it by saying if policymakers come to the conclusion that they have no other ways that they feel they can deal with influencing the behavior, the choices that people make around their energy consumption and you are considering various schemes by which to do that, and the most profitable ones are various forms of cap and trade policies, our valuation of those alternatives suggests that a carbon tax is the most efficient way to implement policy design to influence behavior.

So, our engagement, we talk about why we feel that way to pros and cons of trading systems which we have a long term test and experiment that is going on in Europe now for quite a long time. It's not produced a very good result because Europe carbon emissions are going up while in the United States carbon emissions are going down in the absence of any policy.

And I think it's important that we not take that lightly. So, our conversations have been prefaced first by you need to understand what that means for economic performance for the US economy or economies anywhere in the world when you impose any added cost to the system, first you need to ask yourself what does that mean for the economy and who bears the largest burden in that. And our view continues to be that when you impose a cost like that in whatever form on the economy, those less able to bear it end up bearing it, the poor, the lower middle class. So, we don't really believe to that point that we have to do that. But if you don't want to go there then we sit down and talk about our view that this is the most efficient straightforward fairest way to try and influence behavior.

So, those conversations continue because – I know you are well aware, there is a lot of conversations goes on in Washington about what should, what kind of policy choices should be undertaken. And we remain as actively engaged in those as ever. Other comments on proxy, Robert?

Unidentified Company Speaker

I would like to speak to the lobbying issue as well. And I read with interest this March article kind of a lead article in BusinessWeek, the Petro States of America and in effect it is saying that this company and the industry have the control of what happens in the United States Congress in terms of legislation. That's why they titled the Petro States of America. And as the small sections, big oil swale the Washington, makes the US a petro state in all but me. When I look at that, and then look at other data, I see that according to the centers, the majority of Republicans don't believe that there is climate change, 90% of this company's political contributions are going to Republicans. So, on the one hand in this place we hear you saying there is climate change, the burning of fossil fuels are a human factor contributing to it, and yet we are going to support those very entities that are undermining the reality.

When I look at the power of lobbying and you see what is going on, you see that the new campaign that the company has that was in Wall Street Journal, USA Today, you have all seen it. And I would give anybody $1 on the floor here if you know what this campaign is really saying I could give you a dollar because I have all the property, I can't get much more. Now what has this campaign said Exxon Mobil says there is climate change. There is global warming, the burning up fossil fuels are contributing to it and we got to do something because the world is at the door everybody in the United States would know that we got to do something. This is doing nothing.

This company, the Board of Directors and management have to do something to change. I read in our disciplines I read what you said there is 10 million acres this is what you said 10 million acres are under North American production which is business as usual. I had a Baptist among Sunday here in Arlington and the father is in the second biggest solar company in the United States based here. And if the costs are going down so fast and I thought what if we had 10 million acres in solar. I think they are trying that we got to make choices when we are facing this kind of a crisis. And so I urge you to use your suasion in advertising to let the people know it can't be business as usual. Thank you.

Rex Tillerson

Thank you. Over here.

David Martino

Chairman, my name is David Martino, I am a geologist and I am against between house gas I voted against it. It is interesting to note that the term global warming is now called climate change. You know why this is because the temperature has dropped one degree in the last 10 years. They do not want to recognize that 800 years cycle has been going on for ever and ever. Carbon dioxide is a vital chemical compound that every plant needs to live and grow on and it synthesizes the oxygen for all humans and animals to live on. The main cause of carbon dioxide believe or not is volcanoes and people do not want to recognize it. And so book put out by Professor Ian Plimer, he is from Australia and he says the amount of carbon dioxide actually that comes from volcanoes is what's causing all the problems, it's not the work, it's not all of the greenhouse gas guys that want to say shutdown this. You got the carbon tax they were talking about is really kind of interesting. Our current administration wants carbon tax because he wants to raise money to give to the poor who will vote for him and it's not for anything else (indiscernible). So we are not going to change the global warming concept which is now called climate change and I hope everybody voted against your recommendation.

Rex Tillerson

Thank you.

Jack Fuller

Good morning. My name is Jack Fuller. I am here from (indiscernible) Texas a City of 1,000 people. We do not have an Exxon or a Mobil station. I moved to Harrold two years ago from the city of Odessa, Texas well over a 100,000 people which also does not have one Exxon or one Mobil station. We used to have a large humble pipeline company there your Exxon Mobil Pipeline now. I am wondering why we cannot have an Exxon station there had the people of Odessa done something to have the end the company. We could drive 25 miles, 30 miles over the midland and they have got over Exxon station, three Mobil stations why can't we get the world's best product in Odessa. I would like to know that and if you don't know the reason then shame on you folks because...

Rex Tillerson

I am sure one of these folks I have stated notes for the branded wholesale organization to get right on that, thank you. Any other comments on shareholder proposals. We are seeing none. I think all the items of business are now being covered. If any of you have proxy cards please hand them to the ushers at this time. Those of you who have already returned your proxy cards need not vote by our ballot unless you wish to change your vote. If you do wish to change your vote, simply mark the appropriate sections of the ballot. The appointed proxies in attendance today hereby cast all votes, which we have been authorized to cast in accordance with the instructions indicated on the individual proxy cards. If you have proxies please pass those to the ushers in the hall at this time.

Since proxies and ballots have been collected, I now declare the polls closed. While the inspectors of elections are preparing their preliminary report, I will answer a few more questions regarding Exxon Mobil's business or I will have time for further comments. I will interrupt this discussion period when the results are available so that we can report those to you. So for others who have questions or want to address meeting, I will take your comments at this time.

Unidentified Analyst

Mr. Tillerson, Directors thank you. Just to give you a perspective you started the company in 1975. I was born in 1975 and these shares that I vote today I vote in trust for my son who has born last year. So thank you for making money for all of them. In the presentation you highlighted several Exxon Mobil Russia projects, how Exxon Mobil avoid the political difficulties especially in light of recent events that other companies such as BP has experienced there in Russia? Thank you.

Rex Tillerson

Well I can't comment on issues other companies may have had because I don't would not have sufficient knowledge, all I would tell you is we have operated successfully in Russia now for almost 20 years. We have been in Russia conducting various joint venture activities producing successfully offshore multi-billion dollar investments now for about 8 years. And we

are continuing to expand that project as you may be aware. So that kind of relationship is built over many, many years of the Russian government, our partners understanding the way we conduct our fairs and them understanding the expectations that we have for our joint venture to conduct itself. And I would say we are extraordinarily proud of what we have been to accomplish in Russia.

They have been very good partners for us. So our work force there is also roughly 80% Russian national. In terms of the politics that surround events of the day, I view it as not different than a lot of places we operate in the world have difficult and a complicated social and geopolitical forces surrounding our business. And part of the risk management when I talk about we are in the risk management business and there is elements of risk in essentially everything we do. An important element of risk that we manage is geopolitical risk. So one of the ways we manage that is through our geographic diversity by having your money, having the corporation's money invested broadly around the world. So that while all of those investments are important to us there is no single investment that's going to sink the business so to speak. We are very resilient and can withstand a lot of things and we have been through sanctions and countries before regrettably, we do not support sanctions generally because we don't find them to be effective unless they are very well implemented comprehensively and that's a very hard thing to do. So we always encourage the people who are making those decisions to consider the very broad collateral damage of who are they really harming with sanctions and what are their objectives and whether sanctions are really effective or not.

So in the meantime all we can do is continue to live up to our obligations and our commitments in all countries around the world where we operate and hold our counterparties accountable to live up to their obligations as well. I would tell you thus far the situation surrounding abates in Ukraine has had no impact on our ability to conduct our fairs in Russia and there has been no change in anyone's posture towards us. I think it's a very valued relationship by both parties and we are hopeful that that will continue for many years to come. Yes sir.

David Ridenour - National Center for Public Policy

Good morning. I'm David Ridenour, President of the National Center for Public Policy Research, a free market think tank. My wife and I are a long time shareholders. (indiscernible) in last year at this meeting I commended the company for bowing to leftwing demand (indiscernible) to the American Legislative Exchange Council. We continue to commend you for that. But today I want to kind of go in the other direction. Our think tank once received contributions from the company. These contributions ended after the company told us that it would not continue to contribute unless we adopted a more alarmist position on the climate change. We declined of course.

The company has sharply reduced donations across the board of free market organizations that promote same tax in regulatory policy which is in your interest. But judging from the protesters outside this morning, you haven't really convinced a lot of people and you haven't won a lot of friends. I bet not even one from around the leftwing groups. Even if the company declines the supporter organizations it agrees with as it once did, why is Exxon Mobil not doing more on its own to tell the American people the very compelling stories about this industry? Where is the risk for example in putting stickers on gasoline pump showing consumers how much the price of a gallon a gasoline taxes, how much is production and how very little is actually profit out of that? That information is on some websites that people just don't read those websites. They do go to gas stations.

One of our individual supporters for many years is the late Raleigh Warner who was CEO of Mobil Oil. Under his leadership, Mobil invested heavily in very effective advocacy advertising. If a similar but modernized strategy were employed today, millions could learn how fracing has reduced CO2 emissions dramatically and about the company's engineering marvels that safeguard the environment. You could describe who gets, hurt the most, lower income people who disproportionately are minorities when regulations and taxes make energy prices higher.

You once said, "We have a society that by and large is illiterate in science, math, engineering. What we do is a mystery to them, and they find it scary. Because of that it creates easy opportunities for opponents of development, activist organizations to manufacture fear." The company could reduce that illiteracy and stamp out a lot of that fear if we used an updated version of Mr. Warner's playbook to tell Exxon Mobil's compelling positive story.

This company's products make this country work, less, start powering under the table and tell that fantastic tale. If you and we aren't proud of our product and act like it, why should anybody else. So, I would appreciate any comments you can offer on that. Thank you very much.

Rex Tillerson

Well, thank you for your comments and your confidence in the company of what we do is you're saying a large portion of our efforts over the last two to three years have been to begin to elevate the public's awareness of how important energy is in their daily lives, in order to have them be willing to engage in a next level of conversation about why these things are important and why these issues are important. But I take your comments seriously. It is one of our great challenges is how to engage the public broadly in issues that are often times complicated and mysterious to them. I can assure you we do not shrug from that and we have a very large coalition we call the Speakers Bureau of individuals who speak in their local communities. They speak to Kiwanis Clubs, they speak to Rotary Club, the PTAs, the Chambers of Commerce, and these are our employees. So they know the business better than anyone in order to put that face out there to engage with local communities and address the concerns and questions they have. That's an effort we'll continue. But it's something that we just have to continue to work at daily. And it is always a bit of a judgment of where do you want to set the dial on trying to help people understand this.

So, I take your comments, again seriously and I welcome them and I thank you for your support. Right down here.

Unidentified Analyst

Good morning, Mr. Chairman, Mr. Rosenbusch and all the directors. My name is William (indiscernible) I am from Massachusetts. And I have been an investor in Exxon Mobil for over 30 years. And first I want to thank all the Exxon Mobil employees past and present for all the good and hard work. The current administration in Washington isn't business friendly, especially the companies like ours. There continues to be a push by large universities to divest their multi-billion dollar endowments away from fossil fuel companies. Two other most recent institutions do so make that announcement, Harvard University as well as Stanford University. Can you speak to what Exxon Mobil is doing to support the clean energy movement, and what do you think is possible could you get a percentage of what you think the business will be that supports clean energy towards around 2040. I know it's very difficult. My second question is price per barrel is over $100 and what price does the barrel have to drop to, to continue to support if the lowest price has to drop to the continued selected dividend, thank you.

Well I have to be very careful commenting on prices or walking close to that question in any form, the US justice department takes a great interest in anything I say about this. So I will have to defer on that. All I would comment is that I think we have structured the company financially with the investments we have made to give us a very healthy cash flow. And we have a lot of doves and levers and mobs we can turn and push and pull to ensure that we can continue to deliver the kind of dividend performance that you come to expect of us. We are certainly committed to do that. I think in terms of the clean energy component and again if you look at the energy outlook and I had a slide in here that showed our expectation is that renewables, solar, wind other forms of what people would I guess put in that category, clean energy are going to grow their rates of growth that are two to three times faster than the rate of growth of traditional sources of energy. And I think that's reflective of the pull for that. Its reflective of a lot of regulatory mandate governments require utilities to have a certain component of renewable energy so they have to go out and get it whether it makes economic sense to them or not. So it is driven by a number of factors which we expect are willing to be with us for quite some time. As I think I have commented in the past week, continually evaluate the full landscape of all of the new sources of energy supply including those we have actually been in some of those lines of businesses before. We think thus far there has been no technology breakthroughs, doesn't look like they are particularly promising on the scale basis without a lot of government support mandates and regulations.

