IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF TEXAS
FORT WORTH DIVISION

EXXON MOBIL CORPORATION, Plaintiff, v. MAURA TRACY HEALEY, Attorney General of Massachusetts, in her official capacity, Defendant.	§ § § § § § § § § § § §	No. 4:16-CV-469-K

SUPPLEMENTAL APPENDIX IN SUPPORT OF EXXON MOBIL CORPORATION'S MOTION FOR PRELIMINARY INJUNCTION

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CERTIFICATE OF SERVICE

This is to certify that on this 24th day of August 2016, a true and correct copy of the foregoing document was filed electronically via the CM/ECF system, which gave notice to all counsel of record pursuant to Local Rule 5.1(d).

/s/ Ralph H. Duggins
Ralph H. Duggins

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF TEXAS
FORT WORTH DIVISION

EXXON MOBIL CORPORATION,	§	
	§	
Plaintiff,	§	
	§	
v.	§	CIVIL ACTION NO. 4:16-CV-469-K
	§	
MAURA TRACY HEALEY, Attorney General of Massachusetts, in her official capacity,	§	
	§	
	§	
Defendant.	§	
	§	

DECLARATION OF JUSTIN ANDERSON

I, Justin Anderson, declare as follows:

1. My name is Justin Anderson. I have been admitted to practice law *pro hac vice* in the U.S. District Court for the Northern District of Texas and am an attorney with the law firm Paul, Weiss, Rifkind, Wharton & Garrison LLP, counsel of record for Exxon Mobil Corporation ("ExxonMobil") in this matter. I am 18 years of age and am fully competent in all respects to make this Declaration. 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 ExxonMobil, and each of them is true and correct.

2. I submit this declaration in support of the Reply in Support of Exxon Mobil Corporation's Motion for a Preliminary Injunction.

3. Attached to this declaration as Exhibit A is a copy of a memorandum from Roger W. Cohen to W. Glass, dated August 18, 1981. It was obtained from the appendix filed in support of Attorney General Healey's memorandum of law in opposition to

ExxonMobil's motion for a preliminary injunction ("Opposition"). Attorney General Healey relies on this document for the proposition that "[o]ne Exxon scientist warned that it was 'distinctly possible' that the effects of climate change over time will 'indeed be catastrophic (at least for a substantial fraction of the earth's population).'" Opp. 7.[1] In her discussion of the document, Attorney General Healey omits the following language that undermines her assertion: "[O]ur best guess is that observable effects in the year 2030 are likely to be 'well short of catastrophic.'" Supp. App. 2.

4. Attached to this declaration as Exhibit B is a copy of a letter from Roger W. Cohen to A. M. Natkin, dated September 2, 1982. It was obtained from the appendix filed in support of Attorney General Healey's Opposition. Attorney General Healey relies on this document for the following propositions:

a. "Exxon also understood in the early 1980s that doubling of atmospheric carbon dioxide would occur 'sometime in the latter half of the 21st century,' and that 'CO_2-induced climate changes should be observable well before doubling.'" Opp. 9.

b. "Exxon's scientists agreed with the scientific consensus 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) [degrees Celsius].'" Opp. 9.

c. "Exxon understood 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.'" Opp. 9.

[1] "Opp." refers to the memorandum filed by the Attorney General in opposition to ExxonMobil's motion for a preliminary injunction; "Opp. App." refers to the appendix filed in support of that memorandum.

5. In her discussion of Exhibit B, Attorney General Healey omits the following passages from the letter that undermine her characterization:

a. "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." Supp. App. 8.

b. "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." Supp. App. 7.

6. Attached to this declaration as Exhibit C is a copy of a memorandum from M. B. Glaser, Manager, Environmental Affairs Programs, Exxon Research and Engineering Company, dated November 12, 1982, regarding the "CO_2 'Greenhouse' Effect." Attached to that memorandum is a report prepared by the Coordination and Planning Division of the Exxon Research and Engineering Company, dated April 1, 1982. Exhibit C was obtained from https://insideclimatenews.org/sites/default/files/documents/1982%20Exxon%20Primer%20on%20CO2%20Greenhouse%20Effect.pdf. The appendix filed in support of Attorney General Healey's Opposition includes an excerpt of this document, Opp. App. 622-26, and her Opposition relies on it for the following proposition: "Over three decades ago, Exxon understood that climate-driven risk to its businesses, recognizing in 1982, in a memorandum widely distributed to

Exxon management, that '[m]itigation of the "greenhouse effect" would require major reductions in fossil fuel combustion.'" Opp. 8. In her discussion of the document, Attorney General Healey omits following passages from the memorandum that undermine her characterization:

a. "There is currently no unambiguous scientific evidence that the earth is warming." Supp. App. 15.

b. "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." Supp. App. 15.

c. "Considerable uncertainty also surrounds the possible impact on society of such a warming trend, should it occur." Supp. App. 15.

d. "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." Supp. App. 16.

e. "Key points needing better definition include the impact of fossil fuel combustion and the role of the oceans in the carbon cycle and the interactive effect of carbon dioxide and other trace atmospheric gases on climate." Supp. App. 47.

f. "Given the long term nature of the potential problem and the uncertainties involved, it would appear that there is time for further study and monitoring before specific actions need be taken." Supp. App. 47.

7. Attached to this declaration as Exhibit D is a copy of a presentation by Henry Shaw titled *CO_2 Greenhouse and Climate Issues*, dated March 28, 1984. It was

obtained from the appendix filed in support of Attorney General Healey's Opposition. Attorney General Healey relies on this document for the following propositions:

a. "Exxon's scientists were, in the early 1980s, predicting significant increases in global temperature as a result of the combustion of fossil fuels, and that a 2 to 3 degree Celsius increase could lead to melting of polar ice, rising sea levels, 'redistribution of rainfall,' 'accelerated growth of pests and weeds,' 'detrimental health effects,' and 'population migration.'" Opp. 7.

b. "Over three decades ago, Exxon understood that climate-driven risk to its businesses, recognizing in . . . 1984, that '[w]e can either adapt our civilization to a warmer planet or avoid the problem by sharply curtailing the use of fossil fuels.'" Opp. 8.

8. In her discussion of Exhibit D, Attorney General Healey omits the following passages from the presentation that undermine her characterization:

a. "The time scale for such a catastrophe is measured in centuries." Supp. App. 71.

b. "Our next task is to convert the amou[nt] 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." Supp. App. 70.

c. "The general consensus 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."[2] Supp. App. 71.

9. Attached to this declaration as Exhibit E is a transcript of the AGs United for Clean Power Press Conference, held on March 29, 2016, which was prepared by counsel based on a video recording of the event. The video recording is available at http://www.ag.ny.gov/press-release/ag-schneiderman-former-vice-president-al-gore-and-coalition-attorneys-general-across.

10. Attached to this declaration as Exhibit F is a copy of the Civil Investigative Demand served on Exxon Mobil Corporation by the Massachusetts Attorney General's Office.

11. Attached to this declaration as Exhibit G is a copy of the Climate Change Coalition Common Interest Agreement, obtained from http://eelegal.org/wp-content/uploads/2016/08/Climate-Change-CIA.pdf.

12. Attached to this declaration as Exhibit H is an excerpt of a report by the U.S. Environmental Protection Agency, dated September 1983, obtained from https://nepis.epa.gov/Exe/ZyNET.exe/9101HEAX.txt?ZyActionD=ZyDocument&Client=EPA&Index=2011%20Thru%202015%7C1995%20Thru%201999%7C1981%20Thru%201985%7C2006%20Thru%202010%7C1991%20Thru%201994%7C1976%20Thru%201980%7C2000%20Thru%202005%7C1986%20Thru%201990%7CPrior%20to%201976%7CHardcopy%20Publications&Docs=&Query=delay%20greenhouse%20warming%20&Time=&EndTime=&SearchMethod=2&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQField

[2] "EPA" is the United States Environmental Protection Agency. "NRC/NAS" is the National Research Council / Nation Academy of Sciences. "MIT/NSF" is the Massachusetts Institute of Technology / National Science Foundation.

Op=0&XmlQuery=&File=D%3A%5CZYFILES%5CINDEX%20DATA%5C81THRU85%5CTXT%5C00000024%5C9101HEAX.txt&User=anonymous&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=15&FuzzyDegree=0&ImageQuality=r85g16/r85g16/x150y150g16/i500&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x.

13. Attached to this declaration as Exhibit I is an excerpt of a report by the National Research Council / National Academy of Sciences, dated 1983, obtained from http://www.nap.edu/catalog.php?record_id=18714.

14. Attached to this declaration as Exhibit J is a copy of the U.S. Environmental Protection Agency's endangerment finding for greenhouse gas emissions, which the Administrator signed on December 7, 2009. It was obtained from https://www3.epa.gov/climatechange/endangerment/.

15. Attached to this declaration as Exhibit K is an excerpt of ExxonMobil's *Financial and Operating Review*, dated 2015, obtained from http://cdn.exxonmobil.com/~/media/global/files/financial-review/2015_exxonmobil_financial_and_operating_review.pdf.

16. Attached to this declaration as Exhibit L is a copy of ExxonMobil's *Energy and Carbon – Managing the Risks* report, obtained from http://cdn.exxonmobil.com/~/media/global/files/energy-and-environment/report---energy-and-carbon---managing-the-risks.pdf.

17. Attached to this declaration as Exhibit M is an excerpt of Statoil's *Sustainability Report*, dated 2015, obtained from

http://www.statoil.com/no/InvestorCentre/AnnualReport/AnnualReport2015/Documents/DownloadCentreFiles/01_KeyDownloads/2015_Sustainability_report.pdf.

18. Attached to this declaration as Exhibit N is an excerpt of a public letter by J.J. Traynor, Executive Vice President, Investor Relations, Royal Dutch Shell plc, dated May 16, 2014, obtained from http://s02.static-shell.com/content/dam/shell-new/local/corporate/corporate/downloads/pdf/investor/presentations/2014/sri-web-response-climate-change-may14.pdf.

19. Attached to this declaration as Exhibit O is a copy of a press release issued by the Alabama Attorney General's Office, dated March 30, 2016, obtained from http://www.ago.state.al.us/News-800.

20. Attached to this declaration as Exhibit P is a copy of a press release issued by the Louisiana Attorney General's Office, dated March 30, 2016, obtained from https://www.ag.state.la.us/Article.aspx?articleID=2207&catID=2.

21. Attached to this declaration as Exhibit Q is a copy of an article by Michael Bastasch published on theDailyCaller.com on April 4, 2016, obtained from http://dailycaller.com/2016/04/04/kansas-ag-takes-on-al-gores-alarmism-wont-join-ant-exxon-publicity-stunt.

22. Attached to this declaration as Exhibit R is a copy of an article by Kyle Feldscher published in the Washington Examiner on April 5, 2016, obtained from http://www.washingtonexaminer.com/west-virginia-ag-disappointed-in-probes-of-exxon-mobil/article/2587724.

23. Attached to this declaration as Exhibit S is a copy of an e-mail chain, the last of which is from Michael Meade to Scot Kline and Wendy Morgan and is dated

March 22, 2016, obtained from http://eelegal.org/wp-content/uploads/2016/04/Gore-is-adding-star-power-and-words-to-avoid.pdf.

24. Attached to this declaration as Exhibit T is a copy of an e-mail from Peter Washburn to Lemuel Srolovic, et al., dated March 25, 2016, obtained from http://eelegal.org/wp-content/uploads/2016/04/Questionnaire-responses.pdf.

25. Attached to this declaration as Exhibit U is a copy of an e-mail chain, the last of which is from Wendy Morgan to Peter Washburn and Scot Kline and is dated March 30, 2016, obtained from http://eelegal.org/wp-content/uploads/2016/04/Work-groups-and-first-call-set.pdf.

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

Executed on August 23, 2016.

Justin Anderson
(janderson@paulweiss.com)
(*pro hac vice*)
Paul, Weiss, Rifkind, Wharton & Garrison LLP
2001 K Street, NW
Washington DC 20006-1047
(202) 223-7321
Fax: (202) 204-7394

Exhibit A

ENERAL
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

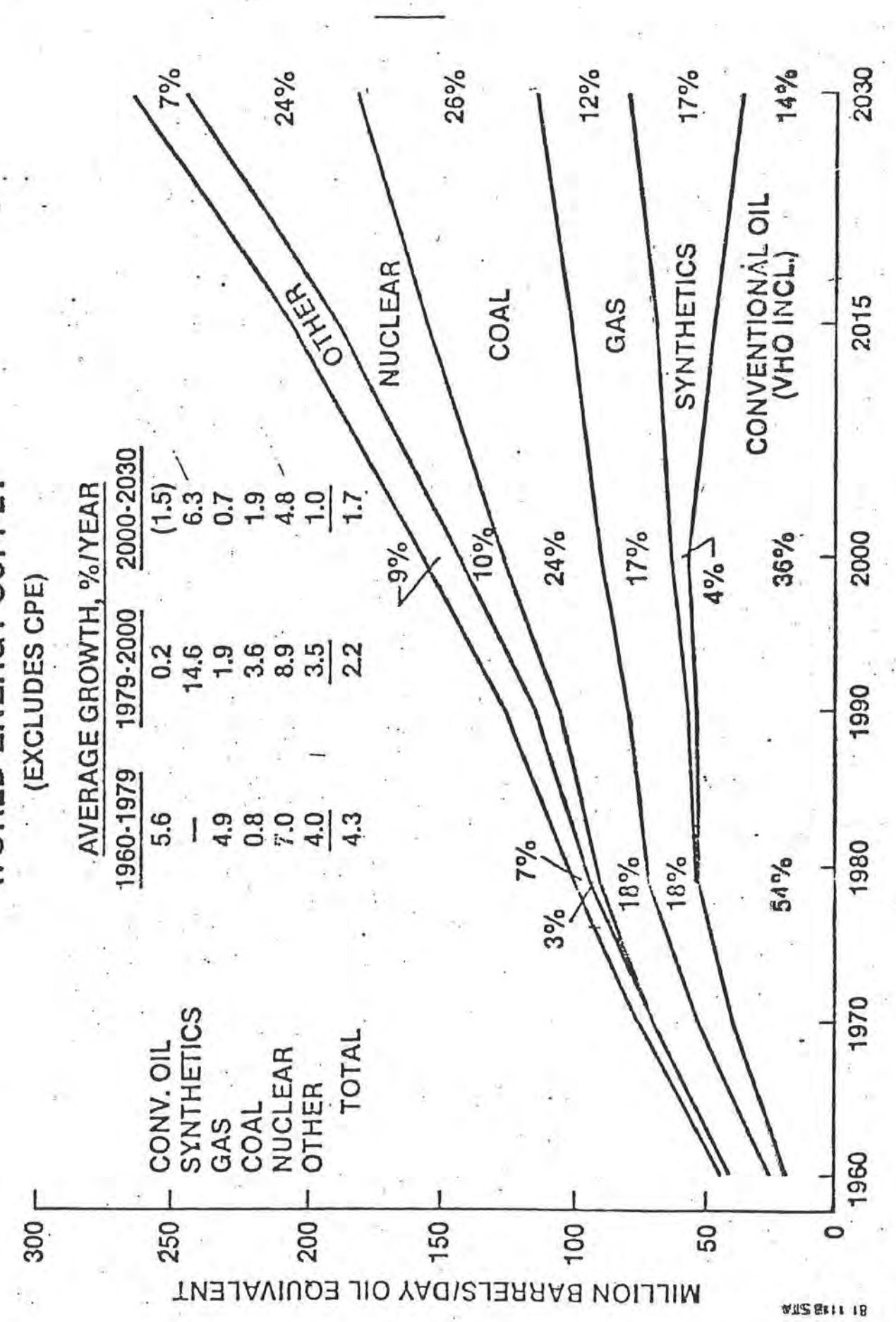
c: T. K. Kett

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)
AVERAGE GROWTH, %/YEAR
1960-1979 1979-2000 2000-2030
CONV. OIL 5.6 0.2 (1.5)
SYNTHETICS — 14.6 6.3
GAS 4.9 1.9 0.7
COAL 0.8 3.6 1.9
NUCLEAR 7.0 8.9 4.8
OTHER 4.0 3.5 1.0
TOTAL 4.3 2.2 1.7
MILLION BARRELS/DAY OIL EQUIVALENT
300
250
200
150
100
50
0
1960
1970
1980
1990
2000
2015
2030
CONVENTIONAL OIL (VHO INCL.)
SYNTHETICS
GAS
COAL
NUCLEAR
OTHER
7%
24%
26%
12%
17%
14%
36%
4%
17%
24%
10%
9%
18%
18%
7%
3%
54%

Supp. App. 005

Exhibit B

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 C

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

H. N. WEINBERG
NOV 15 1982

Distribution List:

R. W. Cohen
M. J. Connor, Jr.
E. E. David, Jr.
C. M. Eidt, Jr.
W. R. Epperly
R. L. Hirsch
T. G. Kaufmann
D. G. Levine
G. H. Long
J. R. Riley
H. R. Savage
A. Schriesheim
J. F. Taylor
D. T. Wade
H. N. Weinberg

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.

PROPRIETARY INFORMATION

FOR AUTHORIZED COMPANY USE ONLY

CO_2 GREENHOUSE EFFECT

A TECHNICAL REVIEW

PREPARED BY THE

COORDINATION AND PLANNING DIVISION

EXXON RESEARCH AND ENGINEERING COMPANY

APRIL 1, 1982

EC-11-5/A2

CO_2 GREENHOUSE EFFECT

A TECHNICAL REVIEW

TABLE OF CONTENTS

EC-11-5/A5

CO_2 GREENHOUSE EFFECT

Background

The buildup of CO_2 in the atmosphere has been monitored continuously at the National Oceanic and Atmospheric Administration's (NOAA) Observatory at Mauna Loa, Hawaii, and periodically in other places since 1957. In addition to observing a trend between 1957-1979 that showed atmospheric CO_2 increasing from 315 to 337 ppm, Keeling and others also observed a seasonal variability ranging from 6 to 10 ppm between a low at the end of the summer growing season (due to photosynthesis) and a high at the end of winter (due to fossil fuel burning for heat, and biomass decay). There is little doubt that these observations indicate a growth of atmospheric CO_2 (see Figure 1). It is also believed that the growth of atmospheric CO_2 has been occurring since the middle of the past century, i.e., coincident with the start of the Industrial Revolution. There is, however, great uncertainty as to whether the atmospheric CO_2 concentration prior to the Industrial Revolution (ca., 1850) was 290-300 ppm which one would arrive at by assuming atmospheric CO_2 growth is due to fossil fuel burning and cement manufacturing, or 260-270 ppm based on carbon isotope measurements in tree rings. The information on CO_2 concentration prior to 1850 is important because it would help establish the validity of climatic predictions with respect to the inception of a CO_2 induced "greenhouse effect".

The "greenhouse effect" refers to the absorbtion by CO_2 and other trace gases contained in the atmosphere (such as water vapor, ozone, carbon monoxide, oxides of nitrogen, freons, and methane) of part of the infrared radiation which is reradiated by the earth. An increase in absorbed energy via this route would warm the earth's surface causing changes in climate affecting atmospheric and ocean temperatures, rainfall patterns, soil moisture, and over centuries potentially melting the polar ice caps.

Sources and Disposition of Atmospheric Carbon Dioxide - The Carbon Cycle

The relative contributions of biomass oxidation (mainly due to deforestation) and fossil fuel combustion to the observed atmospheric CO_2 increase are not known. There are fairly good indications that the annual growth of atmospheric CO_2 is on the order of 2.5 to 3.0 Gt/a* of carbon and the net quantity of carbon absorbed by the ocean is similarly 2.5 to 3 Gt/a. Thus, these two sinks (atmosphere and ocean) can account for the total fossil carbon burned (including 0.3 GtC/a** from cement manufacturing) which is on the order of 5-6 Gt/a and does not allow much room for a net contribution of biomass

* Gt/a = gigatons per annum = 10^9 metric tons per year.
** GtC/a = gigatons carbon per annum = 10^9 metric tons of carbon per year.