And which is not – I prefer not to invest in opportunities that live and die by government mandate. I could what the government gives and just as easily take away the next day and you got a non-performing asset. And in fact you have seen a lot of our competitors who put a lot of money in to wind and solar taking numerous write downs of those investments we didn't mark out. So we stay with what we know best which is all natural gas, petroleum, petrochemicals and we stick with technologies to help consumers use it more wisely, use it in a way that's less impactful to the environment and we continue working technologies that allow us to find ways to deliver that to the consumer. That's the things we know how to do best, but we have a very significant resource organization that has its fingers and hands on everything that is emerging out there because we certainly want to know about it for something that looks promising we have the way with all to enter anything which used to.

Jim Markham

Yes, my name is Jim Markham. I enjoyed a 13 year crew with Exxon Mobil. I am a college young engineer. And I am very proud of the brand. And my question is actually the offset of this gentleman have we ever considered taking the Exxon Mobil name off the street. Now that we have gone to the distributor brand, wholesale brand, we no longer the steward of our brand and here just locally our service stations will stay within $0.2 to $0.3 of competition and now that we have sold these locations to 7/11. We would sometimes with $0.21 off on the street. I am loyal, I will continue to pay it, but its very difficult that most folks don't know that we no longer own those facilities or run those facilities, and we have given our brand to other folks to be the

steward of that and it's a reflection of the brand. And I am very proud of the company and by seeing that that to me, just it's frustrating I would rather not – it's the retail pieces within U.S. marketing it's because it's marketing we put our name on the street to market it. It's really not that big of a piece of the business and I was just wondering if we ever considered that? Thank you.

Rex Tillerson

Well, we constantly evaluate the value of the brand to the consumer. We have included and in fact the business model confirms that there is significant value of the brand. And the agreements as we move the brand in wholesale models we do have specific provisions to protect the brand because the brand I think the point you are making is it's us, it's still us. And so we do have a fair amount of control over the quality of how the brand is presented to the customer. And we have a team of people that monitor that on an ongoing basis including digits that are unexpected, mystery, buyers programs they call them where we go on and test the quality of service. So I would take your comment and just to show you we do monitor that very carefully as we moved to this branded wholesaler model.

In fact the matter is and it's kind of interesting and that's why I had (chocolate), the Odessa and because the number of branded Exxon or Mobil retail sites has gone up since we exited the retail business and went to the branded wholesale which again an indication of how people out there value that brand and want our brand. They have changed from brands they were tied to before, put our brand up because they find it more attractive to their consumers. So we monitor very carefully. So far we are very pleased with the progress of the brand and wholesale model but your point is an excellent one, it's us and we got to protect that brand and we do take that quite seriously. Yes.

Unidentified Analyst

Hi. I am (indiscernible) and I wanted to ask you something about hydraulic fracturing and with one thing – a couple of things. One is on the Halliburton loophole and I was noting that Exxon Mobil talked about that we went to be clean and responsible and that some other companies are not doing so well or as well as Exxon Mobil and would you be in favor of stronger regulations that would require maybe the dirtier players to do as well, so that it wouldn't be an economic disadvantage to the companies that are doing right things. And the other question is regarding to the water waste from hydraulic fracturing and the water used. My family has a ranch in South Texas and water down there is a very precious commodity as it is worldwide. And I know that they are developments but not really seeing much of that happening in the field in terms of using other materials to do the fracturing and to have another way to deal with maybe recycling it, so it doesn't have to be injected and some of those injection wells as you know are causing some earthquakes so could to (without) that frankly? Thank you.

Rex Tillerson

Certainly I am not sure I am familiar with the Halliburton loophole whether that has to do a frac disclosure or not. But I think you have touched on a number of the important elements. And one is how do we lift the performance of the entire industry to level the gears to public and the communities and the neighbors confidence that we can carry those things out and it would be done safely. I think the standards exist, the API has standards that are published the IPAA has standards of the Independent Petroleum Association that they have adopted. And by and large the regulatory structures at the state level are quite effective. And Texas has a very mature regulatory structure because the business and the industry has been ongoing nonstop. Pennsylvania has had to do some things to catch up because the industry activity had gone to a very small level and then suddenly exploded with the Marcellus shale. But they have at least stepped their regulatory capabilities. And in fact you may recall that Exxon Mobil announced that we in partnership with General Electric are putting $1 million each to fund programs that state universities in Pennsylvania, Oklahoma and Texas, I think Colorado, I'm sorry and Texas to train more regulators and what is the process called hydraulic fracturing. What are the risk that you need to be aware of them, what are the things you need to worry about in the regulatory oversight. So, I think all the elements are being put in place and so how do you lift the performance of those that may not be rigidly and rigorously applying the standards that we know if those standards are followed, you're not going to have any issues and problems. I think that comes with enforcing the regulations. The regulations provide a many of these standards to be met and if they're not being met, the regulator needs to deal with that.

I don't, we don't think there's more regulation needed other than the regulators have better need to provide that oversight. And in some cases, they do need some additional personnel. And so, I think that is the best way to lift the competitiveness of all others. And then within the industry, a lot of us are in joint ventures where we own a piece of the acreage and someone else

owns a piece and we might have made it operate that. We can hold them accountable to the standards that we're not operating and we do. On the issue of water maintenance and you notice that I added the chart this year on water because it has become such a crucial element for many parts of the country and the world.

We are advancing in the levels of recycling in frac water and produced water as you mentioned and that's probably the quickest thing we can do in areas like Pennsylvania where people concerned is much not so much about the water supply they are about the water disposal. But, in areas like South Texas and parts of West Texas where water is scarce, recycling of the water is keenly important. And we have ways in which if you have enough volume, so you can bring it to the central location, clean it up and reuse it. The other non water type fracing technologies continue to evolve and there are a number of processes that we evaluate and often cases, they're not particularly cost effective. So, there's more work needed to advance those and they may yet become more attractive particularly in areas where water cost are extremely high. So, thank you for the comments and the questions. Thank you.

Thank you. I'd like to say hello to everybody and god gave us another day so we got to make the best of it. Just wanted to know from Baton Rouge and John (inaudible), and they got a issue down there, I like you to addressed and Mr. Rouge didn't file probably don't wanted to handle this you probably could. But, we've been doing things since I hired in. 25 years ago Exxon you stated on there about safety that we lead, we want to lead in safety. Well, since when I hired in 25 years ago, we're leading safety and that's drop in ever since. And we're aware, we've done cut manning to a point where at time say and brought this up to our management and they don't want to see it. And so, we've added equipment and job task and labor intensive equipment, but cut manning because of different job cuts because we shutdown different chains of stuff. And what would happen is the group would go out and address these issues and so just a one person on one post, one person on another post. And the VP came down and visited us and told us we would have worst sight in the world for safety and it just shows that we've been degrading over time. And so, where I'm at, rest of the plant all over different areas they do better and I believe probably do the worse around that.

We got a situation where we got a one post place and we had an event yesterday. And we happen to have some people chain in and on days we have a day form but at night we don't have that. So, four people were able to respond to this event, event with the feel on it promptly which does 85% to 90% of prompt problems that feel plus want to go to shop can see a blow to switch that is fair. And so, these four people out there instead of one and it's a one post job. And so, they would able to stop anything from getting worse and it's a mastered unit. So, it's really can get bad quick when time starts to go and really gets bad. And so, I'd like you to maybe see if you could look into that and give us a little help because we do need to add some posts.

I know from a company standpoint, management loves they want to make money, I want to make money. I like to be going up, but I don't want to get anyone hurt or possibly heal because of that. And so when that event happens, because it's going to happen, because we are so undermined in this one play, it's going to happen. When it does happen, it's going to get outside and then it's going to be bid. And when they investigate, they are going to come back and say hey, how come you all are so poorly mined. That it is a real big problem and we would like – I would like you to maybe get some the mine to look into it. I appreciate it.

Thank you. The inspectors of election are ready to report the preliminary vote. So may we have your report please?

Unidentified Company Speaker

Mr. Chairman, at least 3.5 billion shares of stock of the corporation have been voted on the 8 items of business discussed at today's meeting. Voting results are expressed as a percentage of total votes cast. According to New Jersey corporate law, abstentions are not votes cast. Subject to the final calculation of votes which should not materially change the results, we report that on average 97.5% of the votes cast were voted to elect as directors, the 13 nominees listed in the proxy statement.

On the resolution concerning the ratification of independent auditors, approximately 99.0% of the shares voting thereon were voted for and 1% were voted against. On the resolution concerning an advisory vote to approve the executive compensation, approximately 89.9% of the shares voting thereon were voted for and 10.1% were voted against.

On the resolution concerning a majority vote for directors, approximately 44.9% of the shares of voting thereon were voted for and 55.1% were voted against. On the resolution to limit directorships, approximately 4.8% of the shares voting thereon were voted for and 95.2% were voted against. On the resolution concerning an amendment of EEO policy, approximately 19.5% of the shares voting thereon were voted for and 80.5% were voted against.

On the resolution concerning a report on lobbying, approximately 21.1% of the shares voting thereon were voted for and 78.9% were voted against. On the resolution concerning greenhouse gas and missions goals approximately 22.0% of the shares voting thereon were voted for and 78.0% were voted against. Our written reports will be submitted to the Secretary as soon as they are completed.

Rex Tillerson - Chairman and Chief Executive Officer

Thank you. As stated in the written report of the inspectors of election on each of these matters that will be delivered to the Secretary involved with the Minutes of the Meeting. The final votes on each of these matters will be available on the Exxon Mobil website and they will be filed with the SEC on Form 8-K.

In concluding the meeting, let me thank all of you once again for taking the time to be with us today for attending and importantly for your participation, your comments, your questions, or input, we appreciate it. We know it's quite an effort to travel to downtown Dallas to attend the meeting, but we appreciate that you are here.

As I have often said, one of the great strengths of this corporation is the diversity of our people, but it's also a great strength in the diversity of our shareholders. We are afforded a great opportunity to hear from the full breadth of concerns that each of you have, which we know represent concerns broadly held by societies in general and around the world. So, we appreciate very much that you bring those forward and share those with us. They inform our thinking. They inform our decision-making. And let me assure you that everything that is brought to this meeting, the directors and myself listen to it carefully and we have further discussions in the future about it. So, again, thank all of you for being here to our long-term shareholders. It's always great to see you every year. It's the highlight of the meeting for me to get to greet some of you upfront. And I appreciate the chance to do that. And as I say every year, for those of you that are short-term shareholders, I look forward to you becoming long-term shareholders. Safe travels and we stand adjourn.

Comments (2)

mathari

The economy is contracting but everyone needs gas. XOM will do well like it always does.

29 May 2014, 09:31 AM

EXHIBIT 53

MARTHA COAKLEY
ATTORNEY GENERAL

Media Contact

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For Immediate Release - June 28, 2010

ExxonMobil Corporation to Pay $2.9 Million Penalty for Violating Air Pollution Laws Under Settlement with AG Coakley's Office

Violations Alleged to have Occurred at Oil Company's Gasoline Terminals in Everett and Springfield

BOSTON - ExxonMobil Corporation and two affiliates will pay a $2.9 million civil penalty to resolve allegations that the company violated the state's air pollution laws at its bulk gasoline terminals in Everett and Springfield, under the terms of a settlement with Attorney General Martha Coakley's Office. The judgment, filed today in Suffolk Superior Court, also requires ExxonMobil to greatly reduce gasoline vapor emissions by improving air pollution control systems at both terminals.
In addition, as part of a Supplemental Environmental Project (SEP) aimed at enhancing air quality in one of the impacted communities, ExxonMobil is also required to contribute $200,000 to the Chelsea Collaborative to help fund the replacement of stationary diesel refrigeration units at the New England Produce Center with non-polluting electrically-driven units.

"When adequate emission control measures are not in place, bulk gasoline terminals can emit harmful air pollutants that can compromise public health," said AG Coakley. "Today's action is an important step to hold ExxonMobil accountable while also protecting the air quality and health of residents in the communities surrounding Everett and Springfield"Big Oil can no longer marginalize environmental compliance while increasing their gasoline sales and distribution in Massachusetts," said MassDEP Commissioner Laurie Burt. "Exxon Mobil's two gasoline terminals will be required to reconstruct their facilities to comply with the most stringent air pollution control requirements in the country. These upgrades will reduce emissions of gasoline vapors, volatile organic compounds and other toxic pollutants in communities already burdened by other environmental health issues."

The lawsuit, also filed today in Suffolk Superior Court, alleges that between 1999 and 2001, without seeking approval from MassDEP, ExxonMobil made changes to the vapor collection and recovery system used to control emissions of volatile organic compounds (VOCs) at its Everett terminal. These changes included the removal of certain emissions controls required under the terminal's state air permits, according to the lawsuit. ExxonMobil also failed to control VOC emissions during the degassing of a storage tank at the Everett facility in 2008, according to the lawsuit.

The lawsuit further alleged ExxonMobil failed, at both the Everett and Springfield terminals, to properly control emissions of VOC's from gasoline tank trucks during loading operations and failed to comply with emissions monitoring, repair, and reporting requirements. As a result of these violations, ExxonMobil increased gasoline vapor emissions at both facilities beyond those allowed under their permits and state law.

Bulk gas terminals store large quantities of gasoline and other fuels, which are then distributed through onsite loading racks to tank trucks. The tank trucks then transfer the fuels to commercial gasoline stations and other facilities throughout Massachusetts and New England . During gasoline loading operations, the terminals generate hazardous air pollutants.

The settlement reached with ExxonMobil also requires the companies to make substantial renovations to the loading racks at both terminals. The renovations include installation of negative pressure vacuum assist technology as part of the vapor collection and recovery systems at the terminals. The negative pressure system will significantly improve the VOC emission control rate at the facilities.

The settlement agreement also requires ExxonMobil to replace the existing "flare" vapor combustion unit at the Springfield terminal with a modern carbon absorption vapor recovery system similar to the systems in use at all of the state's other gas terminals. The new vapor recovery system will reduce VOCs and CO_2 emissions from the facility. In addition, ExxonMobil is required to undertake enhanced vapor and liquid leak inspections at both facilities using an infra-red optical imaging camera and to use certain improved technology to control emissions from storage tanks.

This case was handled by Assistant Attorneys General Tracy Triplett and Betsy Harper of Attorney General Coakley's Environmental Protection Division. Investigating the case and working with the Attorney General's Office on its enforcement were MassDEP staff, including Susan Ruch, Ed Braczyk, Joseph Su, Tom Hannah, Amy LaPusata, Cosmo Buttaro, Colleen McConnell, and Doug Shallcross.

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Associated Press

Mass. reaches $2.9M settlement with Exxon Mobil

June 28, 2010

BOSTON—Exxon Mobil Corp. and two affiliates have agreed to pay a $2.9 million civil penalty to resolve allegations that the company violated Massachusetts air pollution laws, the attorney general said Monday.

The judgment filed in Suffolk Superior Court requires Exxon Mobil to reduce gasoline vapor emissions by updating and improving air pollution control systems at its bulk gasoline terminals in Everett and Springfield.

"Big oil can no longer marginalize environmental compliance while increasing their gasoline sales and distribution in Massachusetts," said Laurie Burt, commissioner of the state Department of Environmental Protection.

Attorney General Martha Coakley alleged that between 1999 and 2001, and without the approval of Massachusetts environmental regulators, Exxon Mobil made changes to the vapor collection and recovery system used to control emissions of volatile organic compounds at its Everett terminal.

Changes included the removal of certain emissions controls required under state air permits. Exxon Mobil also failed to control VOC emissions during the degassing of a storage tank in Everett in 2008, Coakley said.

The state also alleged that Exxon Mobil did not properly control emissions of VOCs from gasoline tank trucks during loading operations and failed to comply with emissions monitoring, repair and reporting requirements at both locations.

"While Exxon Mobil does not agree with the state on the extent of alleged violations, we have entered into an agreement in an effort to resolve this matter and continue focusing on safe and environmentally responsible operations," Exxon Mobil spokeswoman Patty Errico said in a statement.

Bulk terminals are facilities where large quantities of gasoline are stored before distribution to gas stations.

Exxon Mobil Corp.is based in Irving, Texas. ■

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EXHIBIT 54

NAAG Center for Tobacco and Public Health

NAAG » About » NAAG Center for Tobacco and Public Health

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The **NAAG Tobacco Center** specializes in matters related to the 1998 tobacco Master Settlement Agreement (MSA) and is dedicated to helping the attorneys general of the signatory states (Settling States) interpret, implement, and enforce this agreement. With the leadership of the NAAG Tobacco Committee co-chairs, Wisconsin Attorney General Brad Schimel, and Maine Attorney General Janet Mills, the Center is committed to providing legal expertise to the Settling States as they enforce the MSA.

The MSA is a historic, landmark agreement that has greatly contributed to the decreased smoking rate among Americans. The settlement has not only helped the Settling States recover the health care costs of smoking by ensuring billions in yearly revenue, but has also changed the way tobacco companies operate by restricting advertising and eliminating practices that obscured tobacco's health risks. The MSA is responsible for raising a generation that has never seen ads of "Joe Camel" or other cigarette-smoking cartoon characters. Kids are now protected from the "smoking is cool" advertising messages tobacco companies once freely used. The

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Master Settlement Agreement Related Information

Bankruptcy

NAAG Tobacco Center is committed to working with the Settling States to preserve and enforce the MSA's monetary and public-health mandates.

Our Mission: In addition to providing the Settling States with counsel specializing in the MSA, we provide all states with counsel relating to tobacco regulation generally. Tobacco Center Counsel:

- Advise, support, and represent the Settling States in MSA-related litigation and arbitrations,
- Represent the Settling States in bankruptcy cases filed by tobacco manufacturers,
- Monitor MSA payments and the disbursement process, as well as corroborate the Independent Auditor's yearly payment calculations,
- Monitor tobacco companies' compliance with the MSA's payment and public health provisions, including advertising restrictions,
- Advise the states regarding developments in federal regulation of tobacco, in fashioning tools to make state regulation of tobacco more effective, and in finding ways to reduce youth tobacco use,and
- Liaise between the states, tobacco companies, federal agencies and public health organizations.

MSA Background

In 1998, 46 attorneys general signed the MSA with the four largest tobacco companies in the U.S. to settle several state-law suits brought to recover

billions of dollars in health-care costs associated with treating smoking-related illnesses. Four states Florida, Minnesota, Mississippi, and Texas settled prior to the MSA and are not signatories to the MSA. The central purpose of the MSA is to reduce smoking, especially in American youth. Accordingly, the MSA places restrictions on advertising, marketing, and promoting cigarettes, including prohibiting the use of cartoons and other youth-targeting methods, advertising on billboards or in public transportation, and merchandise branding. Since the first State settlement was announced, cigarette consumption in the United States has fallen by more than 48 percent, and the decline in youth smoking has been even more pronounced. Despite these gains, tobacco remains the number-one cause of preventable death in the United States. As advocates for the public interest, state attorneys general are actively and successfully enforcing the provisions of the MSA to reduce tobacco use and protect consumers.

Find the attorney general who represents you.

Stay informed of NAAG meetings and the NAGTRI trainings we offer.

Douglas S. Chin is the attorney general of Hawaii.

EXHIBIT 55

PROPOSED EXXON RESEARCH PROGRAM TO HELP ASSESS THE GREENHOUSE EFFECT

EDWARD A. GARVEY
HENRY SHAW
WALLACE S. BROECKER
TARO TAKAHASHI

PRESENTED TO:

DR. LESTER MACHTA
AIR RESOURCES LABORATORY
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

MARCH 26, 1979

PROGRAM GOAL

- USE EXXON EXPERTISE AND FACILITIES TO HELP DETERMINE THE LIKELIHOOD OF A GLOBAL GREEN-HOUSE EFFECT

RATIONALE FOR EXXON INVOLVEMENT

- DEVELOP EXPERTISE TO ASSESS THE POSSIBLE IMPACT OF THE GREENHOUSE EFFECT ON EXXON BUSINESS

- FORM RESPONSIBLE TEAM THAT CAN CREDIBLY CARRY BAD NEWS, IF ANY, TO THE CORPORATION

- PROVIDE THE GOVERNMENT WITH HIGH QUALITY INFORMATION TO REDUCE THE BUSINESS RISK OF INADEQUATE GOVERNMENT POLICY

- GENERATE IMPORTANT SCIENTIFIC INFORMATION THAT WILL ENHANCE THE EXXON IMAGE AND PROVIDE PUBLIC RELATIONS VALUE

DOE INTEREST

- ACCELERATE CONTEMPLATED RESEARCH PROGRAM IN OCEANIC CO_2 MEASUREMENTS
- COST EFFECTIVE METHOD TO ACQUIRE ESSENTIAL OCEANOGRAPHIC DATA
- OBTAIN INDUSTRIAL PARTICIPATION TO COMPLEMENT CURRENT ACADEMIC EFFORT
- CONTRIBUTION OF DATA FROM EXXON FUNDED PROGRAMS TO DETERMINE SOURCE OF CO_2 IN ATMOSPHERE AND AIR-OCEAN CO_2 MASS TRANSFER COEFFICIENTS

DEFINITION

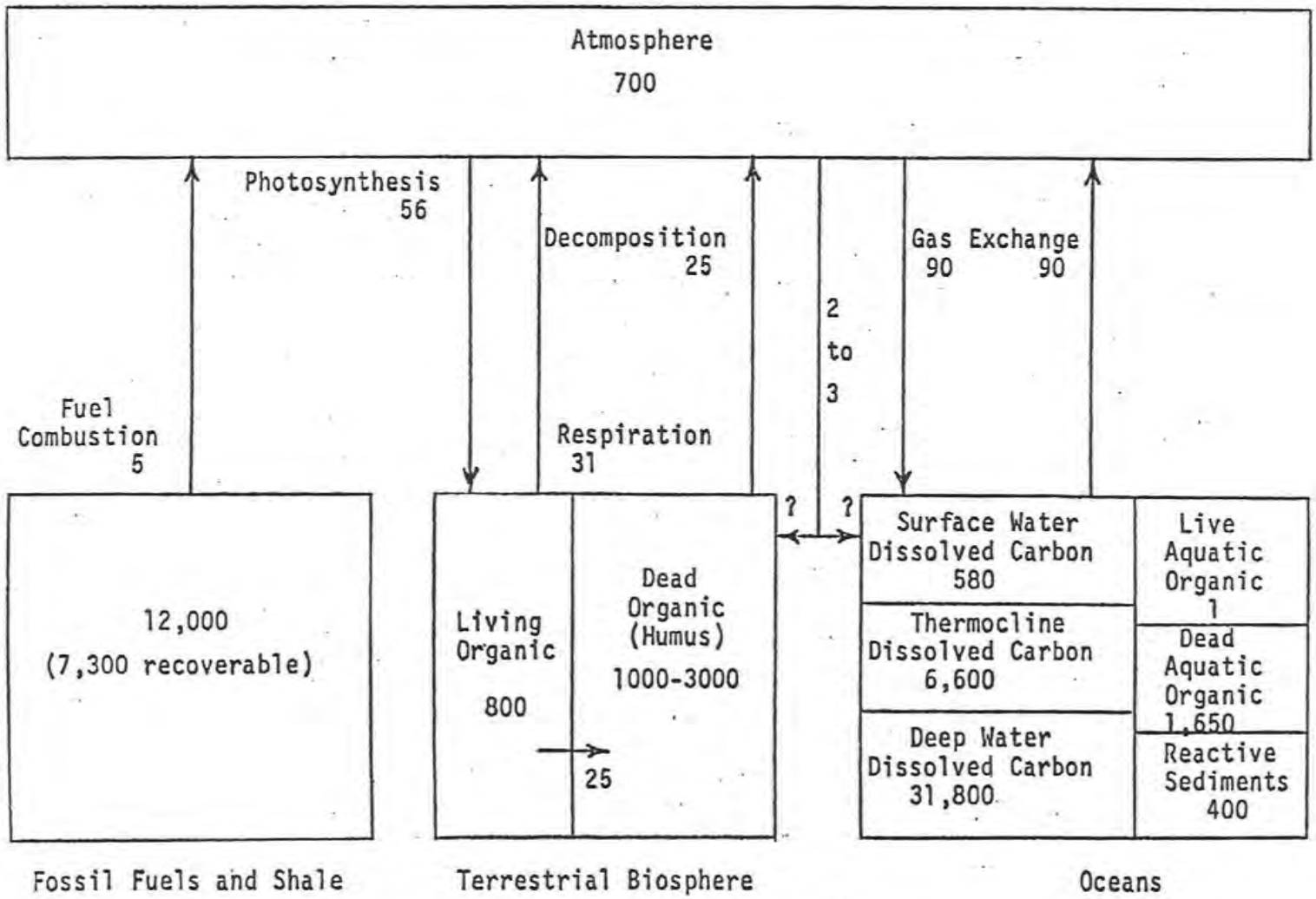
GREENHOUSE EFFECT - AN UPSET IN THE EARTH'S THERMAL BALANCE CAUSED BY THE REABSORPTION OF INFRARED RADIATION FROM THE EARTH BY THE INCREASING LEVELS OF CO_2 AND OTHER ATMOSPHERIC COMPONENTS