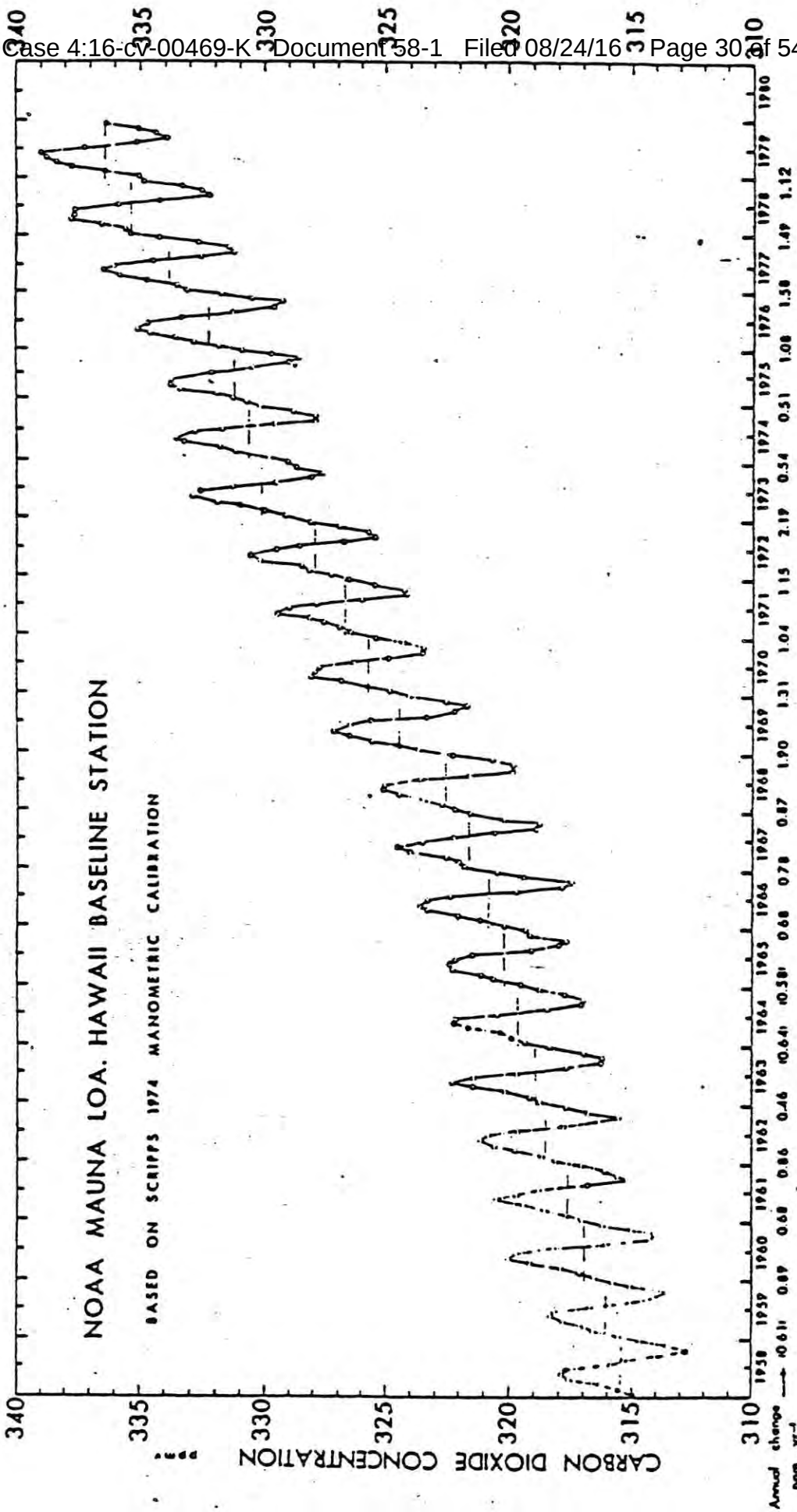


Figure 1 Modern record of atmospheric CO_2 concentrations. Mean monthly concentration measurements at Mauna Loa, Hawaii. Annual changes in parentheses are based on incomplete records; the solid dots are interpolated values (source: NOAA).

carbon. Yet, highly respected scientists such as Woodwell, Bolin and others have postulated a net biomass contribution to atmospheric CO_2 that ranges from 1 to perhaps 8 Gt/a of carbon. During 1980, a number of different groups produced new estimates of the contribution of organic terrestial fluxes to atmospheric CO_2. A consensus has not been reached, but estimates of the net annual terrestial biosphere emissions to the atmosphere now range between a 4 GtC/a source and a 2 GtC/a sink. Figure 2 summarizes the fluxes and reservoirs for the carbon cycle. It should be noted that the net biosphere contribution was assumed to be 0-2 GtC/a.

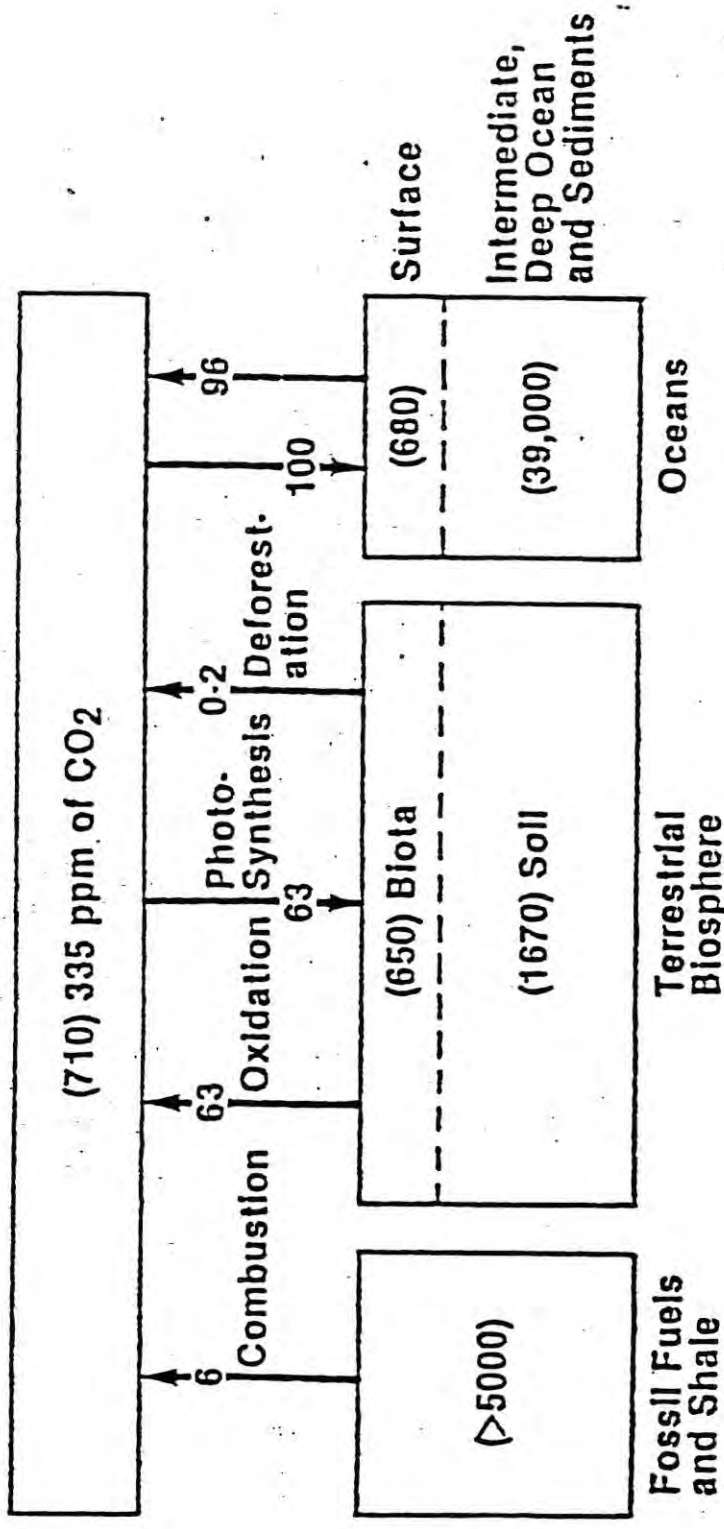
The rate of forest clearing has been estimated at 0.5% to 1.5% per year of the existing area. Forests occupy about 50 x $10^6 km^2$ out of about 150 x $10^6 km^2$ of continental land, and store about 650 Gt of carbon. One can easily see that if 0.5% of the world's forests are cleared per year, this could contribute about 3.0 Gt/a of carbon to the atmosphere. Even if reforestation were contributing significantly to balancing the CO_2 from deforestation, the total carbon stored in new trees tends to be only a small fraction of the net carbon emitted. It should be noted, however, that the rate of forest clearing and reforestation are not known accurately at this time. If deforestation is indeed contributing to atmospheric CO_2, then another sink for carbon must be found, and the impact of fossil fuel must be considered in the context of such a sink.

The magnitude of the carbon fluxes shown in Figure 2 between the atmosphere and the terrestial biosphere, and the atmosphere and the oceans are not precisely known. The flow of carbon between these reservoir pairs is generally assumed to have been in equilibrium prior to the Industrial Revolution. However, the errors in the estimated magnitude of these major fluxes are probably larger than the magnitude of the estimated man-made carbon fluxes, i.e., fossil fuels and deforestation. The man-made fluxes are assumed to be the only ones that have disturbed the equilibrium that is believed to have existed before the Industrial Revolution, and they can be estimated independently of the major fluxes. The man-made carbon fluxes are balanced in Figure 2 between the known growth rate of atmospheric carbon and the oceans. The carbon flux to the atmosphere is 6Gt/a from fossil fuels and cement manufacturing (cement manufacturing contributes about 4% of non-biosphere anthropogenic carbon) and 2Gt/a from deforestation, while 4Gt/a return to the ocean, resulting in a 50% carbon retention rate in the atmosphere. One cannot rule out, in view of the inherent uncertainty of the major fluxes, that the biosphere may be a net sink and the oceans may absorb much less of the man-made CO_2.

Projections of scientists active in the area indicate that the contribution of deforestation, which may have been substantial in the past, will diminish in comparison to the expected rate of fossil fuel combustion in the future. A few years ago a number of scientists hypothesized that a doubling of the amount of carbon dioxide in the atmosphere could occur as early as 2035. This hypothesis is generally not acceptable anymore because of the global curtailment of fossil fuel usage. Calculations recently completed at Exxon Research

FIGURE 2

Exchangeable Carbon Reservoirs and Fluxes



( ) = Size of Carbon Reservoirs in Billions of Metric Tons of Carbon

Fluxes (arrows) = Exchange of Carbon Between Reservoirs in Billions of Metric Tons of Carbon per Year

and Engineering Company using the energy projections from the Corporate Planning Department's 21st Century Study*, indicate that a doubling of the 1979 atmospheric CO_2 concentration could occur at about 2090. If synthetic fuels are not developed and fossil fuel needs are met by new gas and petroleum discoveries, then the atmospheric CO_2 doubling time would be delayed by about 5 years to the late 2090's. Figure 3 summarizes the projected growth of atmospheric CO_2 concentration based on the Exxon 21st Century Study-High Growth scenario, as well as an estimate of the average global temperature increase which might then occur above the current temperature. It is now clear that the doubling time will occur much later in the future than previously postulated because of the decreasing rate of fossil fuel usage due to lower demand.

Description of Potential Impact on Weather, Climate, and Land Availability

The most widely accepted calculations carried on thus far on the potential impact on climate of doubling the carbon dioxide content of the atmosphere use general circulation models (GCM). These models indicate that an increase in global average temperature of $3^{\circ} \pm 1.5^{\circ}C$ is most likely. Such changes in temperature are expected to occur with uneven geographic distribution with greater warming occurring at the higher latitudes, i.e., the polar regions. This is due to increased absorption of solar radiation energy on the darker polar surfaces that would become exposed when ice and snow cover melt due to increasing temperature (see Figure 4). There have been other calculations using radiative convective models and energy balance models which project average temperature increases on the order of $0.75^{\circ}C$ for a doubling of CO_2. These calculations are compared in Figure 5. Figure 6 summarizes possible temperature increases due to various changes in atmospheric CO_2 concentration.

If the atmospheric CO_2 content had been 295 ppm prior to the Industrial Revolution, and an average global temperature increase above climate noise is detectable at the present time, this would add credibility to the general circulation models. However, if the CO_2 concentration and been 265 ppm prior to the Industrial Revolution, then detecting a temperature effect of $0.5^{\circ}C$ now would imply that the temperature for a doubling of CO_2 would be $1.9^{\circ}C$. The projected temperatures for both alternatives fall within the $3^{\circ} \pm 1.5^{\circ}C$ range. Temperature projections for alternate scenarios will be discussed later.

Climate modeling was studied by a committee of the National Research Council, chaired by Jules G. Charney of MIT, and the conclusions are summarized in

* The "21st Century Study" referred to here and in other places in this report has been superseded by a new energy study called the "2030 Study". The new study projects energy demands that are lower than the earlier figures, but not sufficiently different to change any of the conclusions of this report.

Figure 3

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

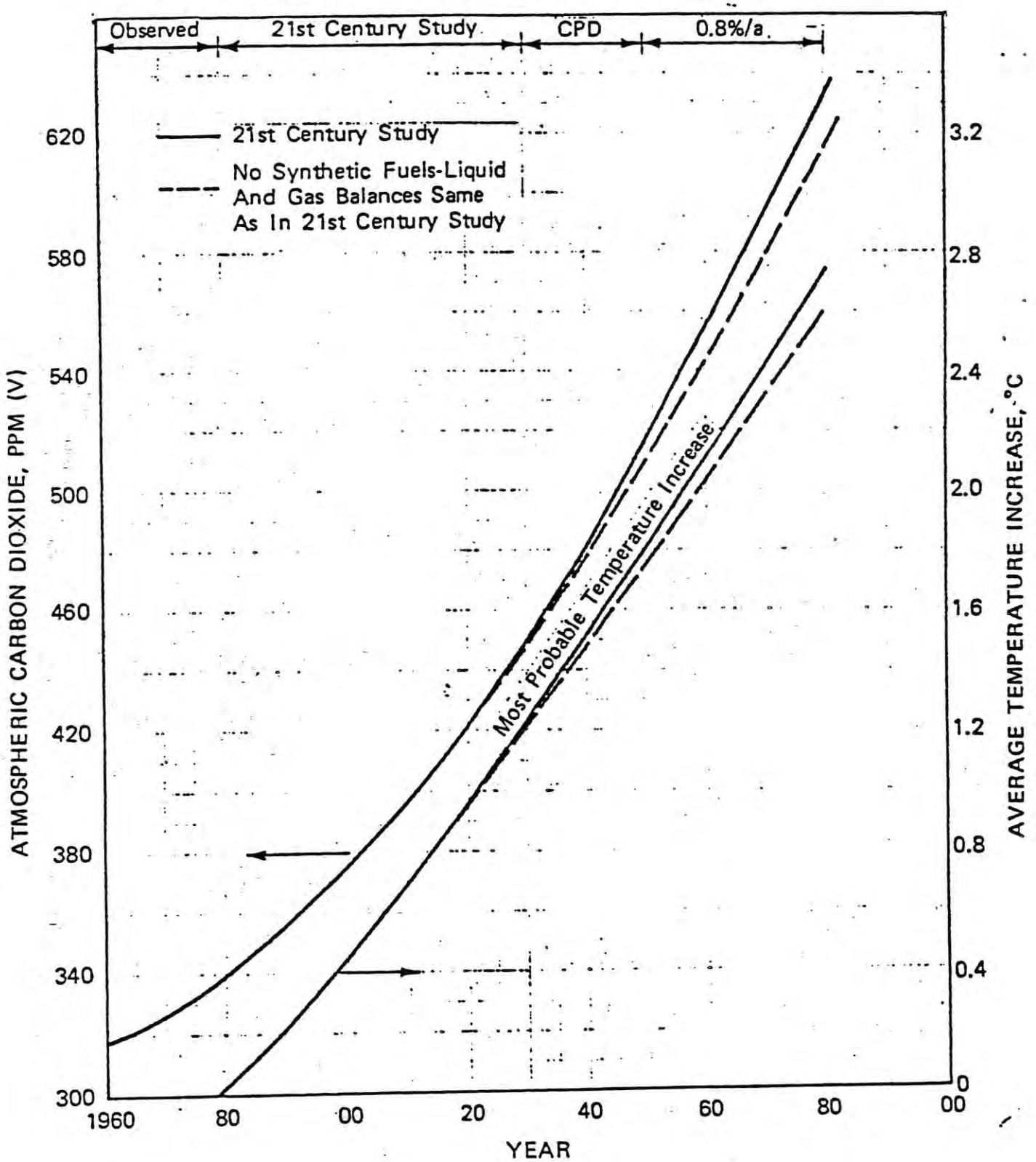
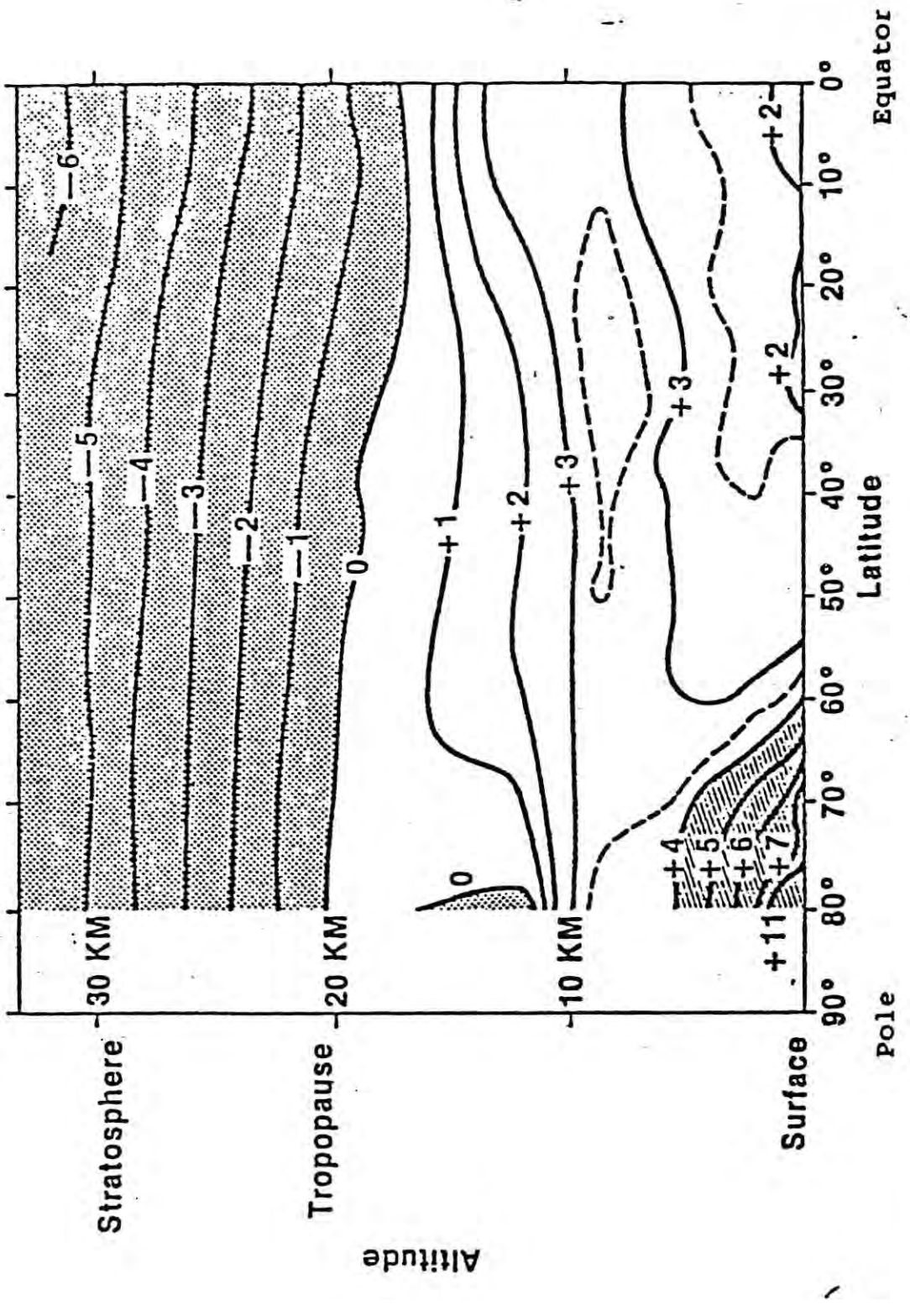


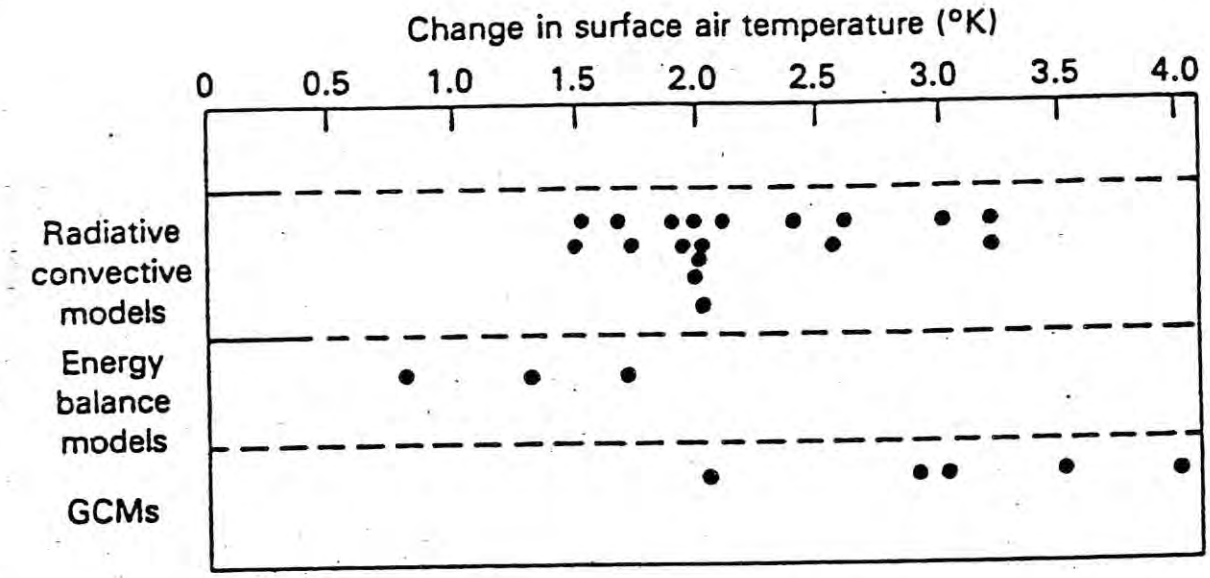
Figure 4

Temperature Change (°C) Due to Doubling CO_2 Concentrations



Basis: Computed by the U.S. National Oceanic and Atmospheric Administration using their general circulation model.

Figure 5



The change in globally averaged surface air temperature resulting from a doubling of atmospheric CO_2 as given by a variety of radiative-convective, energy balance, and global circulation (GCM) models. (From W. L. Gates, Oregon State University Technical Report no. 4.)

Figure 6

Estimates of the Change in Global Average Surface Temperature Due to Various Changes in CO_2 Concentration. Shading Shows Present Range of Natural Fluctuations.

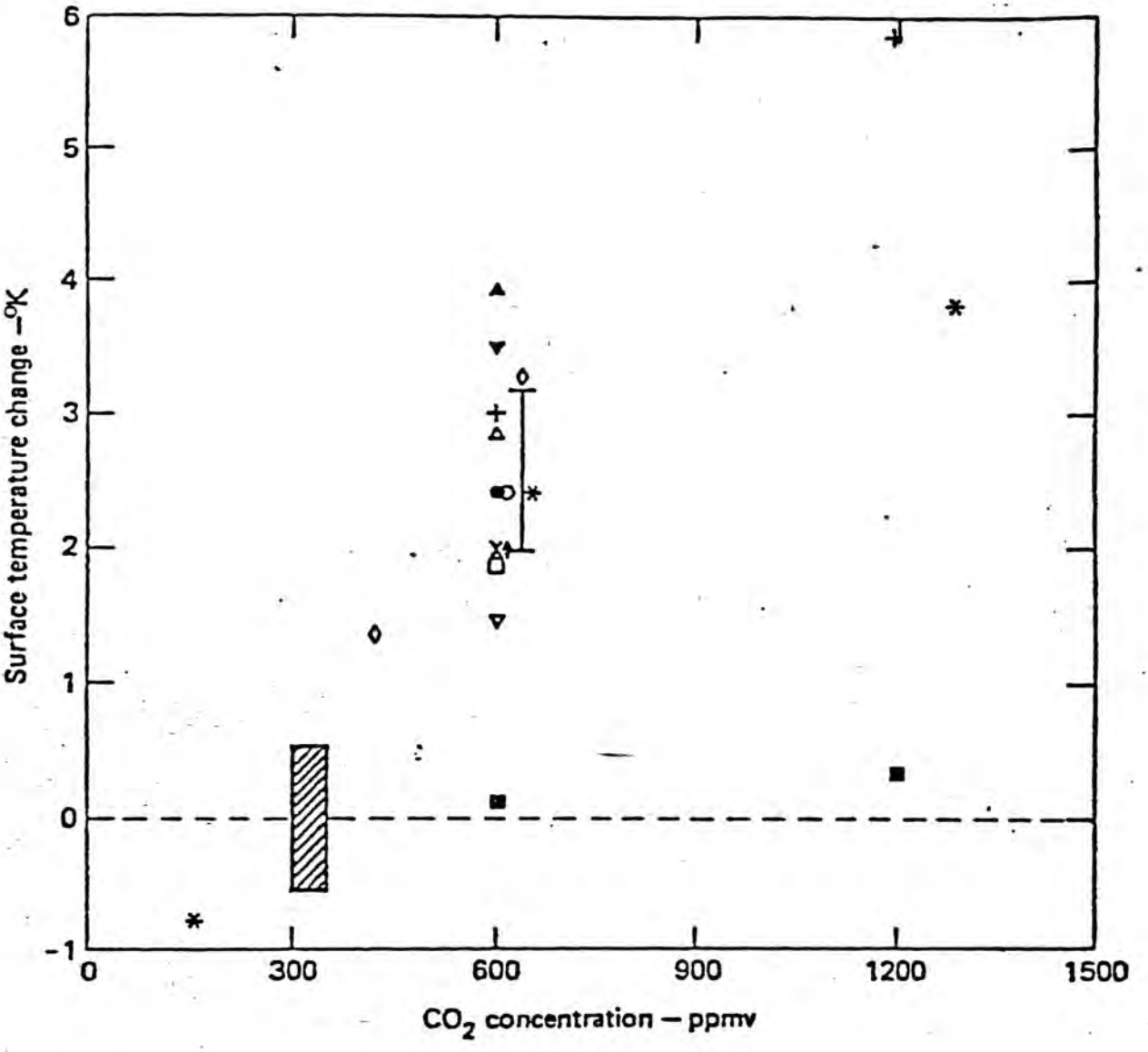
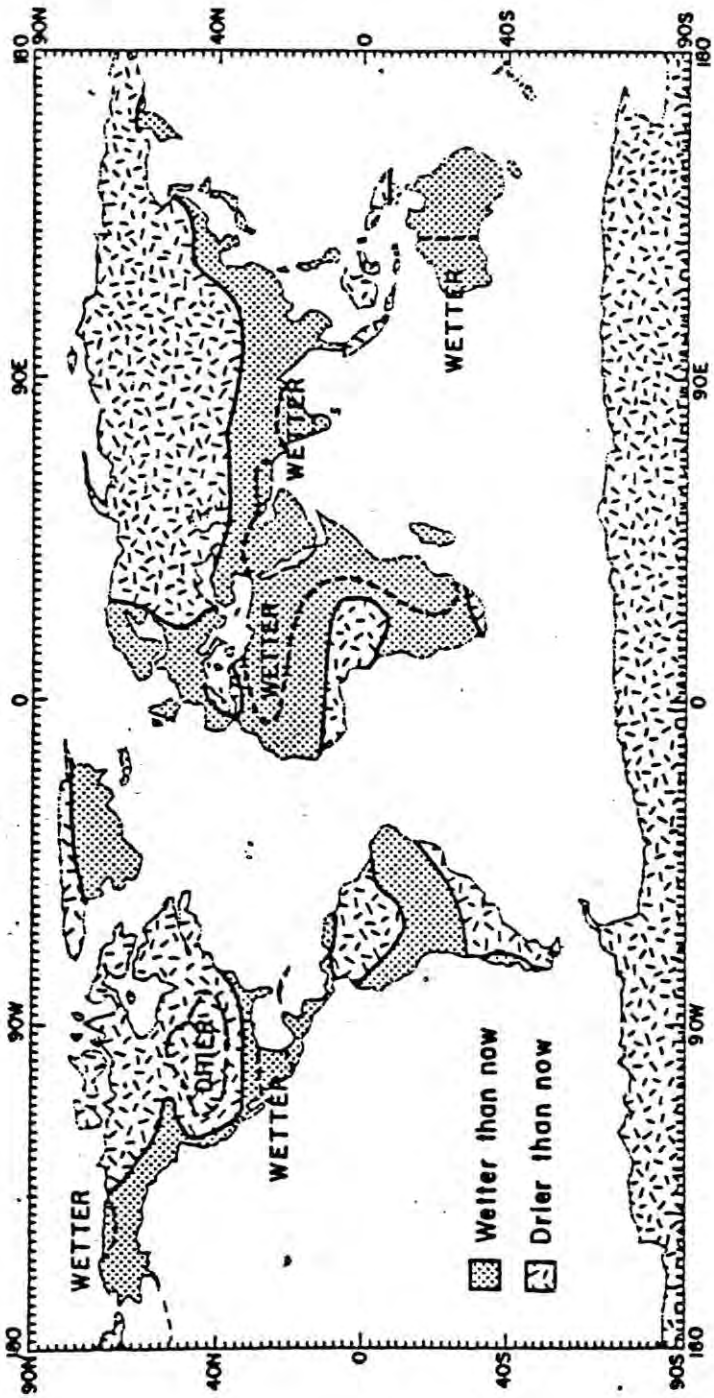


Figure 7



Example of a scenario of possible soil moisture patterns on a warmer Earth. It is based on paleoclimatic reconstructions of the Altithermal Period (4500 to 8000 years ago), comparisons of recent warm and cold years in the Northern Hemisphere, and a climate model experiment. (For a discussion of these sources of information see Appendix C.) Where two or more of these sources agree on the direction of the change we have indicated the area of agreement with a dashed line and a label.

their report titled, "Carbon Dioxide and Climate: A Scientific Assessment." This National Research Council study concluded that there are major uncertainties in these models in terms of the timing for a doubling of CO_2 and the resulting temperature increase. These uncertainties center around the thermal capacity of the oceans. The oceans have been assumed to consist of a relatively thin, well mixed surface layer averaging about 70 meters in depth in most of the general circulation models, and the transfer of heat into the deep ocean is essentially infinitely slow. The Charney panel felt, however, that the amount of heat carried by the deep ocean has been under estimated and the oceans will slow the temperature increase due to doubling of atmospheric CO_2. The Charney group estimated that the delay in heating resulting from the effect of the oceans could delay the expected temperature increase due to a doubling of CO_2 by a few decades. Accordingly, the time when the temperature increases discussed above are reached must be assumed to have occurred at an instantaneous equilibrium.

Along with a temperature increase, other climatological changes are expected to occur including an uneven global distribution of increased rainfall and increased evaporation. These disturbances in the existing global water distribution balance would have dramatic impact on soil moisture, and in turn, on agriculture. Recently, Manabe et al., using GCM's calculated that the zonal mean value of soil moisture in summer declines significantly in two separate zones of middle and high latitudes in response to an increase in the CO_2 concentration of air. This CO_2 induced summer dryness results not only from the earlier ending of the snowmelt season, but also from the earlier occurrence of the spring to summer reduction in rainfall rate. The former effect is particularly important in high latitudes, whereas the latter effect becomes important in middle latitudes. Other statistically significant changes include large increases in both soil moisture and runoff rates at high latitudes during most of the annual cycle with the exception of the summer season. The penetration of moisture rich, warm air into high latitudes is responsible for these increases.

The state-of-the-art in climate modeling allows only gross global zoning while some of the expected results from temperature increases of the magnitude indicated are quite dramatic. For example, areas that were deserts 4,000 to 8,000 years ago in the Altithermal period (when the global average temperature was some $2^{\circ}C$ higher than present), may in due time return to deserts. Conversely, some areas which are deserts now were formerly agricultural regions. It is postulated that part of the Sahara Desert in Africa was quite wet 2,000 to 8,000 years ago. The American Midwest, on the other hand, was much drier, and it is projected that the Midwest would again become drier should there be a temperature increase of the magnitude postulated for a doubling of atmospheric CO_2 (see Figure 7).

In addition to the effects of climate on global agriculture, there are some potentially catastrophic events that must be considered. For example, if the Antarctic ice sheet which is anchored on land should melt, then this

could cause a rise in sea level on the order of 5 meters. Such a rise would cause flooding on much of the U.S. East Coast, including the State of Florida and Washington, D.C. The melting rate of polar ice is being studied by a number of glacialogists. Estimates for the melting of the West Anarctica ice sheet range from hundreds of years to a thousand years. Etkins and Epstein observed a 45 mm raise in mean sea level. They account for the rise by assuming that the top 70 m of the oceans has warmed by $0.3^{\circ}C$ from 1890 to 1940 (as has the atmosphere) causing a 24 mm rise in sea level due to thermal expansion. They attribute the rest of the sea level rise to melting of polar ice. However, melting 51 Tt (10^{12} metric tonnes) of ice would reduce ocean temperature by $0.2^{\circ}C$, and explain why the global mean surface temperature has not increased as predicted by CO_2 greenhouse theories.

In an American Association for the Advancement of Science (AAAS) and Department of Energy (DOE) sponsored workshop on the environmental and societal consequences of a possible CO_2 induced climate change, other factors such as the environmental effects of CO_2 concentration on weeds and pests were considered. The general consensus was that these unmanaged species would tend to thrive with increasing average global temperature. The managed biosphere, such as agriculture, would also tend to benefit from atmospheric CO_2 growth. This is a consequence of CO_2 benefiting agriculture, provided the other key nutrients, phosphorous and nitrogen, are present in the right proportions. Agricultural water needs can be met by new irrigation techniques that require less water. In addition, with higher CO_2 and higher temperature conditions, the amount of water needed by agricultural plants may be reduced. It is expected that bioscience contributions could point the way for dealing with climatological disruptions of the magnitude indicated above. As a result of the workshop, research in 11 areas was recommended:

1. CO_2 fertilization could have broad beneficial effects on agriculture. These effects need to be studied in detail and for a variety of plant, soil and climatic conditions.

2. There is a need for a fuller understanding of the dynamics of currents and water masses in the Arctic Ocean.

3. It is necessary to determine whether there was deglaciation of the West Antarctic ice sheet about 120,000 years ago and whether this caused a rise in global sea levels at that time. If this occurred, then the information could serve as an analog of future deglaciation.

4. It is necessary to develop and use scenarios which integrate (a) information about population, resources, energy consumption and fuel mixes; (b) buildup of atmospheric CO_2; (c) response of the climate system; (d) effects on various biological systems, especially agricultural, economic and social consequences, international and interregional conflicts; and (e) possible feedback among these forces.

5. CO_2 induced warming is predicted to be much greater at the polar regions. There could also be positive feedback mechanisms as deposits of peat, containing large reservoirs of organic carbon, are exposed to oxidation. Similarly, thawing might also release large quantities of carbon currently sequestered as methane hydrates. Quantitative estimates of these possible effects are needed.

6. Although all biological systems are likely to be affected, the most severe economic effects could be on agriculture. There is a need to examine methods for alleviating environmental stress on renewable resource production — food, fiber, animal, agriculture, tree crops, etc.

7. Information exists on the relationship of cultivated and non-cultivated biomes to climatic fluctuations. Similarly, there is considerable information on the response of various nations and economic sectors to climatic variations over the past few hundred years. This information, which is currently scattered and not uniformly presented or calibrated, is thus of limited usefulness.

8. Studies of climate effects are recommended for the semi-arid tropics because of the relatively large populations in these countries and because of special sensitivity to climate.

9. There are situations (soil erosion, salinization, or the collapse of irrigation systems) which are recommended for study as indicators of how societies respond, and how they might learn to cope and adapt more effectively to a shift in global climate.

10. Research is recommended on the flow of information on risk perception and decision making to and from both laymen and experts, the physiological aspects of understanding and perception, and the factors that influence decision making.

11. There is a need to be sure that "lifetime" exposure to elevated CO_2 poses no risks to the health of humans or animals. Health effects associated with changes in the climate sensitive parameters, or stress associated with climate related famine or migration could be significant, and deserve study.

In terms of the societal and institutional responses to an increase in CO_2, the AAAS-DOE workshop participants felt that society can adapt to the increase in CO_2 and that this problem is not as significant to mankind as a nuclear holocaust or world famine. Finally, in an analysis of the issues associated with economic and geopolitical consequences, it was felt that society can adapt to a CO_2 increase within economic constraints that will be existing at the time. Some adaptive measures that were tested would not consume more than a few percent of the gross national product estimated in the middle of the next century.

Major Research Programs Underway

The Department of Energy (DOE) which is acting as a focal point for the U.S. government in this area is planning to issue two reports to the scientific community and to policy makers. The first one, summarizing five years of study is due in 1984, and the second one in 1989. The current plan is to invest approximately 10 years of research and assessment prior to recommending policy decisions in this area which impact greatly on the energy needs and scenarios for the U.S. and the world. The strategic elements of the United States national total CO_2 program are summarized in Figure 8.

Much of the government sponsored effort to date has focused on delineating the research needed to enhance our understanding of the potential problems. Accordingly, a number of workshops and symposia were held to this end. The consensus of the key research needs is summarized in Figure 8 under the heading "Research Program Results." To date, most of the research effort has been concentrated on the first two research categories. It should be noted, however, that this research started in 1979 and there are few results to report. The most ambitious project being conducted at this time is called "Transient Tracer in the Ocean (TTO)." This research, jointly funded by the DOE and the National Science Foundation (NSF), is a 4M$ project to investigate ocean mixing processes in order to enhance the understanding of how surface water CO_2 is mixed into the deep ocean. Tracers normally found in the ocean, such as ^{14}C, ^{3}H, ^{3}He, ^{85}Kr and ^{39}Ar, are monitored in the North Atlantic Ocean from oceanographic vessels.

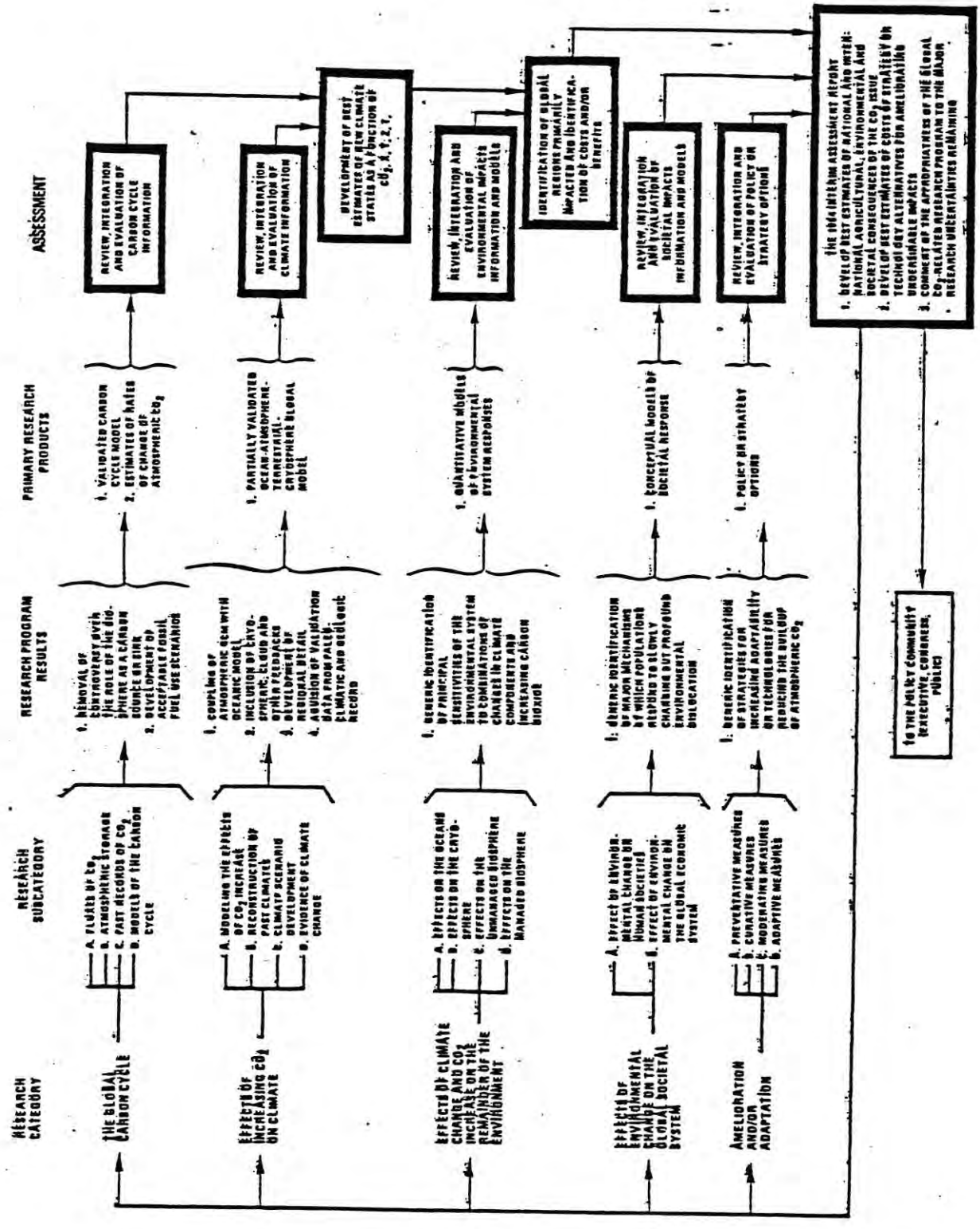
In addition to the mixing of surface waters into the bottom layers, carbon can be added to deep waters by the oxidation of organic matter and the dissolution of calcium carbonate. In order to separate these three processes and determine their relative significance, precise total carbon dioxide, alkalinity, and calcium concentration data are needed to construct and test mathematical models. Preliminary analysis of the limited data indicates that (1) lateral processes dominate the distribution of calcium and inorganic carbon in the deep oceans away from the polar regions, (2) the amount of calcium carbonate dissociated in the deep oceans is only a fraction of the previously estimated value, and (3) the excess CO_2 may have penetrated farther into the deep oceans than the currently available models predict.