- ATMOSPHERIC CO_2 HAS INCREASED 15% SINCE THE INDUSTRIAL REVOLUTION
- THE ANNUAL ANTHROPOGENIC ADDITION OF CO_2 TO THE ATMOSPHERE HAS BEEN INCREASING AT 4% PER YEAR SINCE THE INDUSTRIAL REVOLUTION
- THIS INCREASE HAS BEEN ATTRIBUTED TO FOSSIL FUEL UTILIZATION
- APPROXIMATELY 10-15% OF THE CO_2 FROM FOSSIL FUELS CANNOT BE ACCOUNTED FOR
- ATMOSPHERIC CO_2 CONTRIBUTION FROM FOREST CLEARING IS NOT KNOWN

The Carbon Cycle

1978

Fluxes in Gt/a
Pool sizes in Gt



MAJOR RESEARCH NEEDS

PROBLEM AREA	RESEARCH NEEDS	EXXON CAPABILITY
ATMOSPHERE	- WEATHER MODELING	NO
	- DISPERSION OF CO_2	YES
OCEAN	- INTERLAYER EXCHANGE OF CO_2	YES
	- CIRCULATION OF SEAWATER	YES
TERRESTRIAL BIOSPHERE	- STORAGE AND EXCHANGE OF CARBON	YES
INTER-AREA EXCHANGE	- CO_2 EXCHANGE ACROSS OCEAN-ATMOSPHERIC INTERFACE	YES
	- CO_2 EXCHANGE BETWEEN BIOSPHERE AND ATMOSPHERE	

PROPOSED PROGRAMS

PROGRAMS	FUNDING
OCEAN SAMPLING PROGRAM	
- TANKER SAMPLING SYSTEM	DOE/EXXON
- DRILLING SHIP STATION	EXXON
LAND BIOTA SAMPLING PROGRAM	
- C-13 AND C-14 SAMPLING	EXXON

OBJECTIVES OF OCEAN SAMPLING

- DETERMINE CO_2 FLUX BETWEEN AIR AND OCEAN

  FLUX = (TRANSFER COEFFICIENT) X (DRIVING FORCE)

  DRIVING FORCE DETERMINED FROM TANKERS AS A FUNCTION OF $CO_{2_{ATM}}$, $CO_{2_{SW}}$, TEMPERATURE, LOCATION, ETC.

  TRANSFER COEFFICIENT DETERMINED FROM DRILLING SHIPS BY TRACER STUDY AS A FUNCTION OF WEATHER, SEA-STATE, ETC.

- CROSSCHECK RATE OF CO_2 EXCHANGE ACROSS THE AIR-SEA INTERFACE USING C-14 RELEASED DURING ATOMIC BOMB TESTS AS TRACER

TANKER PROGRAM

- TANKERS WILL SAMPLE CONTINUOUSLY
  - ATMOSPHERIC CO_2 TO ± 0.5 PPMV
  - OCEAN CO_2 TO ± 0.5 PPMV
  - SEA AND AIR TEMPERATURE TO ± 0.1°C
  - RELATIVE HUMIDITY
  - BAROMETRIC PRESSURE
  - SALINITY
  - SEAWATER pH

- TANKER WILL ALSO SAMPLE SURFACE SEAWATER FOR C-14 ON A PERIODIC BASIS

- DEPTH THERMOMETERS WILL BE USED PERIODICALLY TO DETERMINE THE TEMPERATURE PROFILE OF THE OCEAN ALONG THE TANKER ROUTE

TANKER PROGRAM (CONTINUED)

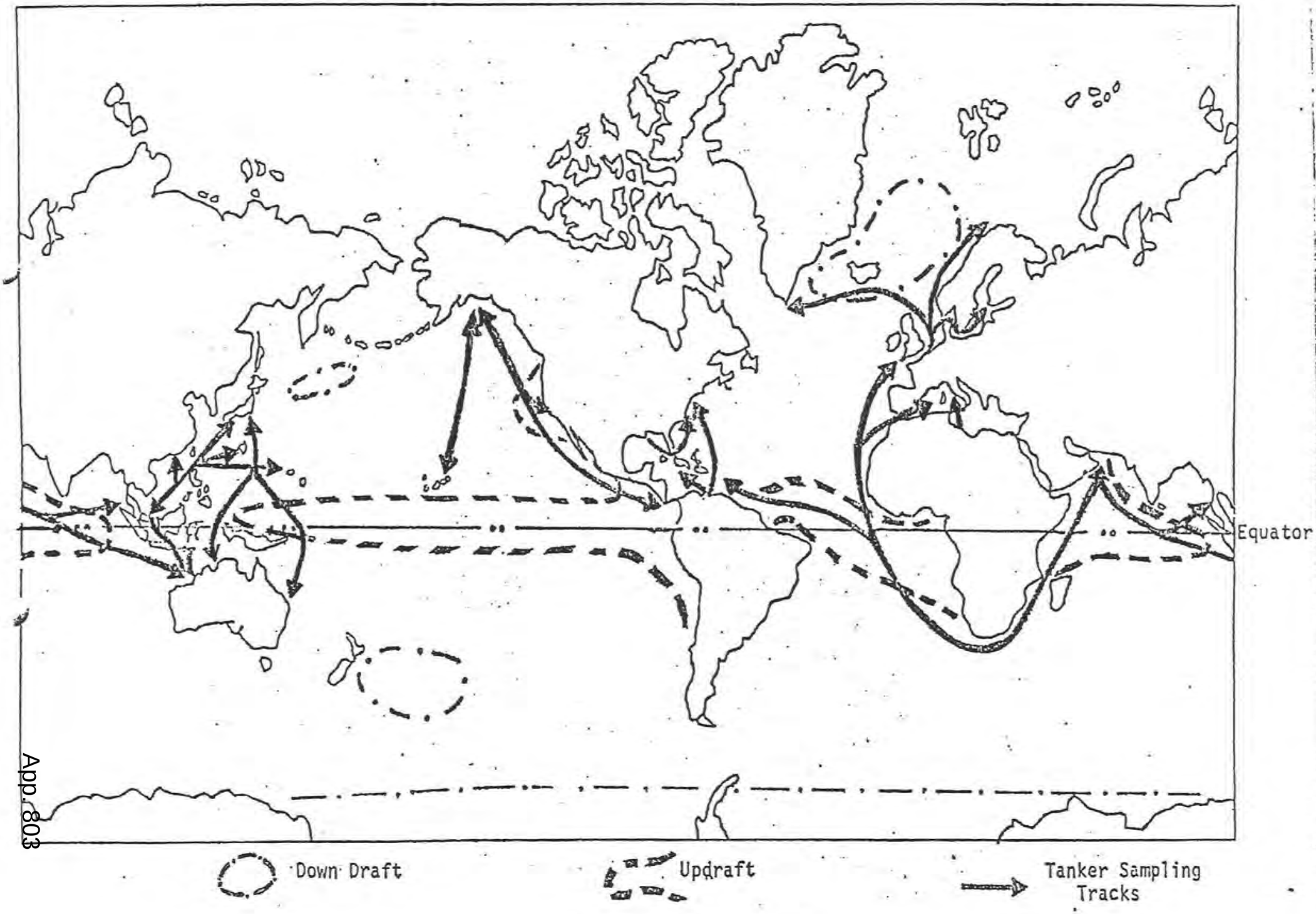
- TANKER WILL BE ABLE TO REPEAT MEASUREMENTS ALONG A PARTICULAR ROUTE ANYWHERE FROM 10 TO 40 TIMES PER YEAR DEPENDING ON ROUTE LENGTH AND PETROLEUM DEMAND

- TANKER PROGRAM WILL BE EXPANDED FROM ONE ROUTE DURING THE FIRST YEAR TO FIVE BY THE THIRD YEAR

- SOME TANKER ROUTES PROPOSED IN THIS PROGRAM CROSS AREAS WHERE RELATIVELY LITTLE OCEANOGRAPHIC WORK HAS BEEN DONE

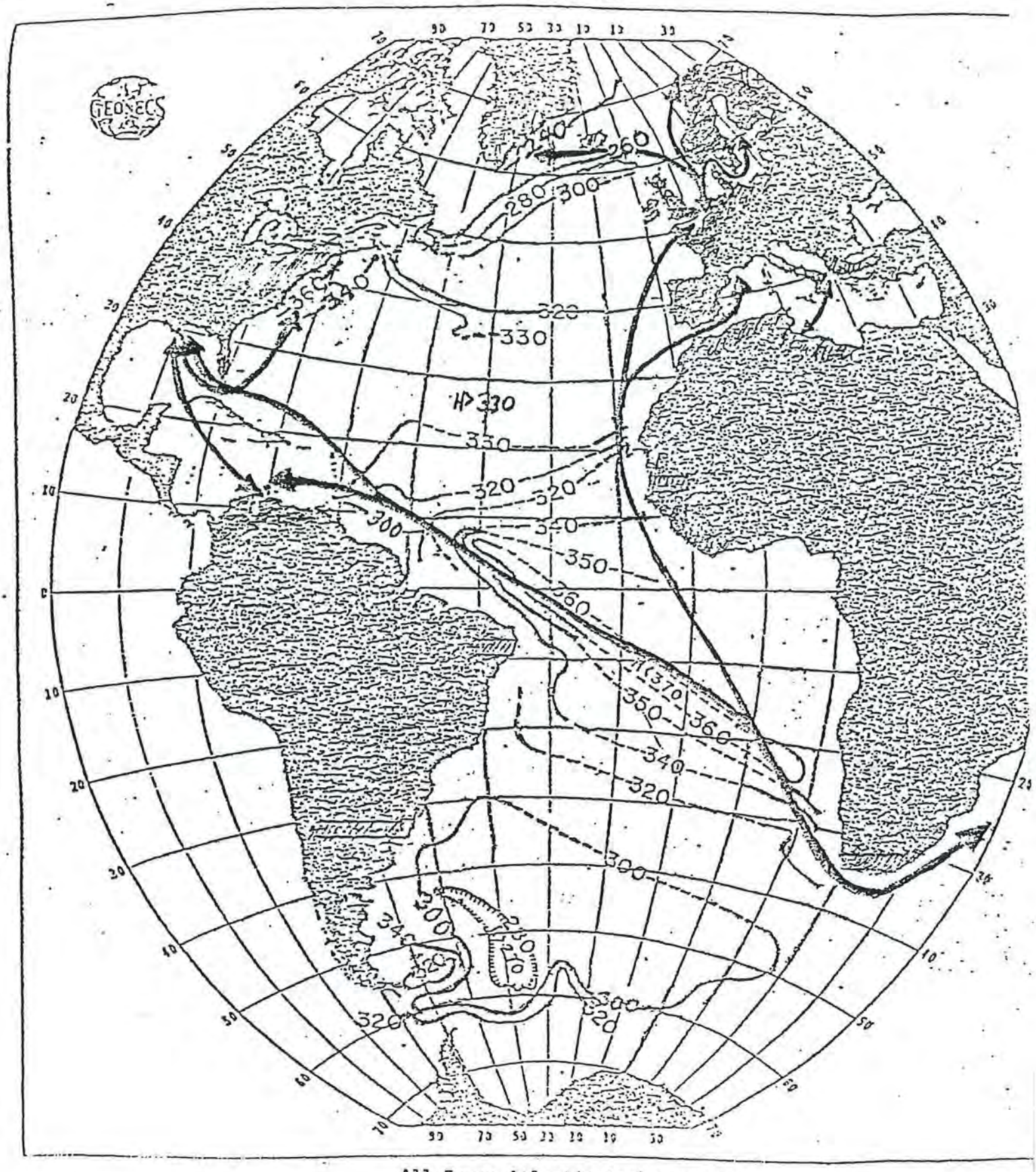
- THE DATA COLLECTED WILL BE USED TO DETERMINE pCO_2 LEVELS ON A REGIONAL AND SEASONAL BASIS IN BOTH THE ATMOSPHERE AND THE OCEANS

DEEP WATER WELLINGS AND TANKER ROUTES



pCO_2 10^{-6} atm. IN THE SURFACE WATER OF THE ATLANTIC OCEAN

JULY 1972 - MARCH 1973



All Exxon Atlantic tanker routes.

pCO_2 10^{-6} atm. IN THE SURFACE WATERS OF THE PACIFIC OCEAN
AUGUST 1973 - JUNE 1974

Pacific tanker routes.