Ultimately, CO_2 in the air should find its way into the deep ocean sediments. As currently understood, the deeper sediments have thus far been little affected by the fossil fuel era because of the slow mixing of the ocean. A group of scientists examined the contention that some shallow water sediments could now be dissolving and thus providing a sink for atmospheric CO_2, and concluded that the extent of dissolution is not great enough to have a large effect on the global carbon cycle.

It would be helpful if reliable estimates of the CO_2 concentration in the air could be obtained for the years prior to 1957, when the modern measurements

Figure 8

A NATIONAL PROGRAM ON CARBON DIOXIDE, ENVIRONMENT AND SOCIETY



began. Old Smithsonian Astrophysical Observatory plates of the solar spectrum taken in the early twentieth century might provide such an opportunity if they could be properly interpreted. A method for reducing the data has been developed and estimates of the CO_2 concentration should be available next year. As mentioned previously, determination of the CO_2 concentrations prior to the Industrial Revolution would help ascertain the validity of climate models, and thus the likely temperature due to a doubling of atmospheric CO_2.

Groups in Europe have used Antarctic and Greenland ice cores to independently estimate the CO_2 concentrations in the more distant past. While it is difficult to measure the CO_2 content of the dated ice cores, the results suggest that the atmospheric CO_2 concentration during the height of the last ice age (about 18,000 years ago) may have been about half its present value. This is consistent with recently published speculations derived from examination of the composition of ocean sediment cores.

There are currently approximately 40 carbon cycle and climate research projects in about 25 different institutions. Many of these projects are either supported jointly by the DOE and other agencies or exclusively by other agencies. The 1982 Federal budget request for CO_2 research was 23.9M$. The DOE, as the lead agency, would be allocated 14.0M$, NSF 6.4M$, NOAA 2.5M$, and the Department of Agriculture 1.0M$.

Future Energy Scenarios and Their Potential Impact on Atmospheric Carbon Dioxide

A number of future energy scenarios have been studied in relation to the CO_2 problem. These include such unlikely scenarios as stopping all fossil fuel combustion at the 1980 rate, looking at the delay in doubling time, and maintaining the pre-1973 fuel growth rate. Other studies have investigated the market penetration of non-fossil fuel technologies, such as nuclear, and its impact on CO_2. It should be noted, however, that fuel technology would need about 50 years to penetrate and achieve roughly half of the total market. Thus, even if solar or nuclear technologies were to be considered viable alternatives, they would not really displace fossil fuel energy for the next 40 to 50 years, and CO_2 growth would have to be estimated based on realistic market displacement of the fossil fuel technologies.

A draft report from Massachusetts Institute of Technology (MIT) and Oak Ridge (ORNL) authored by D. Rose and others considered the societal and technological inertia vis a vis decision making on the CO_2 issue. The CO_2 problem was considered as the major potential constraint on fossil fuel use. It was estimated in the study that the CO_2 problem may curtail fossil fuel use before physical depletion occurs. Considerable effort was devoted in the study to "option space," i.e., what are the potential energy alternatives, how long would it take to introduce them, and what type of material resources would be needed for effective market penetration. On reviewing the report we addressed only the technical questions relating to CO_2, and did not evaluate the plausibility of the scenarios relating to energy use in the future.

The study considered the implications of limiting atmospheric CO_2 at two different levels:

1. Rate of CO_2 addition to the atmosphere be limited to 450-500 ppm in 50 years.

2. The concentration ceiling for atmospheric CO_2 be in the range of 500-1000 ppm.

The rationale for choosing these limits is economic. If the rate of CO_2 increase is too rapid, then society may not be able to economically adapt to the resulting climate change. The second limit is based on a level where the harm due to CO_2 would greatly exceed the societal benefits that produced the CO_2. The second limit can be illustrated as an assumed threshold for inducing great irreversible harm to our planet, such as causing a large ocean level rise due to melting polar ice. In addition to improving the use of energy sources as a means of gaining time to understand the problem, it was concluded that vigorous development of non-fossil energy sources be initiated as soon as possible.

The study appears to be based on reasonable assumptions but has an inherent bias towards the accelerated development of non-fossil energy sources which, based on the present state-of-the-art, implies nuclear energy.

In his analysis, Rose introduced the concept of AIT (action initiation time), defined as the time when policies to modify or restrain fossil fuel use actually start to be effective. Based on this concept, Rose projects non-fossil growth rates of 6 to 9%/a over 40 to 50 years in order to limit atmospheric CO_2 to 500 to 700 ppm. These rates can be put in perspective by noting that such growth rates were achieved for natural gas introduction. However, nuclear or solar sources would have severe restrictions because such technologies are not as economically and politically attractive, technologically straightforward, and are encountering social and environmental opposition. In addition, Rose points out that the rate of growth of manufacturing facilities required to achieve a 6-9%/a growth rate in non-fossil fuel power generation is so large that it would be equivalent to increasing each year the U.S. power equipment manufacturing capability by an amount equivalent to the current capacity.

The study also indicated that other energy-use-related greenhouse gases (viz. carbon monoxide, methane, and oxides of nitrogen) may significantly contribute to a global warming. We believe the contribution of these gases to a global warming is highly speculative. Furthermore, N_2O, the only oxide of nitrogen that could contribute to a global warming is produced primarily by the microbial oxidation of ammonia from fertilizer use, and to a lesser extent from the combustion of fossil fuels. Additionally, N_2O is more reactive than CO_2 and is expected to have a relatively shorter atmospheric residence time. In

a similar vein, methane is primarily emitted to the atmosphere via the anaerobic fermentation of organic material. The contribution of anthropogenic activities (mining, industrial processes, and combustion) are 1% to 10% of the total atmospheric methane sources. The atmospheric destruction of methane is more rapid than that of CO_2, and tends to yield CO, water vapor and formaldehyde. Also, methane is believed to contribute to tropospheric ozone formation by oxidizing to CO_2. The CO in the atmosphere can be traced to anthopogenic sources (50 to 60%) and to the atmospheric oxidation of methane (30%). The major CO sink is oxidation (70 to 90%) to CO_2. One can therefore consider CO and methane as precursors to CO_2. Accordingly, CO and methane ultimately contribute to climatological effects as part of atmospheric CO_2. The N_2O, on the other hand, may not be directly related to fossil fuel combustion. One should question whether the other "greenhouse" gases should be considered part of the CO_2 problem in view of the uncertainties regarding their connection to energy use. It is not clear, at this time, whether their effect would be additive to CO_2.

Forecast Based on Fossil Fuel Projected in Exxon's Long Range Energy Outlook

As part of the Exxon 21st Century Study, the rate of fossil fuel CO_2 emissions was estimated in late 1981. Specifically, the "High Case" volumetric data provided by the Corporate Planning Department was used to estimate the potential growth of atmospheric CO_2. The volumetric data was converted to an energy basis (Quads/a = 10^{15} Btu/year) using 5.55 MBtu/B for U.S., 5.64 MBtu/B for Canada and 5.85 MBtu/B for all other countries. In addition, a shale processing loss was added using a constant rate of 27.5% of the primary energy consumption from shale. This was based on the assumption that above ground retorting of relatively high quality oil shale (>30 gallons/ton) would be recovered with a thermal efficiency of 80%, and in-situ recovery of relatively poor oil shale (>15 gallons/ton) would be accomplished with a thermal efficiency of 65%. These efficiencies were averaged over the U.S. resource base to arrive at 72.5%. Table 1 summarizes the primary energy consumption of fossil fuels.

The total carbon dioxide that can be emitted from primary fossil fuels was estimated using the following factors:

Oil = 170 lb CO_2/MBtu = 21.0 MtC*/Quad.

Gas = 115 lb CO_2/MBtu = 14.2 MtC/Quad.

Coal = 207 lb CO_2/MBtu = 25.6 MtC/Quad.

In addition, the quantity of carbon dioxide that could be emitted from the decomposition of carbonate minerals in processing U.S. oil shale was estimated by averaging this potentially large CO_2 source over the Green River formation resource base. It should be noted that poorer shale resources tend to

* MtC = million metric tons of carbon.

PRIMARY ENERGY CONSUMPTION OF FOSSIL FUELS
21st CENTURY STUDY--HIGH CASE

Quads/a

Year	1979	1990	2000	2015	2030	2050
Oil						
U.S.	37.09	33.32	32.01	35.35	36.35	36.80
Canada	4.06	4.30	4.71	5.62	6.09	5.97
Others	96.62	111.93	128.16	139.63	148.57	132.75
Total	137.77	149.55	164.88	180.60	191.01	175.52
Gas						
U.S.	20.95	17.83	17.24	15.98	16.87	17.42
Canada	1.83	2.51	2.88	3.48	4.38	4.73
Others	30.88	55.54	74.95	86.24	99.65	108.68
Total	53.66	75.88	95.07	105.70	120.90	130.83
Coal						
U.S.	14.69	20.14	28.66	37.19	43.17	55.10
Canada	0.80	1.37	1.98	2.72	3.62	5.35
Others	60.17	81.44	103.90	125.55	175.55	261.14
Total	75.66	102.95	134.54	165.41	222.54	321.59
Fossil Fuels						
World Total	267.09	328.38	394.49	451.71	534.45	627.94
Rate %/a		1.90	1.85	0.91	1.13	0.81

emit much more CO_2 from carbonate minerals than the more desirable high quality resources for the same quantity of shale oil produced. It was further assumed that 65% of the carbonate minerals decompose during processing. This very conservative assumption is based on the average of 100% decomposition that may occur in "hot spots" during in-situ recovery and 30% decomposition that is generally observed in above ground retorting. Table 2 summarizes the total CO_2 produced in GtC/a. Please note that CO_2 emissions resulting from CO_2 mixed with natural gas in producing wells can be substantial, but due to the unavailability of quantitative data this factor was assumed to contribute about 5% additional CO_2 currently rising to 15% in the year 2050. This trend of CO_2 contamination of natural gas is consistent with recent Exxon experience.

The contributions of shale oil to primary fossil fuel energy and primary fossil fuel carbon are summarized in Table 3. This table shows that the fraction of shale oil CO_2 emissions to total CO_2 is greater than the corresponding contribution of shale oil energy to total energy. Table 3 also indicates the breakdown between CO_2 generated in producing and consuming shale oil, and that due to carbonate mineral decomposition.

Table 4 presents the estimated total quantities of CO_2 emitted to the environment as GtC, the growth of CO_2 in the atmosphere in ppm (v), and average global temperature increase in $^{\circ}C$ over 1979 as the base year. In order to estimate the buildup of atmospheric CO_2, it was assumed that the average atmospheric CO_2 concentration was 337 ppm in 1979. The fraction of CO_2 accumulated in the atmosphere was assumed to be 0.535 of the total fossil fuel CO_2. This number is derived from the observed historic ratio of total atmospheric CO_2 to total fossil fuel CO_2. Inherent in this number is the assumption that biomass and cement production did not contribute to atmospheric CO_2. It should be noted, however, that this method of calculation would tend to predict total anthropogenic CO_2 as long as the ratio of biomass and cement manufacture to fossil fuel consumption remains constant. The average temperature increase since 1979 was estimated, assuming that a doubling of CO_2 would cause an average global temperature increase of $3.0^{\circ} \pm 1.5^{\circ}C$. It was also assumed that fossil fuel carbon would grow at a rate of 0.8%/a between 2050 and 2080, which is a reasonable decrease from the 0.97%/a rate projected between 2030 and 2050. The following section analyzes the implications of the temperature rise due to CO_2 doubling with respect to initial detection of a greenhouse effect.

One variation of the High Case scenario was considered. It was assumed that adequate quantities of oil and gas would be discovered to exactly match those estimated to be produced from synthetic fuels in the High Case scenario, and thus balance the primary energy needs of the 21st Century Study. The net quantity of carbon that would be saved is summarized in Table 5. The implications of the synfuel losses are compared with the High Case in Figure 3. The overall impact is relatively minor.

TABLE 2

PRIMARY CARBON DIOXIDE (AS CARBON) FORMATION FROM FOSSIL FUELS
21st CENTURY STUDY--HIGH CASE

GtC/a

Year	1979	1990	2000	2015	2030	2050
Oil	2.90	3.15	3.47	3.79	4.01	3.69
Inorganic Carbon	-	0.01	0.05	0.19	0.27	0.40
Total Oil	2.90	3.16	3.52	3.98	4.28	4.09
Gas	0.76	1.08	1.35	1.50	1.72	1.86
CO_2 in Gas	0.04	0.11	0.15	0.18	0.22	0.28
Total Gas	0.80	1.19	1.50	1.68	1.94	2.14
Total Coal	1.93	2.64	3.45	4.24	5.70	8.24
World Total	5.63	7.00	8.47	9.90	11.92	14.47
Rate %/a		2.00	1.92	1.05	1.25	0.97	0.80

TABLE 3

OIL SHALE LIQUID FUELS
PRIMARY ENERGY CONSUMPTION AND
CARBON DIOXIDE (AS CARBON) PRODUCTION
21st CENTURY STUDY--HIGH CASE

Year	1979	1990	2000	2015	2030	2050
U.S. Shale, Quads/a	--	1.01	3.65	14.38	20.66	30.79
Other Shale	--	0.21	1.49	2.56	5.55	11.10
Total	--	1.21	5.14	16.94	26.21	41.89
% Primary Shale Energy/Primary Fossil Fuels Energy	--	0.35	1.30	3.75	4.90	6.67
Shale Carbon, GtC/A	--	0.03	0.11	0.36	0.55	0.88
Carbonate Carbon	--	0.01	0.05	0.19	0.27	0.40
Total	--	0.04	0.16	0.55	0.82	1.28
% Primary Shale Carbon/Primary Fossil Fuel Carbon	--	0.55	1.89	5.55	6.87	8.85

TABLE 4

ESTIMATED ATMOSPHERIC CO_2 CONCENTRATION AND AVERAGE TEMPERATURE INCREASE
21st CENTURY STUDY--HIGH CASE

Year	Emitted, GtC		Stored in Atmosphere, GtC		Atmospheric Concentration, ppm		Average Temperature Increase, °C
	Incremental	Cummulative	Incremental	Cummulative	Incremental	Cummulative	
1979	--	--	--	715	--	337	0
1990	69.3	69.3	37.1	752	17.5	355	0.22
2000	77.2	146.5	41.3	793	19.5	374	0.45
2015	137.5	284.0	73.6	867	34.7	409	0.84
2030	163.3	447.3	87.4	954	41.2	450	1.25
2050	263.5	710.8	141.0	1095	66.5	516	1.84
2080	490.6	1201.4	262.5	1358	123.7	640	2.76
2090	191.3	1392.7	102.3	1160	48.2	688	3.09

TABLE 5

ESTIMATED INCREMENTAL CO_2 CONTRIBUTION FROM SYNTHETIC FUELS TO ATMOSPHERIC CO_2 CONCENTRATION AND AVERAGE GLOBAL TEMPERATURE INCREASE

GtC/a

Year	1990	2000	2015	2030	2050	2080
Shale Loss	0.004	0.025	0.069	0.114	0.181	
Carbonate Decomposition	0.013	0.047	0.186	0.267	0.398	
Total Shale	0.017	0.072	0.255	0.381	0.579	
Coal Loss	0.018	0.067	0.136	0.276	0.535	
Total Synfuels Loss	0.035	0.139	0.391	0.657	1.114	
Rate %/a	14.8	7.1	3.5	2.7	2.0	
Incremental CO_2, GtC	-	0.80	3.73	7.73	17.38	45.79
Cummulative CO_2, GtC	-	0.80	4.53	12.26	29.64	75.43
Incremental Atmospheric CO_2, ppm	-	0.2	0.9	1.9	4.4	11.5
Cummulative Atmospheric CO_2, ppm	-	0.2	1.1	3.1	7.5	19
Net Atmospheric CO_2, ppm	355	374	407	446	506	616
Average Temperature Increase, °C	0.22	0.45	0.82	1.21	1.76	2.61

Detection of a CO_2 Greenhouse Effect

It is anticipated by most scientists that a general consensus regarding the likelihood and implications of a CO_2 induced greenhouse effect will not be reached until such time as a significant temperature increase can be detected above the natural random temperature fluctuations in average global climate. These fluctuations are assumed to be $\pm 0.5^{\circ}C$. The earliest that such discreet signals will be able to be measured is one of the major uncertainties of the CO_2 issue.

A number of climatologists claim that they are currently measuring a temperature signal (above climate noise) due to a CO_2 induced greenhouse effect, while the majority do not expect such a signal to be detectable before the year 2000. In order to quantify the implications of detecting a greenhouse effect now, as opposed to the year 2000, estimates were made on temperature projections as a function of the CO_2 concentration that existed prior to the Industrial Revolution. Available data on CO_2 concentration prior to the Industrial Revolution tend to fall into two groups: 260 to 270 ppm or 290 to 300 ppm. In Table 6, possible temperature increases were estimated as a function of initial CO_2 concentrations of 265 and 295 ppm. Temperatures were projected for three cases, viz., (1) a temperature increase of $3^{\circ}C$ occurs if current CO_2 concentration doubles, (2) the greenhouse effect is detectable now (1979), and (3) the greenhouse affect is detected in the year 2000.

One can see in Table 6 that if a doubling of atmospheric CO_2 will cause a $3^{\circ}C$ rise in temperature, then we should have seen a temperature increase above climate noise if initial CO_2 concentration was 265 ppm, or be on the threshold of detecting such an effect now, if the initial concentration was 295 ppm. If we assume that we are on the threshold of detecting a greenhouse effect, then the average temperature due to a doubling of CO_2 will be $1.9^{\circ}C$ for an initial CO_2 concentration of 265, or $3.1^{\circ}C$ for an initial concentration of 295 ppm. Finally, if the greenhouse effect is detected in the year 2000, then the doubling temperature for initial CO_2 concentrations of 265 and 295 ppm will be 1.3° and $1.7^{\circ}C$, respectively. Based on these estimates, one concludes that a doubling of current concentrations of CO_2 will probably not cause an average global temperature rise much in excess of $3^{\circ}C$, or the effect should be detectable at the present time. Alternatively, if the greenhouse effect is not detected until 2000, then the temperature due to a CO_2 doubling will probably be under $2^{\circ}C$. Using the Exxon 21st Century Study as a basis for fossil fuel growth patterns, the average global temperature increases due to CO_2 would range between 0.8 and $1.6^{\circ}C$ by 2030. A doubling of atmospheric CO_2 would be extropolated from the fossil fuel consumption rates of the 21st Century Study to occur at about the year 2090 with the temperature increase ranging between 1.3° and $3.1^{\circ}C$. The projected range presented above is considerably lower than the generally accepted range of 1.5° to $4.5^{\circ}C$. Figure 9 illustrates

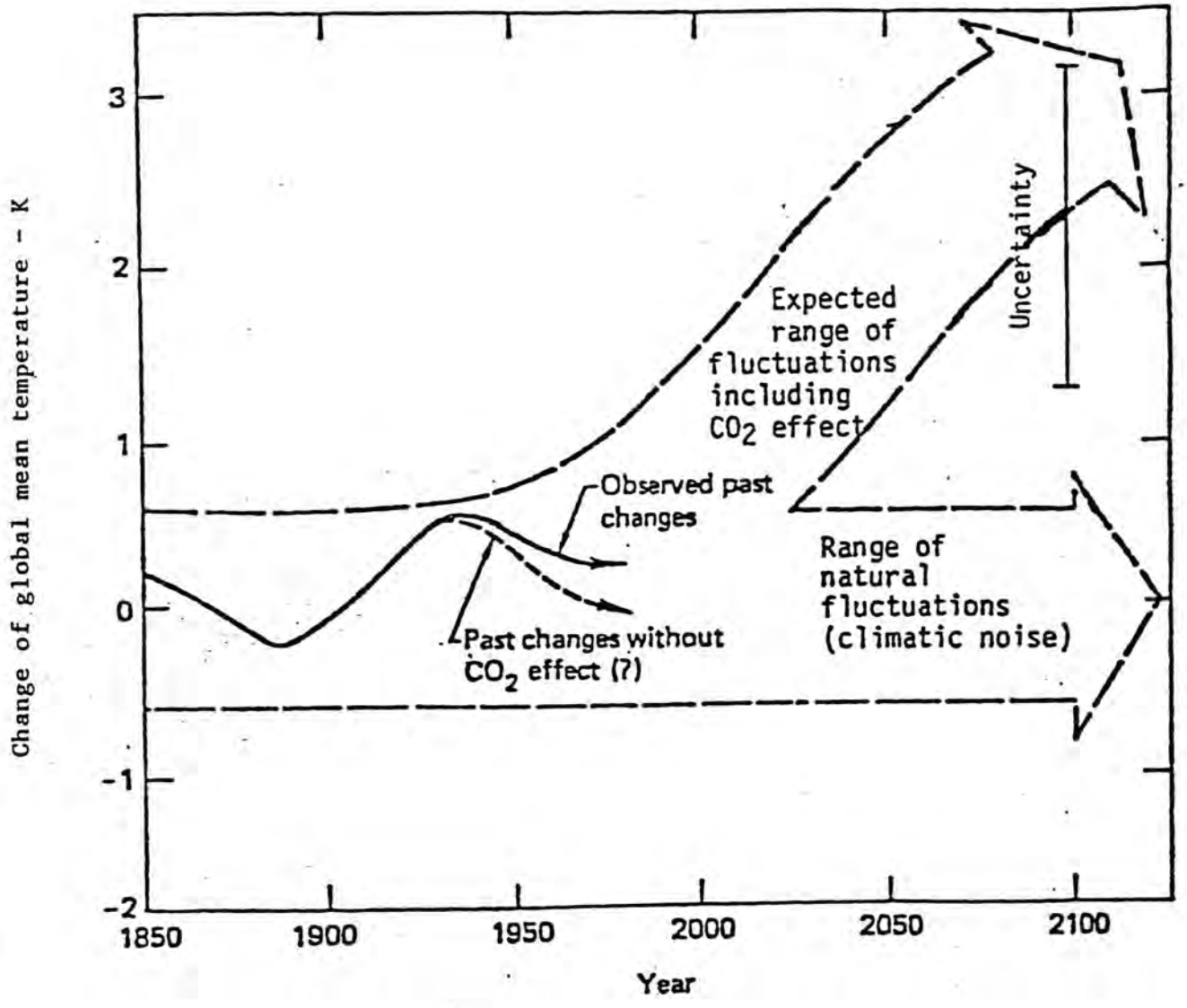
TABLE 6

EFFECT OF PRE-INDUSTRIAL ATMOSPHERIC CO_2 CONCENTRATION ON GLOBAL AVERAGE TEMPERATURE INCREASE

Atmospheric CO_2 Concentration, ppm	Time (Instantaneous Equilibrium)	Temperature, °C					
		Doubling ~2090		Detected 1979		Detected 2000	
		265	295	265	295	265	295
1,000	~2140	4.3	4.4	2.8	4.6	1.9	2.5
800	~2110	3.6	3.6	2.3	3.7	1.4	2.1
674 (Doubling)	~2090	3.0	3.0	1.9	3.1	1.3	1.7
451	2030	1.7	1.5	1.1	1.6	0.8	0.9
375	2000	1.1	0.9	0.7	0.9	0.5	0.5
337 (Current)	1979	0.8	0.5	0.5	0.5	0.3	0.3
295	~1850	0.3	0	0.2	0	0.2	0
265	~1850	0	-	0	-	0	-

Figure 9

Range of Global Mean Temperature From 1850 to the Present with the Projected Instantaneous Climatic Response to Increasing CO_2 Concentrations.



the behavior of the mean global temperature from 1850 to the present, contained within an envelop scaled to include the random temperature fluctuations, and projected into the future to include the 1.3° to 3.1°C range of uncertainty noted above for the CO_2 effect.

Depending on the actual global energy demand and supply, it is possible that some of the concerns about CO_2 growth due to fossil fuel combustion may be reduced if fossil fuel use is decreased due to high price, scarcity, and unavailability.

The above discussion assumes that an instantaneous climatic response results from an increase in atmospheric CO_2 concentration. In actuality, the temperature effect would likely lag the CO_2 change by about 20 years because the oceans would tend to damp out temperature changes.

Given the long term nature of the potential problem and the uncertainties involved, it would appear that there is time for further study and monitoring before specific actions need be taken. At the present time, that action would likely be curtailment of fossil fuel consumption which would undoubtedly seriously impact the world's economies and societies. Key points needing better definition include the impact of fossil fuel combusion and the role of the oceans in the carbon cycle and the interactive effect of carbon dioxide and other trace atmospheric gases on climate.

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Exhibit D

CO_2 GREENHOUSE AND CLIMATE ISSUES

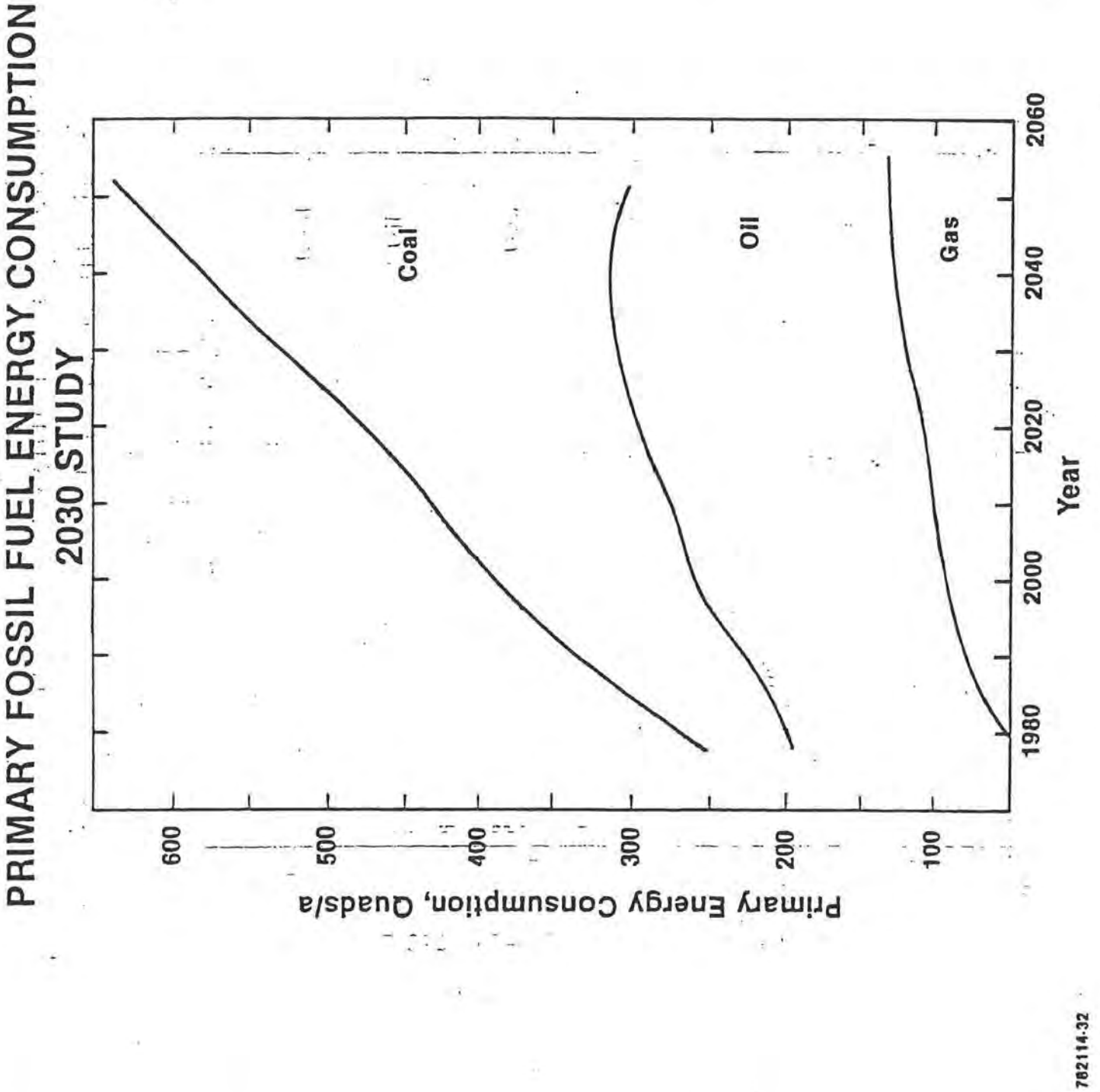
HENRY SHAW

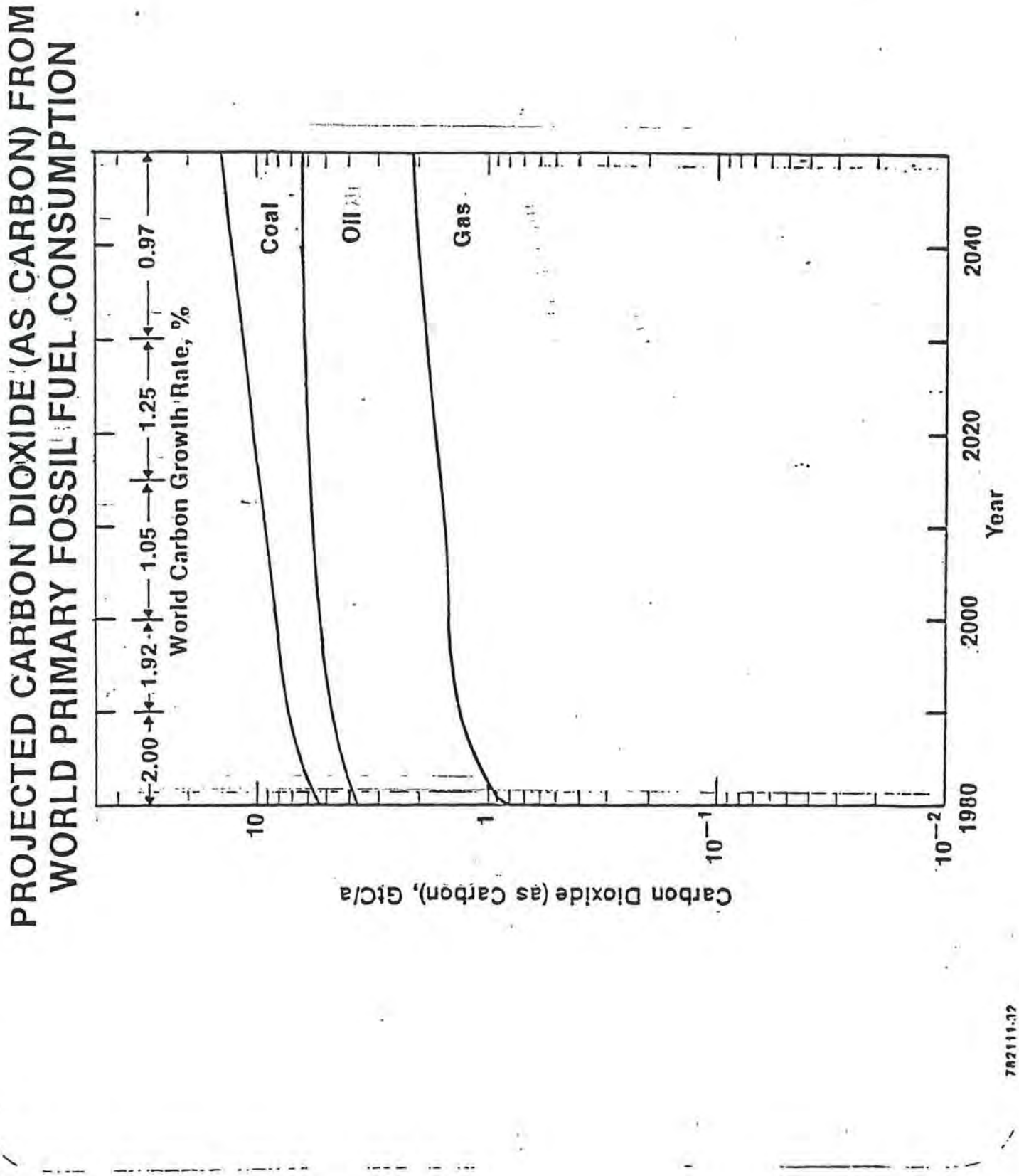
PRESENTED AT

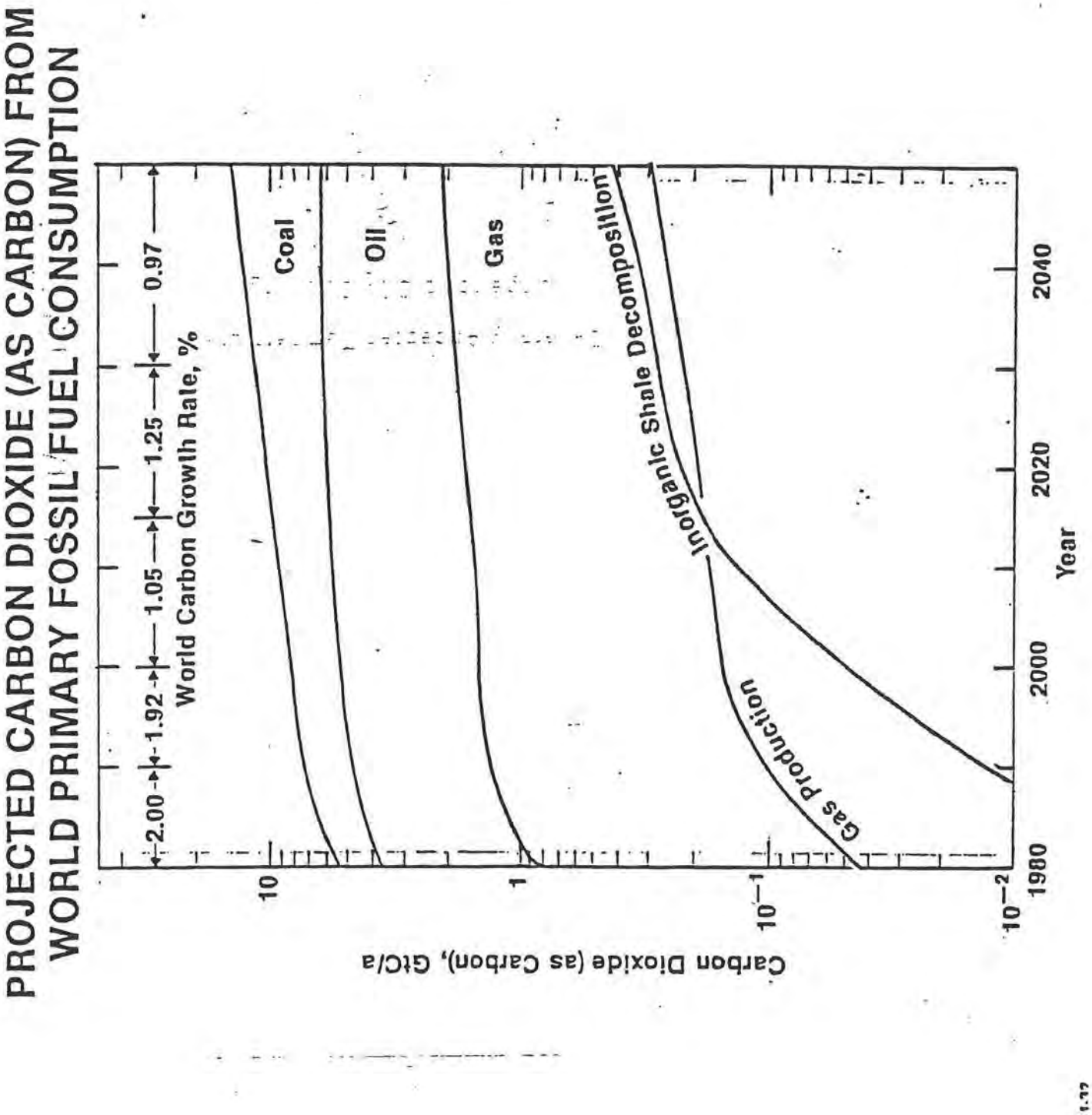
EUSA/ER&E ENVIRONMENTAL CONFERENCE

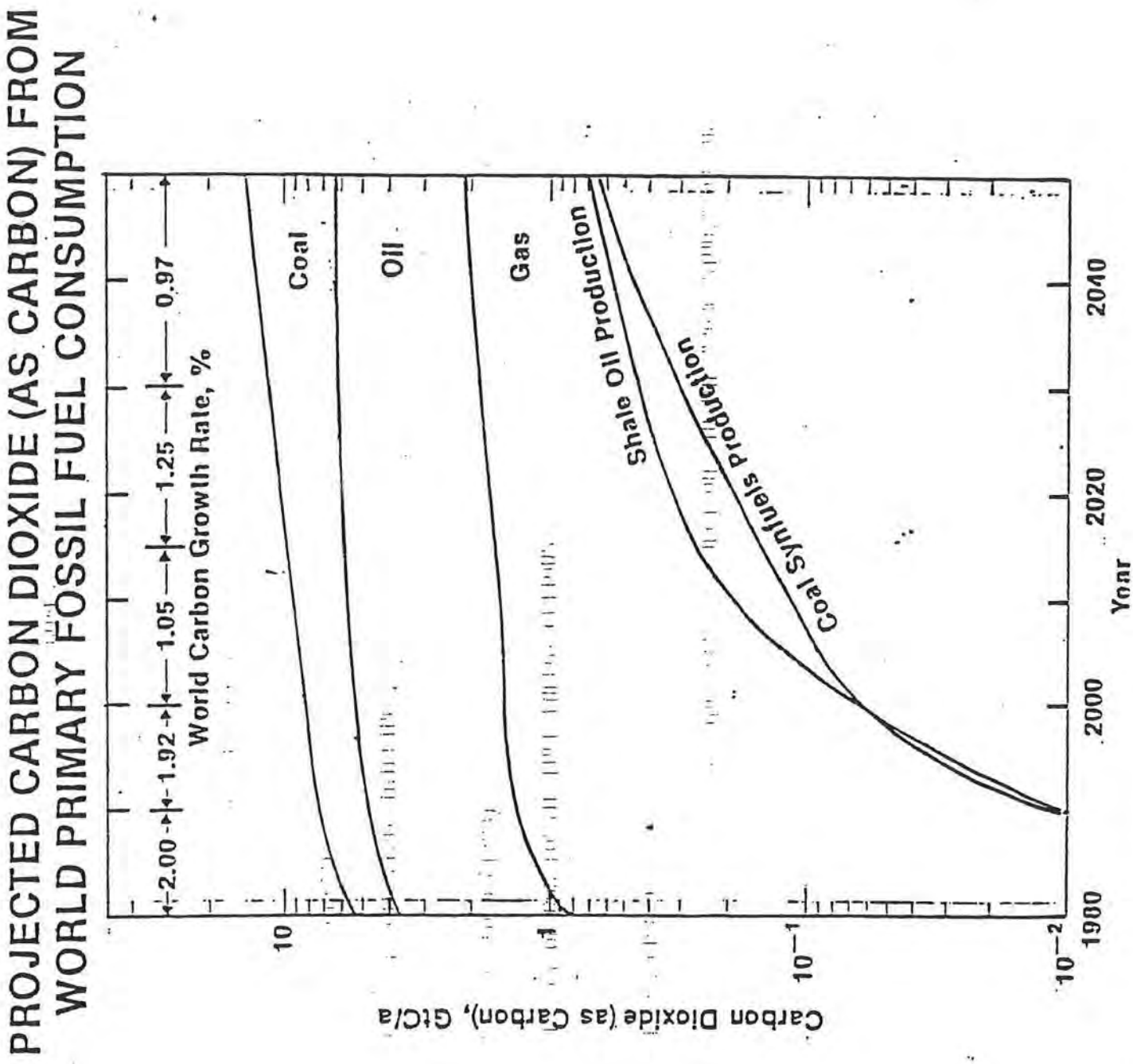
FLORHAM PARK, NEW JERSEY

MARCH 28, 1984


PRIMARY FOSSIL FUEL ENERGY CONSUMPTION
2030 STUDY
Primary Energy Consumption, Quads/a
600
500
400
300
200
100
Coal
Oil
Gas
1980
2000
2020
2040
2060
Year
782114-32


PROJECTED CARBON DIOXIDE (AS CARBON) FROM WORLD PRIMARY FOSSIL FUEL CONSUMPTION
Carbon Dioxide (as Carbon), GtC/a
10
1
10^{-1}
10^{-2}
1980
2000
2020
2040
Year
Coal
Oil
Gas
2.00
1.92
1.05
1.25
0.97
World Carbon Growth Rate, %


PROJECTED CARBON DIOXIDE (AS CARBON) FROM WORLD PRIMARY FOSSIL FUEL CONSUMPTION
World Carbon Growth Rate, %
2.00
1.92
1.05
1.25
0.97
Coal
Oil
Gas
Inorganic Shale Decomposition
Gas Production
Carbon Dioxide (as Carbon), GtC/a
10
1
10⁻¹
10⁻²
1980
2000
2020
2040
Year


PROJECTED CARBON DIOXIDE (AS CARBON) FROM WORLD PRIMARY FOSSIL FUEL CONSUMPTION
2.00
1.92
1.05
1.25
0.97
World Carbon Growth Rate, %
Coal
Oil
Gas
Shale Oil Production
Coal Synfuels Production
10
1
10^{-1}
10^{-2}
1900
2000
2020
2040
Year
Carbon Dioxide (as Carbon), GtC/a

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.