Exxon routes

Other tanker routes

DRILLING SHIP PROGRAM

- EXXON CONTRACTED DRILLING SHIPS ARE PRESENTLY EXPLORING MANY DEEP WATER AREAS AROUND THE WORLD
  - DRILL IN OCEAN DEPTHS WELL OVER 1000 FEET, SOMETIMES AS MUCH AS 5000 FEET
  - REMAIN IN ONE LOCATION FOR TWO TO THREE MONTHS

- AT THESE DEPTHS, THE OCEAN IS USUALLY WELL STRATIFIED, AND IS SUITABLE FOR TRACER GAS STUDY

DRILLING SHIP PROGRAM (CONTINUED)

- MEASUREMENT OF SURFACE WATER RADON-222 PROFILES AND WEATHER DATA CAN BE USED TO DETERMINE THE RATE OF GAS EXCHANGE AS A FUNCTION OF WIND SPEED AND SEA STATE

- DEEP WATER SAMPLING CAN ALSO BE PERFORMED TO ENHANCE OUR UNDERSTANDING OF DEEP OCEAN EXCHANGE OF CO_2, RADON-222, AND OTHER CHEMICAL TRACERS

INFORMATION YIELDS

TANKER PROGRAM

- THE FOLLOWING DATA WILL BE COLLECTED ALONG THE TANKER ROUTES:
  - ATMOSPHERIC pCO_2
  - OCEANIC pCO_2
  - SEA TEMPERATURE PROFILES
  - SALINITY
  - pH
  - SURFACE WATER CARBON-14 LEVELS

- USING THE ABOVE DATA TO MAP SEASONAL AND REGIONAL VARIATIONS WILL ENHANCE OUR UNDERSTANDING OF:

INFORMATION YIELDS (CONTINUED)

- ATMOSPHERIC CIRCULATION
  - + THE VARIATIONS WILL HELP DETERMINE GLOBAL AIR CIRCULATION PATTERNS AND COULD BE A USEFUL CONTRIBUTION TO THE TRANSIENT TRACES PROGRAM NOW BEGINNING UNDER DOE FUNDING
- OCEANIC pCO_2
  - + WILL BE USED TO ESTABLISH GLOBAL SEAWATER CIRCULATION PATTERNS
  - + BY CROSSING UPWARD AND DOWNWARD ADVECTION ZONES THE SEASONAL AND YEARLY EXCHANGE OF SURFACE AND DEEP WATER WILL BE MONITORED
- OCEANIC AND ATMOSPHERIC pCO_2
  - + WILL BE USED TO ESTABLISH THE CONCENTRATION GRADIENT ACROSS THE INTERFACE

INFORMATION YIELDS (CONTINUED)

- + THE CONCENTRATION VARIATIONS ACCORDING TO SEASON AND REGION WILL BE USED TO GENERATE MORE ACCURATE CO_2 EXCHANGE MODELS

- OCEAN TEMPERATURE PROFILES
  - + WILL BE USED TO DETERMINE THE THICKNESS OF THE SURFACE WATER LAYER AND ITS VARIATION ACCORDING TO SEASON AND REGION
  - + THIS WILL PROVIDE ADDITIONAL INFORMATION ON OCEAN CIRCULATION PATTERNS AND WIND EFFECTS ON OCEAN MIXING

- SALINITY
  - + WILL BE USED TO DEFINE OCEAN WATER MASSES
  - + IT IS ALSO USED TO CORRECT THE RAW pCO_2 MEASUREMENTS

INFORMATION YIELDS (CONTINUED)

- pH WILL BE USED TO DETERMINE TOTAL INORGANIC CARBON
- SURFACE WATER C-14 LEVELS
  - + WILL BE USED AS AN ALTERNATIVE METHOD OF CHECKING THE OCEAN-AIR CO_2 EXCHANGE
  - + SEASONAL AND YEARLY TIME TRENDS OF C-14 LEVELS IN THE UPWARD ADVECTION ZONES WILL BE USED TO MEASURE CARBON PENETRATION AND COMPLEMENT THE TRANSIENT TRACER PROGRAM IN THIS AREA

INFORMATION YIELDS (CONTINUED)

DRILLING SHIP PROGRAM WILL BE USED TO:

- OBTAIN A RELATION FOR THE GAS EXCHANGE COEFFICIENT OF A NON-REACTIVE GAS WITH WIND SPEED AND SEA STATE
- DETERMINE NEEDED CORRECTIONS FOR CO_2 REACTIVITY
- THE GAS TRANSFER COEFFICIENT FUNCTION WILL BE USED WITH THE REGIONAL AND SEASONAL pCO_2 MEASUREMENTS AND PREVAILING LOCAL WEATHER CONDITIONS TO CALCULATE MORE ACCURATELY THE NET FLUX OF CARBON INTO THE OCEAN

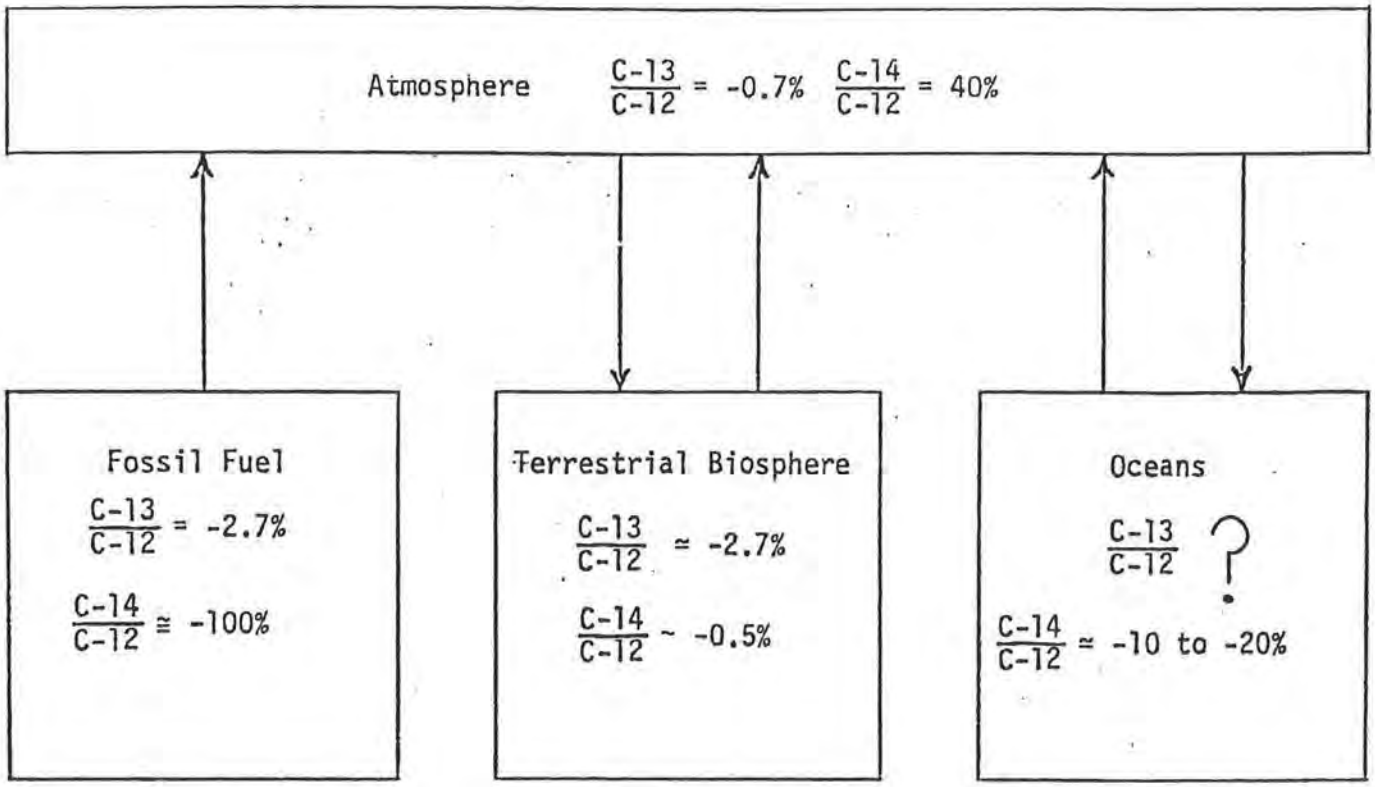
PROGRAM RESULTS AND BENEFITS

- A RELATIVELY INEXPENSIVE MEANS OF PROVIDING HIGHLY USEFUL INFORMATION ON YEARLY, SEASONAL AND REGIONAL ATMOSPHERIC AND OCEANIC PROCESSES
- IMPROVED AIR-OCEAN CARBON EXCHANGE MODEL
- ADDITIONAL INFORMATION ON BOTH ATMOSPHERIC AND OCEANIC CIRCULATION PATTERNS
- REPORTS FROM EXXON ON THE FINDINGS ISSUED JOINTLY WITH LAMONT-DOHERTY AND OTHER PARTICIPATING INSTITUTIONS
- SAMPLING VESSELS WILL BE AVAILABLE FOR ADDITIONAL SCIENTIFIC MEASUREMENTS TO ENHANCE OUR UNDERSTANDING OF THE CARBON BUDGET OR RELATED AREAS

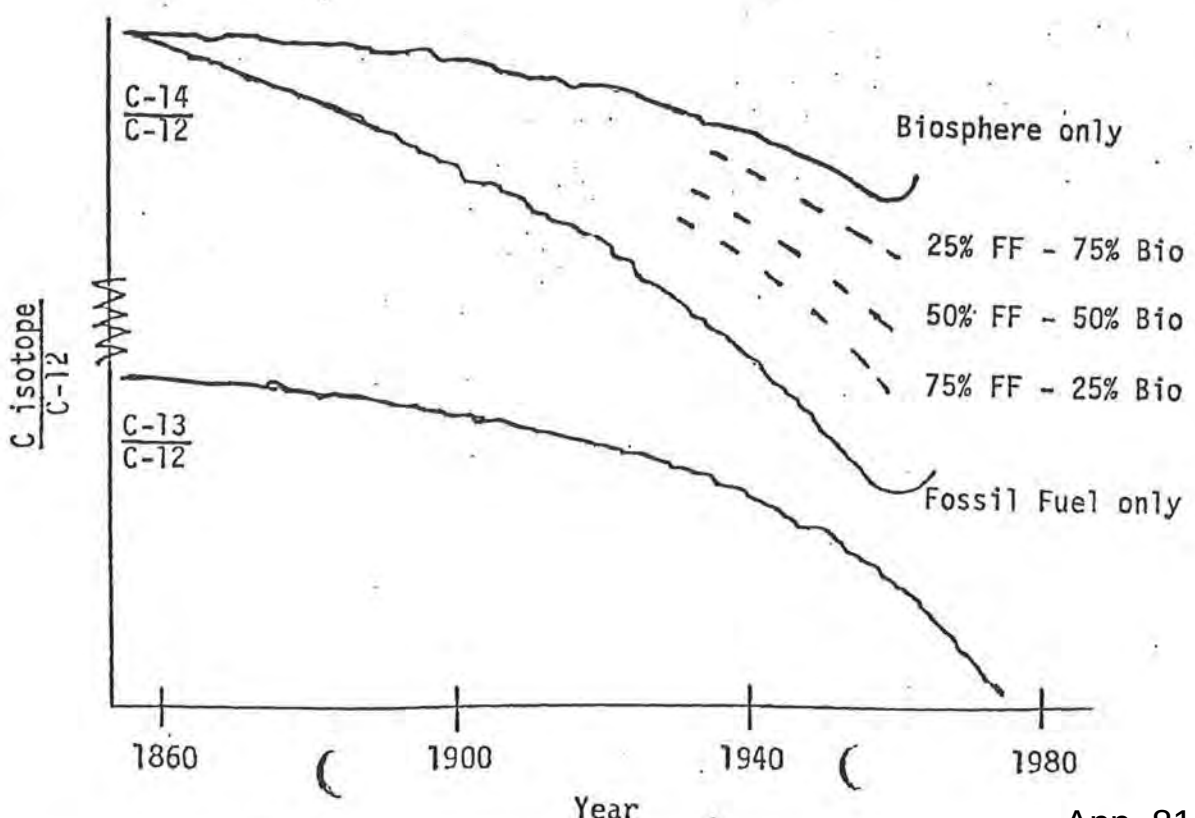
THEORY OF LAND BIOTA SAMPLING

- INCREASE IN ATMOSPHERIC CO_2 MAY BE DUE TO FOSSIL FUEL COMBUSTION OR FOREST CLEARING
- SOURCE OF CO_2 MAY BE IDENTIFIED BY CARBON ISOTOPES IN THE ATMOSPHERE
  - C-13 IS PRESENT IN FOSSIL FUELS AND PLANTS
  - C-14 IS PRESENT ONLY IN PLANTS
- MEASURING RELATIVE CHANGE OF C-13 AND C-14 IN STORED BIOMASS CAN YIELD INFORMATION ON THE SOURCE OF THE CO_2 THAT WAS PRESENT DURING PLANT GROWTH