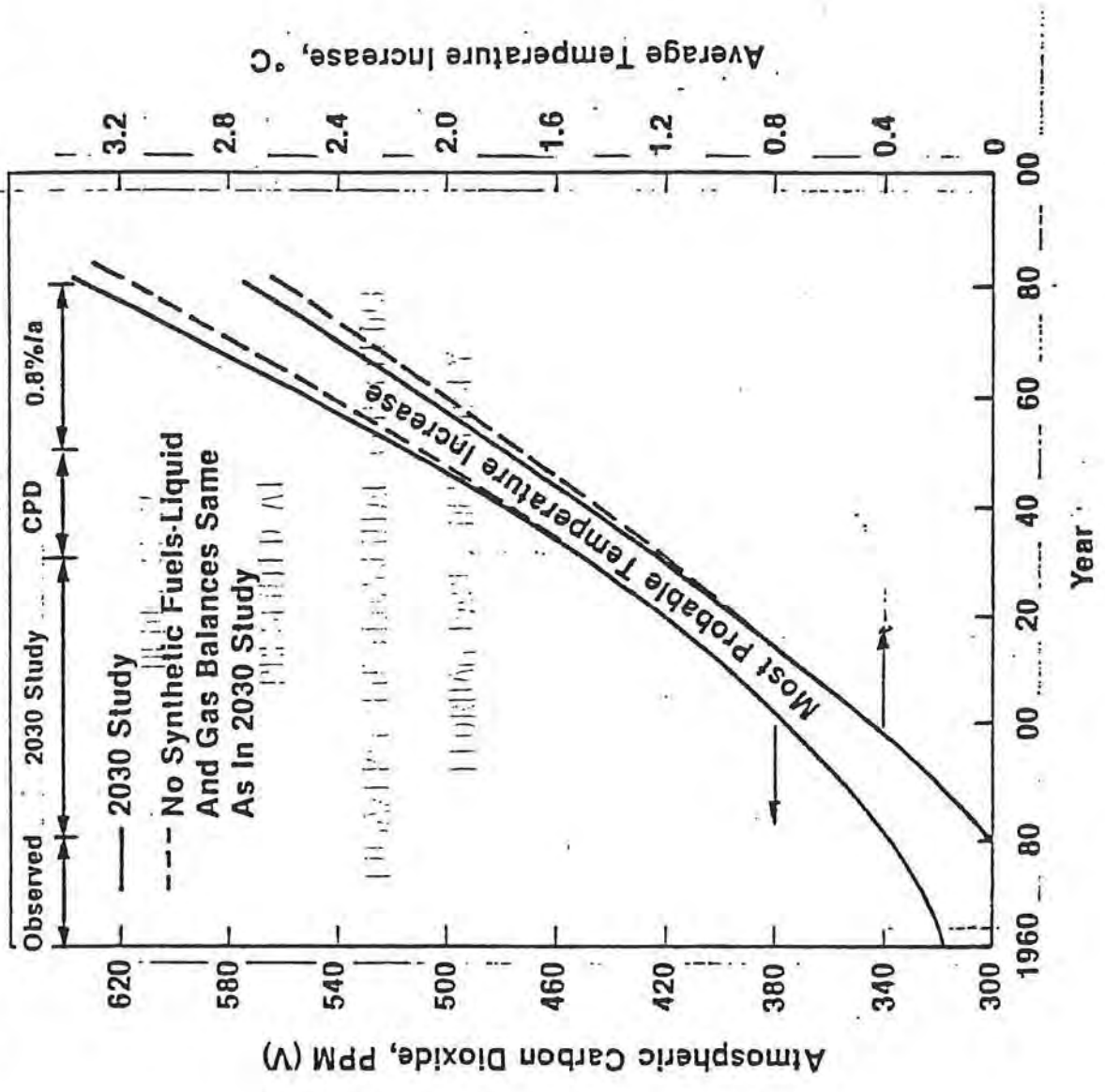
INTERNATIONAL DEBATE ON LEGISLATION IS NEEDED.

EXXON

THERE IS ADEQUATE TIME TO STUDY THE PROBLEM.

LEGISLATION IS PREMATURE.

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



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°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°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°C RISE IN GLOBAL AVERAGE TEMPERATURE. THESE VALUES FALL TOWARD THE LOWER END OF THE GENERALLY ACCEPTED TEMPERATURE RANGE FOR A DOUBLING OF 3 ± 1.5°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 E

AGs United For Clean Power Press Conference*

March 29, 2016: 11:35 am – 12:32 pm

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

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

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

And, I think it's fair to say that no one in American public life either during or beyond their time in elective office has done more to elevate the debate of our climate change or to expand global awareness about the urgency of the need for collective action on climate change than Vice President Gore. So it's truly an honor to have you here with us today.

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

AGs United For Clean Power Press Conference

March 29, 2016: 11:35 am – 12:32 pm

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

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

But, ladies and gentlemen, we are here for a very simple reason. We have heard the scientists. We know what's happening to the planet. There is no dispute but there is confusion, and confusion sowed by those with an interest in profiting from the confusion and creating misperceptions in the eyes of the American public that really need to be cleared up. The U.S. Defense Department, no radical agency, recently called climate change an urgent and growing threat to our national security. We know that last month, February, was the furthest above normal for any month in history since 1880 when they started keeping meteorological records. The

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

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

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

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

And now I want to turn it over to my great colleague, the co-convener of this conference, Vermont Attorney General William Sorrel.

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

states represented today are involved in looking at the alleged actions by Volkswagen and the issues relating to emissions from tens of thousands of their diesel automobiles.

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

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

[Laughter]

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

[Laughter]

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

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

[Applause]

Thank you very much, Attorney General Schneiderman. It really and truly is an honor for me to join you and your colleagues here,

AGs United For Clean Power Press Conference
March 29, 2016: 11:35 am – 12:32 pm

Bill Sorrel of Vermont, Maura Healey of Massachusetts, Brian Frosh of Maryland, Mark Herring of Virginia, George Jepsen of Connecticut and Claude Walker from the U.S. Virgin Islands, and the ten (let's see 1, 2, 3, 4, 5) how many other – ten other states . . . eleven other state attorneys general offices that were represented in the meetings that took place earlier, prior to this press conference.

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

I am a fan of what President Obama has been doing, particularly in his second term on the climate crisis. But it's important to recognize that in the federal system, the Congress has been sharply constraining the ability of the executive branch to fully perform its obligations under [the] Constitution to protect the American people against the kind of fraud that the evidence suggests is being committed by several of the fossil fuel companies, electric utilities, burning coal, and the like. So what these attorneys general are doing is exceptionally important. I remember very well – and I'm not going to dwell on this analogy – but I remember very well from my days in the House and Senate and the White House the long struggle against the fraudulent activities of the tobacco companies trying to keep Americans addicted to the deadly habit of smoking cigarettes and committing fraud to try to constantly hook each new generation of children to replenish their stock of customers who were dying off from smoking-related diseases. And it was a combined effort of the executive branch, and I'm proud that the Clinton-Gore administration played a role in that, but it was a combined effort in which the state attorneys general played the crucial role in securing an historic victory for public health. From the time the tobacco companies were first found out, as evidenced by the historic attorney generals' report of 1964, it

took 40 years for them to be held to account under the law. We do not have 40 years to continue suffering the consequences of the fraud allegedly being committed by the fossil fuel companies where climate change is concerned.

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

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

Ninety-three percent of the extra heat goes into the oceans of the world, and that has consequences. When Super Storm Sandy headed across the Atlantic toward this city, it crossed areas of the Atlantic that were nine degrees Fahrenheit warmer than normal

and that's what made that storm so devastating. The sea level had already come up because of the ice melting, principally off Greenland and Antarctica. And as the Attorney General mentioned, that's a process now accelerating. But these ocean-based storms are breaking records now. I just came from the Philippines where Super Typhoon Haiyon created 4 million homeless people when it crossed much warmer waters of the Pacific. By the way, it was a long plane flight to get here and I happened to get, just before we took off, the 200-page brief that you all filed in support of the Clean Power Plan. Really excellent work. Footnotes took up a lot of those 200 pages so I'm not claiming to [have] read all 200 of them.

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

Every night on the news now it's like a nature hike through the Book of Revelation. And we're seeing tropical diseases moving to higher latitudes – the Zika virus. Of course the transportation revolution has a lot to do with the spread of Zika and Dengue Fever and Chikungunya and diseases I've never heard of when I was growing up and maybe, probably most of you never did either. But now, they're moving and taking root in the United States. Puerto Rico is part of the United States, by the way – not a state, but part of our nation. Fifty percent of the people in Puerto Rico are estimated to get the Zika virus this year. By next year, eighty percent. When people who are part of the U.S. territory, when women are advised not to get pregnant, that's something new that

ought to capture our attention. And in large areas of Central America and South America, women are advised now not to get pregnant for two years until they try to get this brand new viral disease under control.

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

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

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

AG Schneiderman: Thank you very much, and now my other colleagues are going to say a few words. For whatever reason, I've gotten into the habit, since we always seem to do this, we do this in alphabetical order by state, which I learned when I first became an AG but I guess we'll stick with it. Connecticut Attorney General George Jepsen who was our partner in the *Friedrichs* case and stood with me when we announced that we were filing in that case. We've done a lot of good work together. Attorney General Jepsen.

AG Jepsen: I'd like to thank Eric and Bill for their leadership on this important issue and in convening this conference and to recognize the man who has done more to make global warming an international issue than anybody on the entire planet – Vice President Al Gore. In the backdrop, in the backdrop of a very dysfunctional Congress, state attorneys general, frequently on a bipartisan, basis have shown that we can stand up and take action where others have not. The Vice President referenced the tobacco litigation, which was before my time but hugely important in setting the tone and the structures by which we do work together. Since becoming attorney general in 2011, we've taken on the big banks and their mortgage servicing issues, a $25 billion settlement. We've taken on Wall Street's Standard & Poor's for mislabeling mortgage-backed securities – as

a 20-state coalition – mislabeling mortgage-backed securities as AAA when in fact they were junk. Working together on data privacy issues, and now it's time that we stand up once again and take on what is the most important issue of our generation. We owe it to our children, our children's children, to step up and do the right thing, to work together and I'm committed to it. Thank you.

AG Schneiderman: Thank you. And now a relatively new colleague but someone who has brought incredible energy to this fight and who we look forward to working with on this and other matters for a long time to come. Maryland Attorney General Brian Frosh.

AG Frosh: Well, first thank you again to General Schneiderman and General Sorrel for putting together this group and it's an honor to be with you, Mr. Vice President. Thank you so much for your leadership. I'm afraid we may have reached that point in the press conference where everything that needs to be said has been said, but everyone who needs to say it hasn't said it yet.

[Laughter]

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

AG Schneiderman: Thank you. And, another great colleague, who has done extraordinary work before and since becoming attorney general working with our office on incredibly important civil rights issues,

financial fraud issues, Massachusetts Attorney General Maura Healey.

AG Healey: Thank you very much General Schneiderman. Thank you General Schneiderman and General Sorrel for your leadership on this issue. It's an honor for me to be able to stand here today with you, with our colleagues and certainly with the Vice President who, today, I think, put most eloquently just how important this is, this commitment that we make. Thank you for your leadership. Thank you for your continuing education. Thank you for your inspiration and your affirmation.

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

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

AGs United For Clean Power Press Conference
March 29, 2016: 11:35 am – 12:32 pm

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

AG Schneiderman: Thank you. And now another great colleague who speaks as eloquently as anyone I've heard about what's happening to his state, and a true hero of standing up in a place where maybe it's not quite as politically easy as it is to do it in Manhattan but someone who is a true aggressive progressive and a great attorney general, Mark Herring from Virginia.

AG Herring: Thank you, Eric. Good afternoon. In Virginia, climate change isn't some theoretical issue. It's real and we are already dealing with its consequences. Hampton Roads, which is a coastal region in Virginia, is our second most populated region, our second biggest economy and the country's second most vulnerable area as sea levels rise. The area has the tenth most valuable assets in the world threatened by sea level rise. In the last 85 years the relative sea level in Hampton Roads has risen 14 inches – that's well over a foot – in just the last century.

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

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

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

And for any folks who would say the climate change is some sort of made-up global conspiracy, that we're wasting our time, then

come to Hampton Roads. Come to Norfolk and take a look for yourselves. Mayor Fraim would love to have you.

AG Schneiderman: Thank you. And our closer, another great colleague who has traveled far but comes with tremendous energy to this cause and is an inspiration to us all, U.S. Virgin Islands Attorney General Claude Walker.

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

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

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

AG Schneiderman: Thank you and Eric. And I do want to note, scripture reports David was not alone in fact, Brother Walker. Eric and Matt will take on-topic questions.

Moderator: Please just say your name and publication.

Press Person: John [inaudible] with *The New York Times*. I count two people who have actually said that they're launching new investigations. I'm wondering if we could go through the list and see who's actually in and who is not in yet.

AG Schneiderman: Well, I know that prior to today, it was, and not every investigation gets announced at the outset as you know, but it had already been announced that New York and California had begun investigations with those stories. I think Maura just indicated a Massachusetts investigation and the Virgin Islands has, and we're meeting with our colleagues to go over a variety of things. And the meeting goes on into the afternoon. So, I am not sure exactly where everyone is. Different states have – it's very important to understand – different states have different statutes, different jurisdictions. Some can proceed under consumer protection law, some securities fraud laws, there are other issues related to defending taxpayers and pension funds. So there are a variety of theories that we're talking about and collaborating and to the degree to which we can cooperate, we share a common interest, and we will. But, one problem for journalists with investigations is, part of doing an investigation is you usually don't talk a lot about what you're doing after you start it or even as you're preparing to start it.

AGs United For Clean Power Press Conference
March 29, 2016: 11:35 am – 12:32 pm

Press Person: Shawn McCoy with *Inside Sources*. A *Bloomberg Review* editorial noted that the Exxon investigation is preposterous and a dangerous affirmation of power. *The New York Times* has pointed out that Exxon has published research that lines up with mainstream climatology and therefore there's not a comparison to Big Tobacco. So is this a publicity stunt? Is the investigation a publicity stunt?

AG Schneiderman: No. It's certainly not a publicity stunt. I think the charges that have been thrown around – look, we know for many decades that there has been an effort to influence reporting in the media and public perception about this. It should come as no surprise to anyone that that effort will only accelerate and become more aggressive as public opinion shifts further in the direction of people understanding the imminent threat of climate change and other government actors, like the folks represented here step up to the challenge. The specific reaction to our particular subpoena was that the public reports that had come out, Exxon said were cherry picked documents and took things out of context. We believe they should welcome our investigation because, unlike journalists, we will get every document and we will be able to put them in context. So I'm sure that they'll be pleased that we're going to get everything out there and see what they knew, when they knew it, what they said and what they might have said.

Press Person: David [inaudible] with *The Nation.* Question for General Schneiderman. What do you hope to accomplish with your Exxon investigation? I'm thinking with reference to Peabody where really there was some disclosure requirements but it didn't do a great deal of [inaudible]. Is there a higher bar for Exxon? What are the milestones that you hope to achieve after that investigation?

AG Schneiderman: It's too early to say. We started the investigation. We received a lot of documents already. We're reviewing them. We're not pre-judging anything, but the situation with oil companies and coal companies is somewhat different because the coal companies right now are, the market is already judging the coal industry very harshly. Coal companies, including Peabody, are teetering on the brink. The evidence that we advanced and what was specifically disclosed about Peabody were pretty clear cut examples of misrepresentations made in violation with the Securities and Exchange Commission, made to investors. It's too early to say what we're going to find with Exxon but we intend to work as

aggressively as possible, but also as carefully as possible. We're very aware of the fact that everything we do here is going to be subject to attack by folks who have a huge financial interest in discrediting us. So we're going to be aggressive and creative but we are also going to be as careful and meticulous and deliberate as we can.

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

AGs United For Clean Power Press Conference
March 29, 2016: 11:35 am – 12:32 pm

Press Person: [inaudible] with *InsideClimate News*. Along the lines of talking about that analogy: from a legal framework, can you talk about a comparison, similarities and differences between this potential case and that of Big Tobacco?

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

Moderator: Last one.

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

Moderator: What's your name and . . .

Press Person: Oh, sorry. Matthew Horowitz from *Vice*. Taxpayers are going to have to pay for these damages from our national flood insurance claims. So if fossil fuel companies are proven to have committed fraud, will they be held financially responsible for any sorts of damages?

AG Schneiderman: Again, it's early to say but certainly financial damages are one important aspect of this but, and it is tremendously important and taxpayers – it's been discussed by my colleagues – we're already paying billions and billions of dollars to deal with the consequences of climate change and that will be one aspect of – early foreseeing, it's far too early to say. But, this is not a situation where financial damages alone can deal with the problem. We have to change conduct, and as the Vice President indicated, other

places in the world are moving more rapidly towards renewables. There is an effort to slow that process down in the United States. We have to get back on that path if we're going to save the planet and that's ultimately what we're here for.

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

Exhibit F

THE COMMONWEALTH OF MASSACHUSETTS
OFFICE OF THE ATTORNEY GENERAL
ONE ASHBURTON PLACE
BOSTON, MASSACHUSETTS 02108

MAURA HEALEY
ATTORNEY GENERAL

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

CIVIL INVESTIGATIVE DEMAND

BY HAND DELIVERY

Demand No.: 2016-EPD-36

Date Issued: April 19, 2016

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

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

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

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

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

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

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

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

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

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

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

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

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

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

COMMONWEALTH OF
MASSACHUSETTS

MAURA HEALEY
ATTORNEY GENERAL

By: _____

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

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

SCHEDULE A

A. General Definitions and Rules of Construction

1. "Advertisement" means a commercial message made orally or in any newspaper, magazine, leaflet, flyer, or catalog; on radio, television, or public address system; electronically, including by email, social media, and blog post; or made in person, in direct mail literature or other printed material, or on any interior or exterior sign or display, in any window display, in any point of transaction literature, but not including on any product label, which is delivered or made available to a customer or prospective customer in any manner whatsoever.

2. "All" means each and every.

3. "Any" means any and all.

4. "And" and "or" shall be construed either disjunctively or conjunctively as necessary to bring within the scope of the CID all information or Documents that might otherwise be construed to be outside of its scope.

5. "Communication" means any conversation, discussion, letter, email, memorandum, meeting, note or other transmittal of information or message, whether transmitted in writing, orally, electronically or by any other means, and shall include any Document that abstracts, digests, transcribes, records or reflects any of the foregoing. Except where otherwise stated, a request for "Communications" means a request for all such Communications.

6. "Concerning" means, directly or indirectly, in whole or in part, relating to, referring to, describing, evidencing or constituting.

7. "Custodian" means any Person or Entity that, as of the date of this CID, maintained, possessed, or otherwise kept or controlled such Document.

8. "Document" is used herein in the broadest sense of the term and means all records and other tangible media of expression of whatever nature however and wherever created, produced or stored (manually, mechanically, electronically or otherwise), including without limitation all versions whether draft or final, all annotated or nonconforming or other copies, electronic mail ("e-mail"), instant messages, text messages, personal digital assistant or other wireless device messages, voicemail, calendars, date books, appointment books, diaries, books, papers, files, notes, confirmations, accounts statements, correspondence, memoranda, reports, records, journals, registers, analyses, plans, manuals, policies, telegrams, faxes, telexes, wires, telephone logs, telephone messages, message slips, minutes, notes or records or transcriptions of conversations or

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

9. "Entity" means without limitation any corporation, company, limited liability company or corporation, partnership, limited partnership, association, or other firm or similar body, or any unit, division, agency, department, or similar subdivision thereof.

10. "Identify" or "Identity," as applied to any Document means the provision in writing of information sufficiently particular to enable the Attorney General to request the Document's production through CID or otherwise, including but not limited to: (a) Document type (letter, memo, etc.); (b) Document subject matter; (c) Document date; and (d) Document author(s), addressee(s) and recipient(s). In lieu of identifying a Document, the Attorney General will accept production of the Document, together with designation of the Document's Custodian, and identification of each Person You believe to have received a copy of the Document.

11. "Identify" or "Identity," as applied to any Entity, means the provision in writing of such Entity's legal name, any d/b/a, former, or other names, any parent, subsidiary, officers, employees, or agents thereof, and any address(es) and any telephone number(s) thereof.
12. "Identify" or "Identity," as applied to any natural person, means and includes the provision in writing of the natural person's name, title(s), any aliases, place(s) of employment, telephone number(s), e-mail address(es), mailing addresses and physical address(es).

13. "Person" means any natural person, or any Entity.

14. "Refer" means embody, refer or relate, in any manner, to the subject of the document demand.

15. "Refer or Relate to" means to make a statement about, embody, discuss, describe, reflect, identify, deal with, consist of, establish, comprise, list, or in any way pertain, in whole or in part, to the subject of the document demand.

16. "Sent" or "received" as used herein means, in addition to their usual meanings, the transmittal or reception of a Document by physical, electronic or other delivery, whether by direct or indirect means.

17. "CID" means this subpoena and any schedules, appendices, or attachments thereto.

18. The use of the singular form of any word used herein shall include the plural and vice versa. The use of any tense of any verb includes all other tenses of the verb.

19. The references to Communications, Custodians, Documents, Persons, and Entities in this CID encompass all such relevant ones worldwide.

B. Particular Definitions

1. "Exxon," "You," or "Your," means Exxon Mobil Corporation, and any present or former parents, subsidiaries, affiliates, directors, officers, partners, employees, agents, representatives, attorneys or other Persons acting on its behalf, and including predecessors or successors or any affiliates of the foregoing.

2. "Exxon Products and Services" means products and services, including without limitation petroleum and natural gas energy products and related services, offered to and/or sold by Exxon to consumers in Massachusetts.
3. "Carbon Dioxide" or "CO_2" means the naturally occurring chemical compound composed of a carbon atom covalently double bonded to two oxygen atoms that is fixed by photosynthesis into organic matter.

4. "Climate" means the statistical description in terms of the mean and variability of relevant quantities, such as surface variables, including, without limitation, temperature, precipitation, and wind, on Earth over a period of time ranging from months to thousands or millions of years. Climate is the state, including a statistical description, of the Climate System. *See* Intergovernmental Panel on Climate Change (IPCC), 2012: Glossary of terms. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the IPCC. Cambridge University Press, Cambridge, UK, and New York, NY, USA (the "IPCC Glossary"), p. 557.

5. "Climate Change" means a change in the state of Earth's Climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. *See* IPCC Glossary, p. 557.

6. "Climate Model" means a numerical representation of the Climate System based on the physical, chemical, and biological properties of its components, their interactions, and feedback processes, and that accounts for all or some of its known properties. Climate models are applied as a research tool to study and simulate the climate, and for operational purposes, including monthly, seasonal, interannual, and longer-term climate predictions. *See* IPCC Glossary, p. 557.

7. "Climate Risk" means the risk that variables in the Climate System reach values that adversely affect natural and human systems and regions, including those that relate to extreme values of the climate variables such as high wind speed, high river water and sea level stages (flood), and low water stages (drought). These include, without limitation, such risks to ecosystems, human health, geopolitical stability, infrastructure, facilities, businesses, asset value, revenues, and profits, as well as the business risks associated with public policies and market changes that arise from efforts to mitigate or adapt to Climate Change.

8. "Climate Science" means the study of the Climate on Earth.
9. "Climate System" means the dynamics and interactions on Earth of five major components: atmosphere, hydrosphere, cryosphere, land surface, and biosphere. *See* IPCC Glossary, p. 557.

10. "Global Warming" means the gradual increase, observed or projected, in Earth's global surface temperature, as one of the consequences of radiative forcing caused by anthropogenic emissions.

11. "Greenhouse Gas" means a gaseous constituent of Earth's atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. Water vapor (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), chlorofluorocarbons (CFCs), and ozone (O_3) are the primary Greenhouse Gases in the Earth's atmosphere. *See* IPCC Glossary, p. 560.

12. "Greenhouse Gas Emissions" means the exiting to the atmosphere of Greenhouse Gas.

13. "Methane" or "CH_4" means the chemical compound composed of one atom of carbon and four atoms of hydrogen. Methane is the main component of natural gas.

14. "Radiative Forcing Effect" means the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism.

15. "Security" has the same meaning as defined in M.G.L. c. 110A, § 401(k), and includes, without limitation, any fixed- and floating rate-notes, bonds, and common stock, available to investors for purchase by Massachusetts residents.

16. "Sustainable Development" means development that meets the needs of the present without compromising the ability of future generations to meet their own needs. *See* IPCC Glossary, p. 564.

17. "Sustainability Reporting" means the practice of measuring, disclosing and being accountable to internal and external stakeholders for organizational performance towards the goals of Sustainable Development.

18. "Acton Institute for the Study of Religion and Liberty" or "Acton Institute" means the nonprofit organization by that name. Acton Institute is located in Grand Rapids, Michigan.

19. "American Enterprise Institute for Public Policy Research" or "AEI" means the nonprofit public policy organization by that name. AEI is based in Washington, D.C.

20. "Americans for Prosperity" means the nonprofit advocacy group by that name. Americans for Prosperity is based in Arlington, Virginia.

21. "American Legislative Exchange Council" or "ALEC" means the nonprofit organization by that name consisting of state legislator and private sector members. ALEC is based in in Arlington, Virginia.

22. "American Petroleum Institute" or "API" means the oil and gas industry trade association by that name. API is based in Washington, D.C.

23. "Beacon Hill Institute at Suffolk University" means the research arm of the Department of Economics at Suffolk University in Boston, Massachusetts, by that name.

24. "Center for Industrial Progress" or "CIP" means the for profit organization by that name. CIP is located in Laguna Hills, California.

25. "Competitive Enterprise Institute" or "CEI" means the nonprofit public policy organization by that name. CEI is based in Washington, D.C.

26. "George C. Marshall Institute" means the nonprofit public policy organization by that name. George C. Marshall Institute is based in Arlington, Virginia.

27. "The Heartland Institute" means the nonprofit public policy organization by that name. The Heartland Institute is based in Arlington Heights, Illinois.

28. "The Heritage Foundation" means the nonprofit public policy organization by that name. The Heritage Foundation is based in Washington, D.C.

29. "Mercatus Center at George Mason University" means the university-based nonprofit public policy organization by that name. Mercatus Center at George Mason University is based in Arlington, Virginia.

C. Instructions

1. Preservation of Relevant Documents and Information; Spoliation. You are reminded of your obligations under law to preserve Documents and information relevant or potentially relevant to this CID from destruction or loss, and of the consequences of, and penalties available for, spoliation of evidence. No agreement, written or otherwise, purporting to modify, limit or otherwise vary the terms of this CID, shall be construed in any way to narrow, qualify, eliminate or otherwise diminish your aforementioned preservation obligations. Nor shall you act, in reliance upon any such agreement or otherwise, in any manner inconsistent with your preservation obligations under law. No agreement purporting to modify, limit or otherwise vary your preservation obligations under law shall be construed as in any way narrowing, qualifying, eliminating or otherwise diminishing such aforementioned preservation obligations, nor shall you act in reliance upon any such agreement, unless an Assistant Attorney General confirms or acknowledges such agreement in writing, or makes such agreement a matter of record in open court.

2. Possession, Custody, and Control. The CID calls for all responsive Documents or information in your possession, custody or control. This includes, without limitation, Documents or information possessed or held by any of your officers, directors, employees, agents, representatives, divisions, affiliates, subsidiaries or Persons from whom you could request Documents or information. If Documents or information responsive to a request in this CID are in your control, but not in your possession or custody, you shall promptly Identify the Person with possession or custody.

3. Documents No Longer in Your Possession. If any Document requested herein was formerly in your possession, custody or control but is no longer available, or no longer exists, you shall submit a statement in writing under oath that: (a) describes

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

4. No Documents Responsive to CID Requests. If there are no Documents responsive to any particular CID request, you shall so state in writing under oath in the Affidavit of Compliance attached hereto, identifying the paragraph number(s) of the CID request concerned.

5. Format of Production. You shall produce Documents, Communications, and information responsive to this CID in electronic format that meets the specifications set out in Schedule D.

6. Existing Organization of Documents to be Preserved. Regardless of whether a production is in electronic or paper format, each Document shall be produced in the same form, sequence, organization or other order or layout in which it was maintained before production, including but not limited to production of any Document or other material indicating filing or other organization. Such production shall include without limitation any file folder, file jacket, cover or similar organizational material, as well as any folder bearing any title or legend that contains no Document. Documents that are physically attached to each other in your files shall be accompanied by a notation or information sufficient to indicate clearly such physical attachment.

7. Document Numbering. All Documents responsive to this CID, regardless of whether produced or withheld on ground of privilege or other legal doctrine, and regardless of whether production is in electronic or paper format, shall be numbered in the lower right corner of each page of such Document, without disrupting or altering the form, sequence, organization or other order or layout in which such Documents were maintained before production. Such number shall comprise a prefix containing the producing Person's name or an abbreviation thereof, followed by a unique, sequential, identifying document control number.

8. Privilege Placeholders. For each Document withheld from production on ground of privilege or other legal doctrine, regardless of whether a production is electronic or in hard copy, you shall insert one or more placeholder page(s) in the

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

9. Privilege. If You withhold or redact any Document responsive to this CID of privilege or other legal doctrine, you shall submit with the Documents produced a statement in writing under oath, stating: (a) the document control number(s) of the Document withheld or redacted; (b) the type of Document; (c) the date of the Document; (d) the author(s) and recipient(s) of the Document; (e) the general subject matter of the Document; and (f) the legal ground for withholding or redacting the Document. If the legal ground for withholding or redacting the Document is attorney-client privilege, you shall indicate the name of the attorney(s) whose legal advice is sought or provided in the Document.

10. Your Production Instructions to be Produced. You shall produce a copy of all written or otherwise recorded instructions prepared by you concerning the steps taken to respond to this CID. For any unrecorded instructions given, you shall provide a written statement under oath from the Person(s) who gave such instructions that details the specific content of the instructions and any Person(s) to whom the instructions were given.

11. Cover Letter. Accompanying any production(s) made pursuant to this CID, You shall include a cover letter that shall at a minimum provide an index containing the following: (a) a description of the type and content of each Document produced therewith; (b) the paragraph number(s) of the CID request to which each such Document is responsive; (c) the Identity of the Custodian(s) of each such Document; and (d) the document control number(s) of each such Document.

12. Affidavit of Compliance. A copy of the Affidavit of Compliance provided herewith shall be completed and executed by all natural persons supervising or participating in compliance with this CID, and you shall submit such executed Affidavit(s) of Compliance with Your response to this CID.

13. Identification of Persons Preparing Production. In a schedule attached to the Affidavit of Compliance provided herewith, you shall Identify the natural person(s) who prepared or assembled any productions or responses to this CID. You shall further Identify the natural person(s) under whose personal supervision the preparation and assembly of productions and responses to this CID occurred. You shall further Identify all other natural person(s) able competently to testify: (a) that such productions and responses are complete and correct to the best of such person's knowledge and belief; and (b) that any Documents produced are authentic, genuine and what they purport to be.

14. Continuing Obligation to Produce. This CID imposes a continuing obligation to produce the Documents and information requested. Documents located, and information learned or acquired, at any time after your response is due shall be promptly produced at the place specified in this CID.

15. No Oral Modifications. No agreement purporting to modify, limit or otherwise vary this CID shall be valid or binding, and you shall not act in reliance upon any such agreement, unless an Assistant Attorney General confirms or acknowledges such agreement in writing, or makes such agreement a matter of record in open court.

16. Time Period. Except where otherwise stated, the time period covered by this CID shall be from April 1, 2010, through the date of the production.

D. **Documents to be Produced**

1. For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning Exxon's development, planning, implementation, review, and analysis of research efforts to study CO_2 emissions (including, without limitation, from fossil fuel extraction, production, and use), and the effects of these emissions on the Climate, including, without limitation, efforts by Exxon to:

   (a) analyze the absorption rate of atmospheric CO_2 in the oceans by developing and using Climate Models;

   (b) measure atmospheric and oceanic CO_2 levels (including, without limitation, through work conducted on Exxon's *Esso Atlantic* tanker);

   (c) determine the source of the annual CO_2 increment that has been increasing over time since the Industrial Revolution by measuring changes in the isotopic ratios of carbon and the distribution of radon in the ocean; and/or

   (d) assess the financial costs and environmental consequences associated with the disposal of CO_2 and hydrogen sulfide gas from the development of offshore gas from the seabed of the South China Sea off Natuna Island, Indonesia.

2. For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning papers prepared, and presentations given, by James F. Black, at times Scientific Advisor in the Products Research Division of Exxon Research and Engineering, author of, among others, the paper *The Greenhouse Effect*, produced in or around 1978.

3. For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning the paper *CO_2 Greenhouse Effect A Technical Review*, dated April 1, 1982, prepared by the Coordination and Planning Division of Exxon Research and Engineering Company.

4. For the time period from January 1, 1976, through the date of this production, Documents and Communications concerning the paper *CO_2 Greenhouse and Climate Issues*, dated March 28, 1984, prepared by Henry Shaw, including all Documents:

   (a) forming the basis for Exxon's projection of a 1.3 to 3.1 degree Celsius average temperature rise by 2090 due to increasing CO_2 emissions and all Documents describing the basis for Exxon's conclusions that a 2 to 3 degree Celsius increase in global average temperature could:

   - Be "amplified to about 10 degrees C at the poles," which could cause "polar ice melting and a possible sea-level rise of 0.7 meter[sic] by 2080"
   - Cause redistribution of rainfall
   - Cause detrimental health effects
   - Cause population migration

   (b) forming the basis for Exxon's conclusion that society could "avoid the problem by sharply curtailing the use of fossil fuels."

5. Documents and Communications with any of Acton Institute, AEI, Americans for Prosperity, ALEC, API, Beacon Hill Institute at Suffolk University, CEI, CIP, George C. Marshall Institute, The Heartland Institute, The Heritage Foundation, and/or Mercatus Center at George Mason University, concerning Climate Change and/or Global Warming, Climate Risk, Climate Science, and/or communications regarding Climate Science by fossil fuel companies to the media and/or to investors or consumers, including Documents and Communications relating to the funding by Exxon of any of those organizations.

6. For the time period from September 1, 1997, through the date of this production, Documents and Communications concerning the API's draft *Global Climate Science Communications Plan* dated in or around 1998.

7. For the time period from January 1, 2007, through the date of this production, Documents and Communications concerning Exxon's awareness of, and/or response to, the Union of Concerned Scientists report *Smoke, Mirrors & Hot Air: How ExxonMobil Uses Big Tobacco's Tactics to Manufacture Uncertainty on Climate Science*, dated January 2007.

8. For the time period from April 1, 1997, through the date of this production, Documents and Communications concerning the decision making by Exxon in preparing, and substantiation of, the following statements in the remarks *Energy – key to growth and a better environment for Asia-Pacific nations*, by then Chairman Lee R. Raymond to the World Petroleum Congress, Beijing, People's Republic of China, 10/13/97 (the "Raymond WPC Statements"):

   - It is highly unlikely that the temperature in the middle of the next century will be significantly affected whether policies are enacted now or 20 years from now. (Raymond WPC Statements, p. 11)

   - Forecasts of future warming come from computer models that try to replicate Earth's past climate and predict the future. They are notoriously inaccurate. None can do it without significant overriding adjustments. (Raymond WPC Statements, p. 10)

   - Proponents of the agreements [that could result from the Kyoto Climate Change Conference in December 1997] say they are necessary because burning fossil fuels causes global warming. Many people – politicians and the public alike – believe that global warming is a rock-solid certainty. But it's not. (Raymond WPC Statements, p. 8)

   - To achieve this kind of reduction in carbon dioxide emissions most advocates are talking about, governments would have to resort to energy rationing administered by a vast international bureaucracy responsible to no one. (Raymond WPC Statements, p. 10)

   - We also have to keep in mind that most of the greenhouse effect comes from natural sources, especially water vapor. Less than a quarter is from carbon dioxide, and, of this, only four percent of the carbon dioxide entering the atmosphere is due to human activities – 96 percent comes from nature. (Raymond WPC Statements, p. 9)

9. Documents and Communications concerning Chairman Rex W. Tillerson's June 27, 2012, address to the Council on Foreign Relations, including those sufficient to document the factual basis for the following statements:

   - Efforts to address climate change should focus on engineering methods to adapt to shifting weather patterns and rising sea levels rather than trying to eliminate use of fossil fuels.

   - Humans have long adapted to change, and governments should create policies to cope with the Earth's rising temperatures.

- Changes to weather patterns that move crop production areas around – we'll adapt to that. It's an engineering problem and it has engineering solutions.

- Issues such as global poverty [are] more pressing than climate change, and billions of people without access to energy would benefit from oil and gas supplies.

10. Documents and Communications concerning Chairman Tillerson's statements regarding Climate Change and Global Warming, on or about May 30, 2013, to shareholders at an Exxon shareholder meeting in Dallas, Texas, including Chairman Tillerson's statement "What good is it to save the planet if humanity suffers?"

11. Documents and Communications concerning Chairman Tillerson's speech *Unleashing Innovation to Meet Our Energy and Environmental Needs*, presented to the 36th Annual Oil and Money Conference in London, England, 10/7/15 (the "2015 Oil and Money Conference Speech"), including Documents sufficient to demonstrate the factual basis for Chairman Tillerson's representation that Exxon's scientific research on Climate Change, begun in the 1970s, "led to work with the U.N.'s Intergovernmental Panel on Climate Change and collaboration with academic institutions and to reaching out to policymakers and others, who sought to advance scientific understanding and policy dialogue."

12. Documents and Communications concerning any public statement Chairman Tillerson has made about Climate Change or Global Warming from 2012 to present.

13. Documents and Communications concerning changes in the design, construction, or operation of any Exxon facility to address possible variations in sea level and/or other variables, such as temperature, precipitation, timing of sea ice formation, wind speed, and increased storm intensity, associated with Climate Change, including but not limited to:

    (a) adjustments to the height of Exxon's coastal and/or offshore drilling platforms; and

    (b) adjustments to any seasonal activity, including shipping and the movement of vehicles.

14. Documents and Communications concerning any research, analysis, assessment, evaluation, Climate Modeling or other consideration performed by Exxon, or with funding provided by Exxon, concerning the costs for CO_2 mitigation, including,

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

15. Documents and Communications substantiating or refuting the following claims in the 2014 Managing the Risks Report:

- [B]y 2030 for the 450ppm CO2 stabilization pathway, the average American household would face an added CO2 cost of almost $2,350 per year for energy, amounting to about 5 percent of total before-tax median income. (p. 9)
- These costs would need to escalate steeply over time, and be more than double the 2030 level by mid-century. (p. 9)

- Further, in order to stabilize atmospheric GHG concentrations, these CO2 costs would have to be applied across both developed and undeveloped countries. (p. 9)

- [W]e see world GDP growing at a rate that exceeds population growth through [the year 2040], almost tripling in size from what it was globally in 2000 [fn. omitted]. It is largely the poorest and least developed of the world's countries that benefit most from this anticipated growth. However, this level of GDP growth requires more accessible, reliable and affordable energy to fuel growth, and it is vulnerable populations who would suffer most should that growth be artificially constrained. (pp. 3 – 4)

- [W]e anticipate renewables growing at the fastest pace among all sources through [the year 2040]. However, because they make a relatively small contribution compared to other energy sources, renewables will continue to comprise about 5 percent of the total energy mix by 2040. Factors limiting further penetration of renewables include scalability, geographic dispersion, intermittency (in the case of solar and wind), and cost relative to other sources. (p. 6)

- In assessing the economic viability of proved reserves, we do not believe a scenario consistent with reducing GHG emissions by 80 percent by 2050, as suggested by the "low carbon scenario," lies within the "reasonably likely to occur" range of planning assumptions, since we consider the scenario highly unlikely. (p. 16)

16. Documents and Communications that formed the basis for the following statements in Exxon's January 26, 2016, press release on Exxon's 2016 Energy Outlook:

- In 2040, oil and natural gas are expected to make up nearly 60 percent of global supplies, while nuclear and renewables will be approaching 25 percent. Oil will provide one third of the world's energy in 2040, remaining the No. 1 source of fuel, and natural gas will move into second place.