Global Carbon Isotope Distribution



Atmospheric Carbon Isotope Ratios



PROPOSED PROGRAM - LAND BIOTA SAMPLING

- TREE RINGS HAVE PROVIDED INITIAL C-13/C-12 AND C-14/C-12 DATA
  - SAMPLE NOT ISOLATED IN YEARLY INCREMENTS
  - NO TEMPERATURE AND GROWTH HISTORY

- USE A LAND BIOTA SOURCE THAT HAS:
  - WEATHER AND GROWTH HISTORY
  - NOT UNDERGONE ISOTOPE EXCHANGE AFTER GROWING SEASON
  - AVAILABLE SAMPLES DATING BACK TO 1830
  - AFTER SOME INITIAL INVESTIGATION, WINE SEEMS TO BE CAPABLE OF PROVIDING THE BEST SAMPLES

PROPOSED PROGRAM SCHEDULE

PHASE I (ONE-YEAR PROGRAM - K$ 300 EXXON AND K$ 200 DOE)

- ESTABLISH COOPERATIVE PROGRAM WITH LAMONT-DOHERTY
- INITIATE RESEARCH WITH A SINGLE TANKER AS A PILOT PROGRAM
- IMPLEMENT DRILLING SHIP SAMPLING PROGRAM
- CARRY OUT WINE MEASUREMENT PROGRAM FOR ONE LOCATION

PROPOSED PROGRAM SCHEDULE (CONTINUED)

PHASE II (FIVE-YEAR PROGRAM)

- IMPLEMENT FULL-SCALE TANKER PROGRAM USING UP TO FIVE DIFFERENT ROUTES (~ M$/A 1.4 - GOVERNMENT)
- CONTINUE DRILLING SHIP PROGRAM AT SUITABLE LOCATIONS (K$/A 50 - EXXON)
- CONTINUE LAND BIOTA MEASUREMENT WITH GEOGRAPHICALLY DIFFERENT SOURCES (K$/A 80 - EXXON)

ESTIMATED COST OF FULL PROGRAM

(1979 K$)

	PHASE	1979	1980	1981	1982	1983	1984
DRILLING SHIPS	I	50	--	--	--	--	--
	II	--	50	50	50	50	50
LAND BIOTA MEASUREMENTS	I	75	--	--	--	--	--
	II	--	80	80	--	--	--
TANKER (PILOT PROGRAM)	I	375	--	--	--	--	--
TANKERS (4 ADDITIONAL)	II	--	1040	1600	1400	1400	1400
TOTAL		500	1170	1730	1450	1450	1450
CUMULATIVE		500	1670	3400	4850	6300	7750
PROFESSIONALS		1.3	3.6	5.6	5.3	5.3	5.3
N-PROFESSIONALS		2.5	7.1	11.8	11.8	11.8	11.8

GREENHOUSE EFFECT

	Funding		Staffing	
	$	Source	GRL	Other Units
1. Develop background	20 k	ER&E	1 P	
2. Develop research program	30 k	ER&E	1 P	
3. Obtain ER&E management approval	-		1 P	
4. Advise Exxon Corp. & affiliates	5 k	ER&E	1 P	
5. Advise DOE of program	-		1 P	
6. Plan program with affiliates (Exxon International, EUSA, etc.)	5 k	ER&E	1 P	
7. Arrange university partnership	50 k	ER&E	1 P	
8. Designate program manager	-	-	-	-
9. Order and assemble instrumentation	125 k	ER&E	1 P	
10. Begin Phase I			1.3 P	
- Tanker No. 1	275 k	ER&E		
- Drilling Ship	25 k	ER&E		
- Land biota measurements	75 k	ER&E		
11. Prepare and submit proposals to DOE	30 k	ER&E	1 P	
12. Publish initial results	30 k	ER&E		
13. Order additional equipment	425 k	DOE		
14. Begin Phase II			6 P	
- 5 tankers	6.8 M	DOE		
- 9 drilling ships	225 k	ER&E		
- 2 different land biota sources	160 k	ER&E		
15. Awareness and corporate dissemination of information on overall problem	70 k	ER&E	0.1 P	

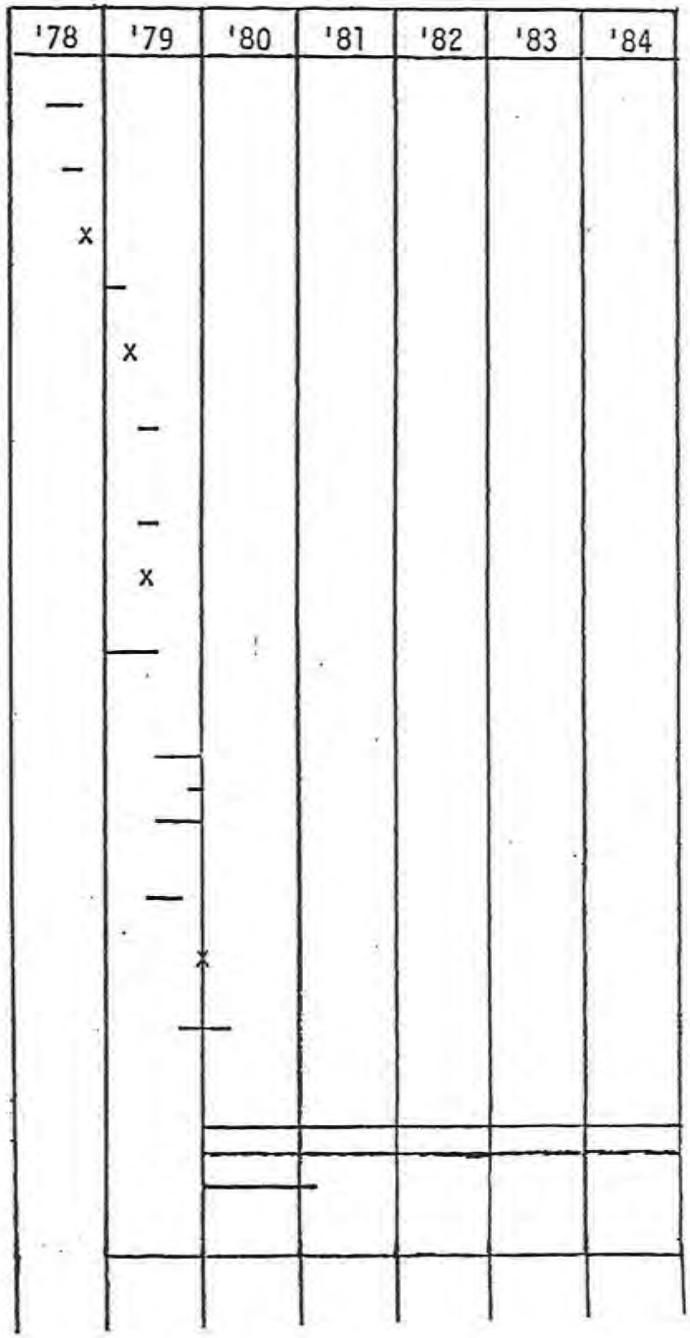


EXHIBIT 56

Speech *Oct. 7, 2015*

Unleashing Innovation To Meet our Energy and Environmental Needs

Rex W. Tillerson
Chairman and Chief Executive Officer

36th Annual Oil and Money Conference
London, England

Ladies and gentlemen ...

It is a pleasure to address the 36th Annual Oil & Money Conference.

This gathering has long been an important event for our industry – bringing together a broad array of leaders from the world over, representing both governments and business, to discuss the challenges faced by the energy sector.

And because of the scientific and engineering culture that pervades our industry, this discussion of challenges soon becomes an exploration for solutions – for how we can find ways to produce and use energy in ways that are increasingly safe, secure, and environmentally responsible.

Last night I had the honor of accepting the Petroleum Executive of the Year Award – for which I am deeply grateful.

It gave me an opportunity to reflect in a personal way on my four decades in the energy sector – and the extraordinary changes and transformation I have seen over time.

It is impossible to look at our industry's achievements on so many frontiers and not be humbled. Humbled by the scale of the challenges we have faced. Humbled by the technological solutions we have found.

It is an essential truth that our industry's technological marvels and greatest achievements are never the work of a single man or woman.

They are the product of countless scientists, engineers, and entrepreneurs – past and present – who have invested and worked together to create innovations that transform our world for the better.

From its first days, our industry has pioneered technologies that have unlocked new supplies of energy – energy that has brought advancement and opportunity to billions of people.

Even now, in the midst of markets undergoing far-reaching transformation and change, we continue to invest and innovate – not just to expand supplies of energy for developed economies, but for the billions of people who still live in "energy poverty" around the world.

The story of our industry is a story of innovation and cooperation – across companies, cultures, and continents.

And these hallmarks of our work together will also be the key to meeting our shared aspirations to further expand supplies, increase energy efficiency, and protect the environment.

This meeting of Oil & Money takes place just two months before the United Nations Climate Change Conference in Paris.

At this time our industry is rightly engaged in discussions with the public and policymakers to identify policies that would best position society to reduce emissions through new efficiencies and new technologies.

This morning, I will discuss the elements and principles that should guide our broader public discourse about energy: first, why we must recognize the role of investment and innovation in helping unlock new supplies of energy; second, how our industry innovations are already helping bring about new efficiencies and environmental benefits; and, finally, I will discuss the policy actions we can take now to enable innovation and cooperation to continue in the decades to come.

Innovation Transforms the World

As this audience knows – and the world has come to recognize, we are living through a period of extraordinary transformation in the energy sector.

Global energy markets have begun to reflect a fundamental and far-reaching realignment of energy supply and demand.

Decades of sustained investment, innovation, and collaboration across the industry have opened up resources from offshore deepwater and ultra-deepwater. Constantly advancing technologies have made it possible to develop oil sands safely and responsibly. And most recently, new technologies and techniques pioneered by our industry made it possible to unlock vast new supplies of oil and natural gas from North American shale.

The result of these innovations has been a growth in energy supplies that few would have imagined even a few years ago.

However, this growth in new supplies from stable areas comes just as economic growth in both developed and developing economies has been sluggish. And this is moderating energy demand.

The convergence of these two market trends has led to a significant downturn in the commodity cycle.

None of us can know how long it will last, but we know what it means for our businesses: We must operate more effectively and efficiently than ever before.

For those companies that do find increased efficiencies through better project management, advanced technologies, and path-breaking innovations, there will be tremendous business opportunities ahead.

We know this because the need for energy is universal. In the decades ahead, the world will need us to develop new technologies and new supplies of energy because the global demand for energy is on a trajectory to grow – and grow significantly.

At ExxonMobil, we foresee future energy demand being shaped by three major forces: population growth, trade and economic development, and energy efficiency.

Taken together, we project global economic output will more than double by the year 2040.

In addition, the world's population will grow, adding about 2 billion new consumers of energy and 3 billion people will join the ranks of the middle class. Even after factoring in continuing increases in energy efficiency, we expect global energy demand will still grow by about 30 percent by 2040.

This fundamental fact, that energy demand and economic growth are inextricably related, guides our view about the importance of our industry meeting its responsibilities.

There is also a humanitarian dimension and a moral imperative to what we do. Expanding energy supplies safely and responsibly will be critical to securing the future for billions of people.

Without such ingenuity and innovation, the world will lack the reliable and affordable energy needed to end "energy poverty."

Of course, it can be hard for those living in advanced economies to understand the magnitude and seriousness of energy poverty. But the leaders and workers in the energy sector have a broad, global perspective. We have seen how energy poverty robs families and communities – and even whole nations – of the opportunity to achieve their full potential.

According to the latest data, about one in five human beings still has no access to electricity. And about two out of five people around the world must rely on biomass such as wood, charcoal, or animal waste for basic cooking and heating needs.

The costs of this energy poverty are steep. The World Health Organization estimated that in 2012 alone more than 4 million people around the world died from household air pollution.

For billions of people living around the world, simply gaining access to reliable, affordable energy is the means to a healthier and better life. For their communities, energy is the key to cleaner water; better sanitation; safer, more nutritious food; storage of medicines; and even light for education, study, and personal advancement.

The Benefits of Integrated Technologies

Energy is essential for life, and the oil and natural gas industry will be instrumental to meeting this fundamental and universal human need. This

means that our investments and innovations will be vital in the decades ahead.

In fact, the world will need to pursue all energy sources, wherever they are economically competitive.

The world will need wind, solar, and other renewables. We will need increased use of nuclear power. And, importantly, we will need coal, oil, and natural gas.

The IEA and other credible energy analyses all agree that carbon-based fuels will continue to meet about three-quarters of global energy needs through 2040.

But with this increased energy demand comes a second challenge: reducing the greenhouse gas emissions associated with energy use.

From the very beginning of concern on this issue, ExxonMobil scientists and engineers have been involved in discussions and analysis of climate change. These efforts started internally as early as the 1970s. They 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.

We believe the risks of climate change are serious and warrant thoughtful action. We also believe that by taking sound and wise actions now we can better mitigate and manage those risks.

But as we work together to reduce emissions, it is critical we do so in a way that recognizes the importance of reliable and affordable energy in supporting human progress across society and the economy.

Throughout our history, the energy industry has continuously proven that technological advances can bring far-reaching and positive change.

Our innovations have brought new supplies to the market and improved energy security and international trade. Technology has also advanced efficiency and contributed to environmental gains.

Just consider the success of the U.S. shale revolution on all these fronts. Technological advances have created a new era of energy abundance in North America – spurring job growth, fueling economic opportunity, and unleashing a manufacturing renaissance.

Moreover, because natural gas emits up to 60 percent less carbon dioxide than coal when used for power generation, natural gas from shale has been instrumental in reducing U.S. carbon dioxide emissions to levels not seen since the 1990s.

Remarkably, these reductions have come even as the U.S. economy has grown about 60 percent and added 50 million more energy consumers.

It is worth noting that these impressive gains have come from the actions of innovative companies operating in free markets – and they have come in the absence of a comprehensive cost-of-carbon policy in the United States.

Fulfilling our Roles to Advance Technology

To build on these types of successes and make progress around the globe, it is important for leaders from every sector of society to reflect on the specific roles and strengths that government and industry can bring to this cooperative effort.

Industry must build and maintain public trust by continuing to operate with safety and integrity and a commitment to responsible environmental stewardship.

We have proven that with the right policies in place, the competition and cooperation that are inherent to free markets will spur us to invest and innovate, creating integrated solutions that improve the production and use of energy at every step in the value chain.

At ExxonMobil, we are working to do our part to reduce emissions and increase our own energy efficiency, reduce flaring volumes, and deploy proven technologies like cogeneration of steam and electric power.

We are also a global leader in carbon capture and sequestration. ExxonMobil now has a working interest in more than one-third of the world's current CCS capacity, and we captured more than 6 million metric tons of carbon dioxide for sequestration last year alone. This is the equivalent of eliminating the annual greenhouse gas emissions of more than 1 million passenger vehicles.

In addition, we are collaborating in research and development into revolutionary ways to make carbon capture and sequestration more affordable and commercially viable.

ExxonMobil is also actively involved in research and development of next-generation technologies in advanced biofuels, and we continue to invest in breakthrough research across a broad spectrum of other energy technologies – both directly and in partnerships with leading institutions such as MIT, Stanford, and Princeton.

Advancing innovation in the energy sector – and across society – will require companies to make long-term investments in research and to develop cost-efficient solutions that are capable of broad commercial application.

As we consider the best policies for the future, it is clear government has a special role to play in this effort, too.

Governments around the world must put in place sound tax, legal, and regulatory frameworks. With sound policies enacted, investment, innovation, and cooperation can flourish.

Government works best when it maintains a level playing field; opens the doors for competition; and refrains from picking winners and losers.

When considering policy options to address the risks of climate change, policymakers should draw from the best insights from economics, science, and engineering.

As I mentioned earlier, the U.S. has achieved remarkable reductions in not just greenhouse gas intensity measures, but in absolute levels of carbon dioxide emissions through thoughtful regulation aimed at both energy efficiency, such as CAFE standards, building efficiency standards,

and continued improvements in emissions levels related to industrial processes.

If, policymakers conclude that more action is required, such as putting a more direct cost to carbon to incentivize different choices, we suggest that these policies ensure a uniform and predictable cost of carbon across the economy; that this lets markets drive solutions; that maximize transparency, reduce complexity, and promote global participation.

For some years now, ExxonMobil has held the view that a "revenue-neutral carbon tax" is the best option to fulfill these key principles.

Instead of subsidies and mandates that distort markets, stifle innovation, and raise energy costs, such a carbon tax could help create the conditions to reduce greenhouse gas emissions in a way that spurs new efficiencies and new technologies.

The revenue-neutral carbon tax could be a workable policy framework for countries around the world – and the policy most likely to preserve the ability of every sector of society to seek out new efficiencies and new technologies.

Sustaining Innovation into the Future

As we look to the energy challenges of the future, the energy policies we establish today will affect the investment and innovations of tomorrow. And those technologies will help determine the economic growth and individual opportunities for future generations.

In the months and years ahead, energy policy will be at the center of public discussions and debate..

It will be up to industry and business leaders, innovators, and investors – the people in this room – to communicate the policy principles that can be the foundation for international understanding, cooperation, and meaningful action.

By appreciating the universal need for energy in advancement of economies and the human condition, we can help lift up every nation.

By valuing the role of sustained innovation, we can learn from our industry's history about how free markets drive us to invest, develop, and deploy promising new technologies.

And by seeking wise and cooperative solutions, we can address the risks of climate change together and build a better future for all.

I thank you for your kind attention.

EXHIBIT 57

Our climate science history

We unequivocally reject allegations that ExxonMobil suppressed climate change research contained in media reports that are inaccurate distortions of ExxonMobil's nearly 40-year history of climate research.

We understand that climate risks are real. The company has continuously, publicly and openly researched and discussed the risks of climate change, carbon life cycle analysis and emissions reductions.

ExxonMobil's four decades of research in climate science has resulted in nearly 150 publicly available papers, including more than 50 peer-reviewed publications, and nearly 300 patents for cutting-edge

technological advances in emissions reductions and other related applications. Our scientists have been involved in the forefront of climate research, understanding and working with the world's leading experts on climate.

We long have informed shareholders and investors on our perception of the business risks associated with climate change through regulatory filings, our annual Corporate Citizenship Report and in other reports to shareholders.

We are working hard on solutions to the challenge of meeting the world's energy needs while reducing the environmental impact through support for research and development. Some recent examples include exploring transformational innovations in energy and the environment, development of climate modeling and lower-carbon energy research - all in conjunction with leading research universities.

We advocate for common sense approaches – substituting natural gas for coal in electrical generation, improving efficiency and using market forces to drive change -- while continuing to fund and participate in research into technology solutions and better understanding of the risks of climate change.

ExxonMobil is a responsible 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 advocate for effective policy approaches.

Read more of ExxonMobil's perspectives on climate.

Blogs:

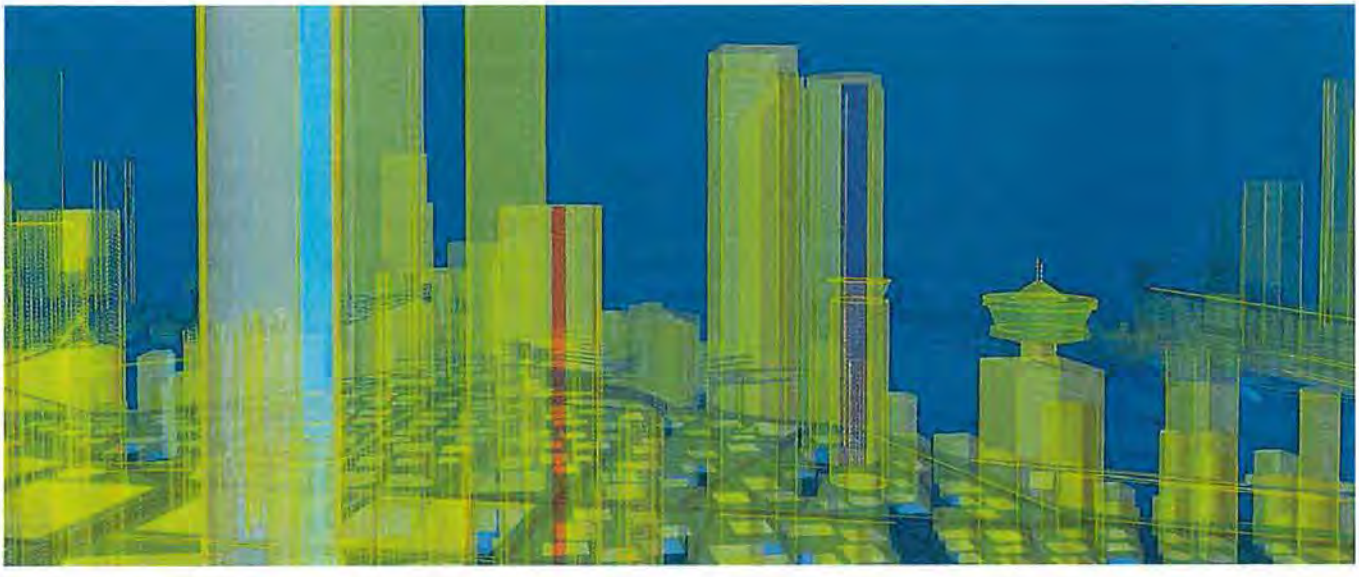
- Signing the Paris accord a step forward
- The coordinated attack on ExxonMobil
- ExxonMobil responds to state AGs
- Despite what divestment activists say, ExxonMobil is searching for climate solutions
- Focus on Technology: Finding a way to capture carbon
- Focus on Technology: Advanced biofuels
- Significant differences of opinion
- ExxonMobil's Statement on COP 21
- ExxonMobil and the carbon tax
- ExxonMobil and the U.N. climate talks
- Fox guarding the henhouse at Columbia
- Washington Post - Half right, half wrong
- A history lesson for InsideClimate News
- More backtracking by InsideClimate News
- "We never said Exxon stopped its research" ... Oh, really?
- A case for readers to read for themselves
- When it comes to climate change, read the documents
- ExxonMobil's commitment to climate science
- Setting the record straight on climate
- ExxonMobil on carbon policy and business planning

Media documents:

- Media reported documents

Peer-reviewed publications:

EXHIBIT 58



Perspectives blog

The truth about ExxonMobil and climate change

Suzanne McCarron - 05/23/2016

For a few months now, ExxonMobil has been hit by a series of politically motivated legal attacks related to our climate research.

Amid all the tumult, it's easy to lose track of the most elemental – if not the most important – facts about our corporation's position on climate change.

So let me take this opportunity to restate it.

At ExxonMobil, we believe the risks of climate change are real.

We are actively working to reduce greenhouse emissions in our own operations and to help our customers reduce their emissions as well.

That means developing technologies that reduce emissions, including working to improve energy efficiency and advance cogeneration. In fact, our cogeneration facilities alone enable the avoidance of approximately 6 million metric tons of greenhouse gas emissions each year, and allow us to feed power back to the grid in certain instances.

We are also developing next-generation biofuels that don't compete with food and water resources. Much of this research is conducted through partnerships with leading universities and research institutions including the Colorado School of Mines, Michigan State, Northwestern University, and the University of Wisconsin.

Meanwhile, we are advancing conventional carbon-capture-and-storage technology while at the same time pursuing innovative carbon-capture solutions involving carbonate fuel cells. This far-sighted research aims to reduce the cost of carbon capture while keeping CO2 out of the atmosphere.

All told, since 2000, ExxonMobil has spent approximately $7 billion to develop lower-emission energy solutions.

That figure doesn't include the fact that as the nation's leading producer of natural gas, ExxonMobil has helped contribute to the overall drop in energy-related CO2 emissions over the past decade.

As policymakers develop mechanisms to meet the goals set in Paris, they are expected to focus on reducing the greatest amount of emissions at the lowest cost to society. At the same time, they should recognize important shared humanitarian needs, including providing reliable and affordable energy to improve living standards.

As a global issue, addressing the risks of climate change requires broad-based, practical solutions around the world.

ExxonMobil believes that effective policies to address climate change should:

- Ensure a uniform and predictable cost of carbon across the economy;
- Be global in application;
- Allow market prices to drive the selection of solutions;
- 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.

Of the policy options being considered by governments, we believe a revenue-neutral carbon tax is the best option to fulfill these principles.

To read more about ExxonMobil's efforts to address the risks of climate change, please visit our corporate website.

Tags: future energy, Emissions, Climate Change, Biofuels

8 Comments **ExxonMobil Perspectives** **Login**

Recommend **Share** **Sort by Newest**

Join the discussion...

Daniel Padgett • 15 days ago

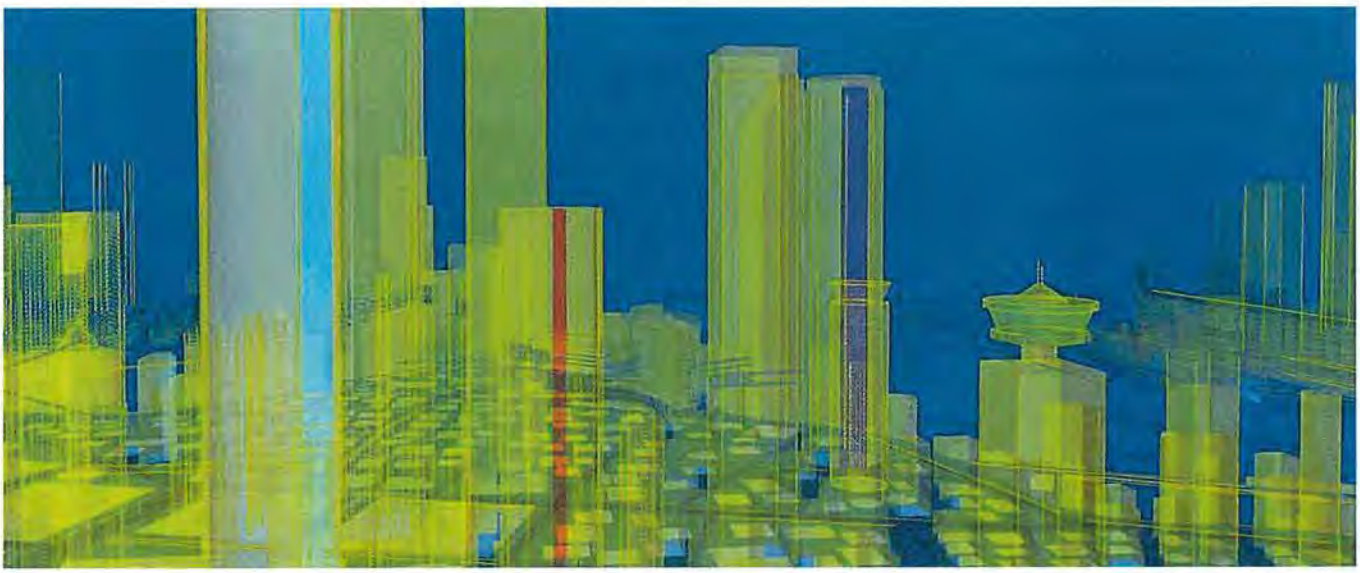
I still fail to understand the so called connection between CO2 and global warming.

As I understand it the CO2 actually turns into dry ice at lower temperatures.
From what I've researched so far, CO2 gases tend to collect in higher volumes at the poles.
This would account for the poles being covered in ice in part, because as the temperature of the poles drop, more CO2 freezes, logically the thawing point of dry ice is at a much slower rate compared to let's say just frozen water.

From this point there should be no reason as to why the poles are melting at such a rapid rate.
At this point it appears most of the damages being done to the poles are actually from the scientists, and government vessels, such as Ice breakers, and ice submarines.

As these vessels break off more of the ice shelves it thaws at a

EXHIBIT 59



Perspectives blog

The coordinated attack on ExxonMobil

Suzanne McCarron - 04/20/2016

A coordinated attack on ExxonMobil has taken place in recent days through the publication of a number of news reports that offer an eye-opening look at a campaign of misinformation about ExxonMobil's history of climate research.

That campaign has led directly to investigations by New York State Attorney General Eric Schneiderman and like-minded officials in other jurisdictions.

The stories unfolding over the past week have been reported by *The Wall Street Journal*, *Fox News*,*U.S. News & World Report*, the *Washington Free Beacon*, Reuters, *Energy in Depth*, *National Review*, and others. They tell a tale that is disturbing in what it says about journalism, the law, and our nation's discussions on the most important public policy issues.

One particularly troubling item that was publicly exposed in recent days provides evidence of a secret meeting in January of environmental activists and plaintiff's attorneys to coordinate strategy for an assault on ExxonMobil's reputation.

Leading the list of subjects for discussionwas this: "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."

In taking aim at our corporation, these activists and trial lawyers are attacking nearly 75,000 dedicated men and women who work to provide the sources of energy that are vital to a functioning economy. And they are taking aim at the millions of shareholders who own ExxonMobil stock.

Ultimately, however, the effort to demonize ExxonMobil distracts from what is truly important – providing the energy supplies to power the future while coming up with technological solutions that address the risks posed by climate change.

There's a meaningful dialogue to be had on climate change, one that focuses on collaborative actions and the search for solutions. We have been in that conversation for several decades. Our critics, on the other hand, want no part of that discussion. Rather, they seek to stifle free speech and limit scientific inquiry while painting a false picture of ExxonMobil.

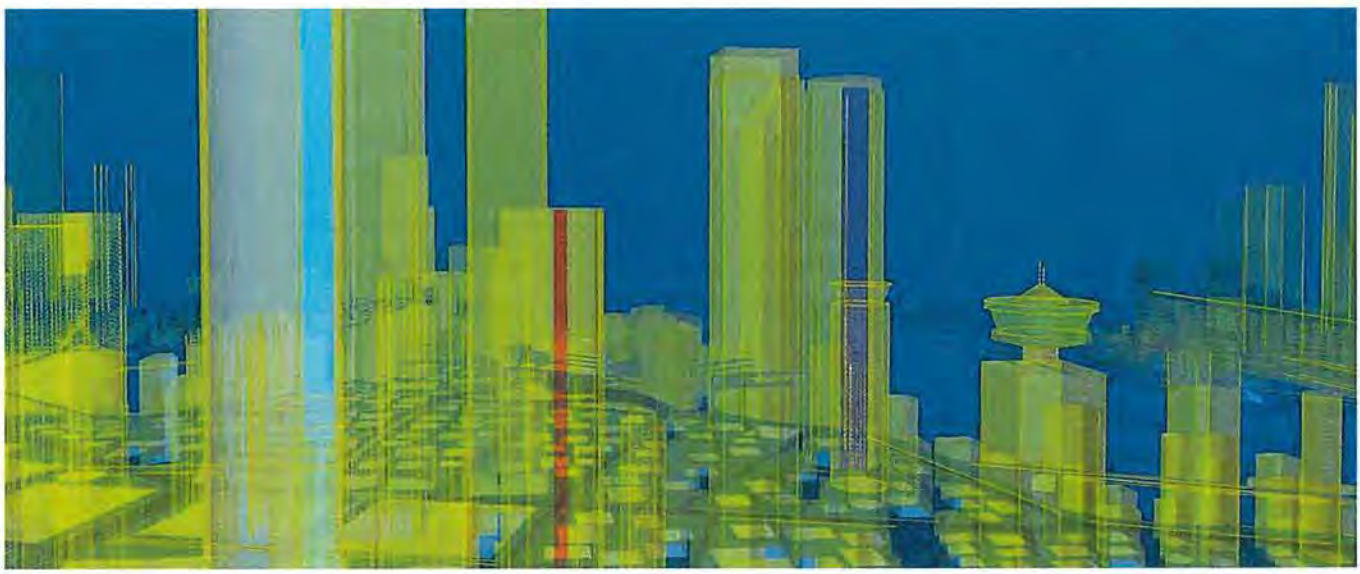
If they were truly interested in finding realistic answers to the dual challenge of providing energy needed for modern life and protecting the environment, they would welcome debate and open discussion. They would not be trying to exclude and silence the innovation, creativity, and brilliant ideas that thousands of scientists at ExxonMobil and other energy companies have to offer.

Tags: ExxonMobil citizenship, Exxon Perspectives, Climate Change

39 Comments **ExxonMobil Perspectives** **Login**

Recommend 4 **Share** **Sort by Newest**

EXHIBIT 60



Perspectives blog

ExxonMobil responds to state AGs

Suzanne McCarron - 03/29/2016

New York Attorney General Eric Schneiderman held a press conference today with former Vice President Al Gore and a few state-level attorneys general at which a number of discredited allegations against ExxonMobil were repeated. We issued the following statement in response:

Statement by Suzanne McCarron, ExxonMobil Vice President of Public and Government Affairs

The allegations leveled against ExxonMobil again today are politically motivated and based on discredited reporting funded by activist organizations. We are actively assessing all legal options.

The allegations are based on the false premise that ExxonMobil reached definitive conclusions about anthropogenic climate change before the world's experts and before the science itself had matured, and then withheld it from the broader scientific community. Such a claim is preposterous. It assumes that the expertise of a handful of Exxon scientists somehow exceeded the accumulated knowledge of the global scientific community at the time, and that the Exxon scientists somehow were able to reach

definitive conclusions before the science had developed. It ignores the fact that Exxon's scientists were fully engaged in the public discussion, openly sharing their findings in peer-reviewed publications and public archives, and actively contributing to the work of the UN's Intergovernmental Panel on Climate Change.

Contrary to activists' claims, our company's deliberations decades ago yielded no definitive conclusions. As our scientists determined at the time, many important questions about climate science remained unanswered, and more research was required. Accordingly, Exxon, and later ExxonMobil, continued research at leading universities, and also engaged in the public debate surrounding policy responses to the emerging science.

It should come as no surprise that Exxon's scientists discussed the available scientific research at the time and sought to build upon it through their own studies. This free exchange of ideas is essential to productive scientific inquiry. If such deliberations are subject to legal scrutiny through the lens of later baseless allegations, what incentive do companies have to pursue further research? The investigations targeting our company threaten to have a chilling effect on private sector research.

The allegations repeated today are an attempt to limit free speech and are the antithesis of scientific inquiry. Left unchallenged, they could stifle the search for solutions to the real risks from climate change.

ExxonMobil recognizes the risks posed by climate change, and we believe that everyone should be engaged in meaningful action to reduce greenhouse gas emissions.

Tags: responsibility, ExxonMobil citizenship, Exxon Perspectives, Climate Change

EXHIBIT 61

News and updates › **News releases**

News *Nov 5, 2015 - 05:23 p.m. EST*

ExxonMobil to Hold Media Call on New York Attorney General Subpoena

Dateline:

IRVING, Texas

Public Company Information:

NYSE: XOM

IRVING, Texas--(BUSINESS WIRE)--ExxonMobil will host a call for media at 5:45 p.m. EST / 4:45 p.m. CST today, Thursday, Nov. 5, 2015 regarding a subpoena for production of documents relating to climate change received from the attorney general of New York. To join the call, dial 888-264-8893 (United States) or 913-312-1500 (International) and enter participant code 5346836.

ExxonMobil has included information about the business risk of climate change for many years in our 10-K, Corporate Citizenship Report and in other reports to shareholders.

Information about ExxonMobil's climate research can be found on the company's blog at www.exxonmobilperspectives.com.

Contact:

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