- ExxonMobil's analysis and those of independent agencies confirms our long-standing view that all viable energy sources will be needed to meet increasing demand.

- The Outlook projects that global energy-related carbon dioxide emissions will peak around 2030 and then start to decline. Emissions in OECD nations are projected to fall by about 20 percent from 2014 to 2040.

17. Documents and Communications concerning any research, study, and/or evaluation by Exxon and/or any other fossil fuel company regarding the Climate Change Radiative Forcing Effect of natural gas (Methane), and potential regulation of Methane as a Greenhouse Gas.

18. Documents and Communications concerning Exxon's internal consideration of public relations and marketing decisions for addressing consumer perceptions regarding Climate Change and Climate Risks in connection with Exxon's offering and selling Exxon Products and Services to consumers in Massachusetts.

19. Documents and Communications concerning the drafting and finalizing of text, including all existing drafts of such text, concerning Greenhouse Gas Emissions and the issue of Climate Change or Global Warming filed with the U.S. Securities and Exchange Commission (the "SEC") by Exxon, including, without limitation, Exxon's Notices of Meeting; Form 10-Ks; Form 10-Qs; Form 8-Ks; Prospectuses; Prospectus Supplements; and Free Will Prospectuses; and/or contained in any offering memoranda and offering circulars from filings with the SEC under Regulation D (17 CFR § 230.501, et seq.).

20. Documents and Communications concerning Exxon's consideration of public relations and marketing decisions for addressing investor perceptions regarding Climate Change, Climate Risk, and Exxon's future profitability in connection with Exxon's offering and selling Securities in Massachusetts.

21. Documents and Communications related to Exxon's efforts in 2015 and 2016 to address any shareholder resolutions related to Climate Change, Global Warming, and how efforts to reduce Greenhouse Gas Emissions will affect Exxon's ability to operate profitably.
22. For the time period from January 1, 2006, through the date of this production, Documents and Communications concerning Exxon's development of its program

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

23. Documents and Communications concerning information exchange among Exxon and other companies and/or industry groups representing energy companies, regarding marketing of energy and/or fossil fuel products to consumers in light of public perceptions regarding Climate Change and Climate Risk.

24. Exemplars of all advertisements, flyers, promotional materials, and informational materials of any type, including but not limited to web-postings, blog-posts, social media-postings, print ads (including ads on op-ed pages of newspapers), radio and television advertisements, brochures, posters, billboards, flyers and disclosures used by or for You, Your employees, agents, franchisees or independent contractors to solicit or market Exxon Products and Services in Massachusetts, including but not limited to:

- A copy of each print advertisement placed in the Commonwealth;
- A DVD format copy of each television advertisement that ran in the Commonwealth;
- An audio recording of each radio advertisement and audio portion of each internet advertisement;
- A copy of each direct mail advertisement, brochure, or other written promotional materials;
- A printout, screenshot or copy of each advertisement, information, or communication provided via the internet, email, Facebook, Twitter, You Tube, or other electronic communications system; and/or
- A copy of each point-of-sale promotional material used by You or on Your behalf.

25. Documents and Communications sufficient to show where each of the exemplars in Demand No. 24 was placed and the intended or estimated consumers thereof, including, where appropriate, the number of hits on each internet page and all Commonwealth Internet Service Providers viewing same.

26. Documents and Communications substantiating the claims made in the advertisements, flyers, promotional materials, and informational materials identified in response to Demand Nos. 22 through 24.

27. Documents and Communications concerning Your evaluation or review of the impact, success or effectiveness of each Document referenced in Demand Nos. 22 through 24, including but not limited to Documents discussing or referring in any way to: (a) the effects of advertising campaigns or communications; (b) focus groups; (c) copy tests; (d) consumer perception; (e) market research; (f) consumer

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

28. Documents sufficient to show Exxon's organizational structure and leadership over time, including but not limited to organizational charts, reflecting all Exxon Entities in any way involved in:

    (a) the marketing, advertisement, solicitation, promotion, and/or sale of Exxon Products and Services to consumers in the Commonwealth; and/or

    (b) the marketing, advertisement, solicitation, promotion, and/or sale to investors of Exxon Securities in the Commonwealth.

29. Documents and Communications sufficient to identify each agreement entered into on or after April 1, 2010, through the present, between and among Exxon and the Commonwealth of Massachusetts, its agencies, and/or its political subdivisions, for Exxon to provide Exxon Products and Services in Massachusetts.

30. Documents sufficient to identify all claims, lawsuits, court proceedings and/or administrative or other proceedings against You in any jurisdiction within the United States concerning Climate Change and relating to Your solicitation of consumers of Exxon Products and Services and/or relating to Your solicitation of consumers of Exxon Securities, including all pleadings and evidence in such proceedings and, if applicable, the resolution, disposition or settlement of any such matters.

31. Documents sufficient to identify and describe any discussion or consideration of disclosing in any materials filed with the SEC or provided to potential or existing investors (e.g., in prospectuses for debt offerings) information or opinions concerning the environmental impacts of Greenhouse Gas Emissions, including, without limitation, the risks associated with Climate Change, and Documents sufficient to identify all Persons involved in such consideration.

32. Transcripts of investor calls, conferences or presentations given by You at which any officer or director spoke concerning the environmental impacts of Greenhouse Gas Emissions, including, without limitation, the risks associated with Climate Change.

33. Documents and Communications concerning any subpoena or other demand for production of documents or for witness testimony issued to Exxon by the New

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

34. Documents sufficient to Identify all other federal or state law enforcement or regulatory agencies that have issued subpoenas or are otherwise currently investigating You concerning Your marketing of Exxon Products and Services to consumers and/or of Exxon Securities to investors.

35. Documents sufficient to Identify any Massachusetts consumer who has complained to You, or to any Massachusetts state or local consumer protection agency, concerning Your actions with respect to Climate Change, and for each such consumer identified, documents sufficient to identify each such complaint; each correspondence between You and such consumer or such consumer's representative; any internal notes or recordings regarding such complaint; and the resolution, if any, of each such complaint.

36. Documents and communications that disclose Your document retention policies in effect between January 1, 1976 and the date of this production.

37. Documents sufficient to Identify Your officers, directors and/or managing agents, or other persons most knowledgeable concerning the subject matter areas enumerated in Schedule B, below.

38. Documents sufficient to identify all natural persons involved in the preparation of Your response to this CID.

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

SCHEDULE B

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

1. Your compliance with Massachusetts General Law Chapter 93A, § 2, and the regulations promulgated thereunder concerning, the marketing, advertising, soliciting, promoting, and communicating or sale of: (1) Exxon Products and Services in the Commonwealth and/or to Massachusetts residents; and (2) Securities in the Commonwealth and/or to Massachusetts residents.

2. The marketing, advertising, soliciting, promoting, and communicating or sale of Exxon Products and Services in the Commonwealth and/or to Massachusetts residents, including their environmental impacts with respect to Greenhouse Gas Emission, Climate Change and/or Climate Risk.

3. The marketing, advertising, soliciting, promoting, and communicating or sale of Securities in the Commonwealth and/or to Massachusetts residents, including as to Exxon's disclosures of risks to its business related to Climate Change.

4. All topics covered in the demands above.

5. Your recordkeeping methods for the demands above, including what information is kept and how it is maintained.

6. Your compliance with this CID.

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

SCHEDULE C

CHAPTER 93A. REGULATION OF BUSINESS PRACTICES FOR CONSUMERS PROTECTION

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

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

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

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

SCHEDULE D

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

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

AFFIDAVIT OF COMPLIANCE WITH CIVIL INVESTIGATIVE DEMAND

State of

County of

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

1. I am employed by _____ in the position of _____;

2. The enclosed production of documents and responses to Civil Investigative Demand 2016-EPD-36 of the Attorney General of the Commonwealth of Massachusetts, dated April 19, 2016 (the "CID") were prepared and assembled under my personal supervision;

3. I made or caused to be made a diligent, complete and comprehensive search for all Documents and information requested by the CID, in full accordance with the instructions and definitions set forth in the CID;

4. The enclosed production of documents and responses to the CID are complete and correct to the best of my knowledge and belief;

5. No Documents or information responsive to the CID have been withheld from this production and response, other than responsive Documents or information withheld on the basis of a legal privilege or doctrine;

6. All responsive Documents or information withheld on the basis of a legal privilege or doctrine have been identified on a privilege log composed and produced in accordance with the instructions in the CID;

7. The Documents contained in these productions and responses to the CID are authentic, genuine and what they purport to be;

8. Attached is a true and accurate record of all persons who prepared and assembled any productions and responses to the CID, all persons under whose personal supervision the preparation and assembly of productions and responses to the CID occurred, and all persons able competently to testify: (a) that such productions and responses are complete and correct to the best of such person's knowledge and belief; and (b) that any Documents produced are authentic, genuine and what they purport to be; and

9. Attached is a true and accurate statement of those requests under the CID as to

Demand No.: 2016-EPD-36
Date Issued: April 19, 2016
Issued To: Exxon Mobil Corporation

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

_____ _____
Signature of Affiant Date

_____
Printed Name of Affiant

Subscribed and sworn to before me

this __ day of _____ 2016.

_____
Notary Public
My commission expires:

_____

Office of the Attorney General - Data Delivery Specification
ONE – Production Load File

I. General

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

Rev. 09-24-2015

g. Sent Date (dates and times must be stored in separate fields)
h. Sent Time (dates and times must be stored in separate fields and without time zones)
i. File extension (.txt, .msg, etc.)
j. Attachment count.

7. eFiles should be produced with at least the following individual fields of metadata:
   a. Author
   b. CreateDate (dates and times must be stored in separate fields)
   c. CreateTime (dates and times must be stored in separate fields with no time zones or am/pm)
   d. LastModifiedDate (dates and times must be stored in separate fields)
   e. LastModifiedTime (dates and times must be stored in separate fields with no time zones or am/pm).
8. Deduplication (Removed From data field)
   a. If the producing entity wishes to deduplicate, exact hash value duplicates may be removed on a global basis if the producing entity provides a field of created data for each deduplicated item that provides a concatenated list of all custodians or other sources where the item was original located. This list should be provided in the RemovedFrom data field.
   b. Any other form of deduplication must be approved in advance by the Office of the Attorney General.

II. File Types and Load File Requirements

a. File Types

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

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

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

Office of the Attorney General - Data Delivery Specification
ONE – Production Load File

- Example Production Deliverable
  - VOL001
    - DATA
      - IMAGES
      - NATIVES
      - TEXT
    - LOAD

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

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

Office of the Attorney General - Data Delivery Specification
ONE – Production Load File

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

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

```
þBegBatesþ¶þEndBatesþ¶þBegAttachþ¶þEndAttachþ¶þFamilyIDþ¶þVolumeþ¶þMD5Hashþ¶þCustodian_Sourceþ¶þFROMþ¶þTOþ¶þCCþ¶þBCCþ¶þSubjectþ¶þSent Dateþ¶þSent Timeþ¶þFile Extensionþ¶þD
þAG000004507þ¶þAG000004510þ¶þAG000004507þ¶þAG000004512þ¶þAG000004507þ¶þVOL001þ¶þþ¶þDoe, Johnþ¶þjohndoe@someplace.comþ¶þjdoe@somewhereelse.comþ¶þtheboss@someplace.comþ¶þþ¶þt
þAG000004511þ¶þAG000004512þ¶þAG000004507þ¶þAG000004512þ¶þAG000004507þ¶þVOL001þ¶þþ¶þDoe, Johnþ¶þjohndoe@someplace.comþ¶þjdoe@somewhereelse.comþ¶þtheboss@someplace.comþ¶þþ¶þt
```

c. **Fields required for an Images Load File – Opticon Format**

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

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

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

```
AG0000004507,VOL001,IMAGES\00\00\AG0000004507.TIF,Y,,,4
AG0000004508,VOL001,IMAGES\00\00\AG0000004508.TIF,,,,
AG0000004509,VOL001,IMAGES\00\00\AG0000004509.TIF,,,,
AG0000004510,VOL001,IMAGES\00\00\AG0000004510.TIF,,,,
AG0000004511,VOL001,IMAGES\01\00\AG0000004511.TIF,Y,,,2
AG0000004512,VOL001,IMAGES\01\00\AG0000004512.TIF,,,,
```

Technical questions regarding this specification should be addressed to:

Diane E. Barry
AAG / eDiscovery Attorney
Office of the Attorney General
One Ashburton Place
Boston MA 02108
Diane.E.Barry@state.ma.us
(617) 963-2120

Rev. 09-24-2015

Exhibit G

CLIMATE CHANGE COALITION COMMON INTEREST AGREEMENT

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

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

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

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

4. Non-Waiver of Privileges. The exchange of Shared Information among Parties—including among Parties' staff and outside advisors—does not diminish in any way the privileged and confidential nature of such information. The Parties retain all applicable privileges and claims to confidentiality, including the attorney client privilege, work product privilege, common interest privilege, law enforcement privilege, deliberative process privilege and exemptions from disclosure under any public records laws that may be asserted to protect against disclosure of Shared Information to non-Parties (hereinafter collectively referred to as "Privileges").

5. Nondisclosure. Shared Information shall only be disclosed to: (i) Parties; (ii) employees or agents of the Parties, including experts or expert witnesses; (iii) government officials involved with the enforcement of antitrust, environmental, consumer protection, or securities laws who have agreed in writing to abide by the confidentiality restrictions of this Agreement; (iv) criminal enforcement authorities; (v) other persons, provided that all Parties consent in advance; and (vi) other persons as provided in paragraph 6. A Party who provides Shared Information may also impose additional conditions on the disclosure of that Shared Information. Nothing in this Agreement prevents a Party from using the Shared Information for law enforcement purposes, criminal or civil, including presentation at pre-trial and trial-related proceedings, to the extent that such presentation does not (i) conflict with other agreements that the Party has entered into, (ii) interfere with the preservation of the Privileges, or (iii) conflict with court orders and applicable law.

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

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

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

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

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

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

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

Dated: May 18, 2016

Michele Van Gelderen
Supervising Deputy Attorney General
Consumer Law Section
Office of Attorney General Kamala D. Harris
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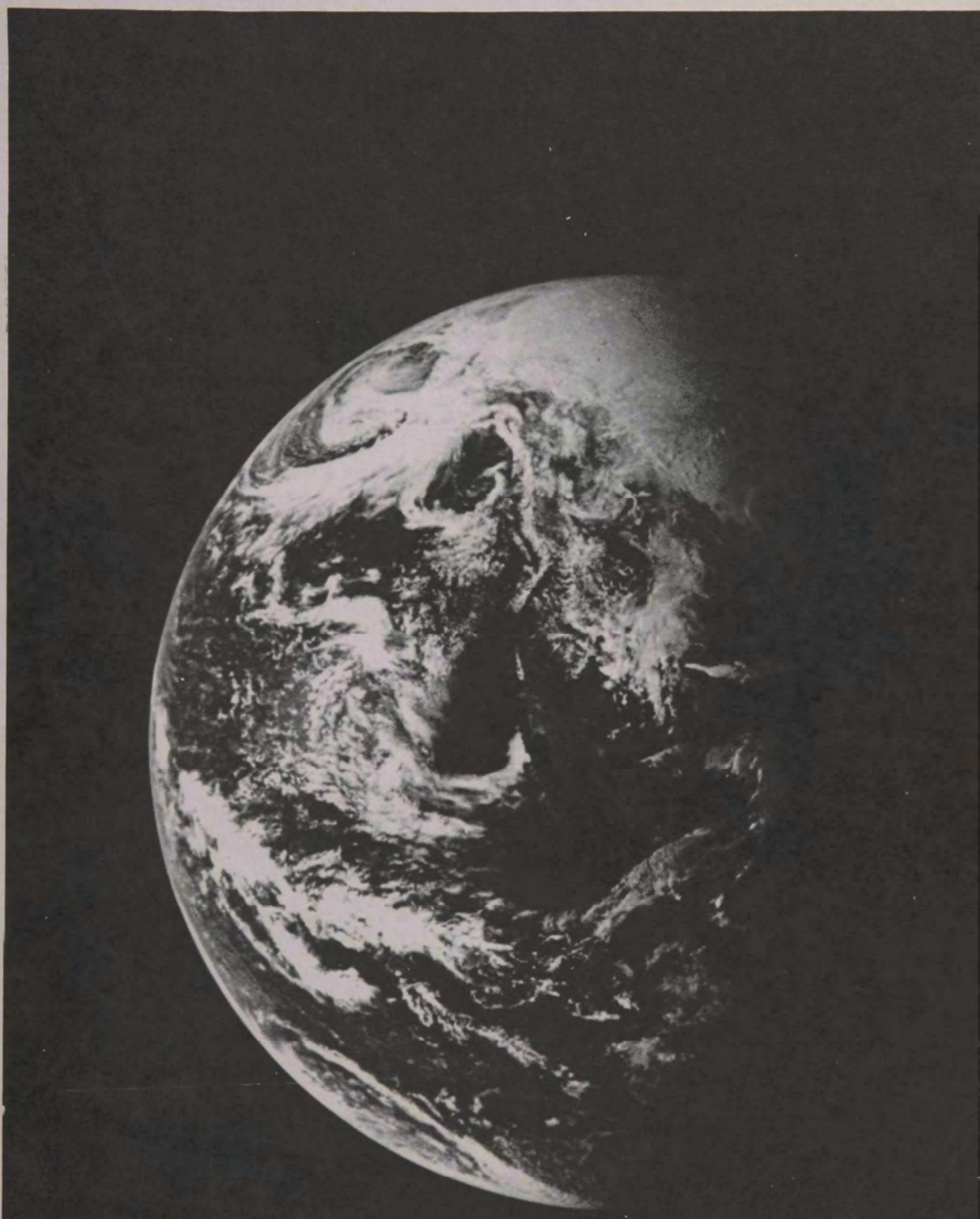
September 1983

EPA

Can We Delay A Greenhouse Warming?



CAN WE DELAY A GREENHOUSE WARMING?

The Effectiveness and Feasibility of Options to Slow a Build-Up of Carbon Dioxide in the Atmosphere

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September 1983

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

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Martin Wagner, Acting Director of EPA's Energy Policy Division, and John Hoffman, who directs EPA's research program on greenhouse effects, provided useful comments on previous drafts. We are also indebted to several other reviewers: Dr. Martin Miller and Dr. David Rose, both of the Massachusetts Institute of Technology; Dr. Henry Lee, the Director of Harvard's Energy and Environmental Policy Center; and Jesse Ausebel of the National Academy of Sciences. However, the contents and conclusions of the study remain the responsibility of the authors.

EXECUTIVE SUMMARY

Evidence continues to accumulate that increases in atmospheric carbon dioxide (CO_2) and other "greenhouse" gases will substantially raise global temperature. While considerable uncertainty exists concerning the rate and ultimate magnitude of such a temperature rise, current estimates suggest that a 2°C (3.6°F) increase could occur by the middle of the next century, and a 5°C (9°F) increase by 2100. Such increases in the span of only a few decades represent an unprecedented rate of atmospheric warming.

Temperature increases are likely to be accompanied by dramatic changes in precipitation and storm patterns and a rise in global average sea level. As a result, agricultural conditions will be significantly altered, environmental and economic systems potentially disrupted, and political institutions stressed.

Responses to the threat of a greenhouse warming are polarized. Many have dismissed it as too speculative or too distant to be of concern. Some assume that technological options will emerge to prevent a warming or, at worst, to ameliorate harmful consequences. Others argue that only an immediate and radical change in the rate of CO_2 emissions can avert worldwide catastrophy. The risks are high in pursuing a "wait and see" attitude on one hand, or in acting impulsively on the other.

This study aims to shed light on the debate by evaluating the usefulness of various strategies for slowing or limiting a global warming. Better information is essential if scientific researchers, policymakers, and private sector decisionmakers are to work together effectively in addressing the threat of climate change.

FOCUS OF STUDY

Because increases in atmospheric CO_2 primarily result from the use of fossil fuels, one logical response to the threat of climate change is to reduce global dependence on these energy sources. This study takes a first look at whether specific policies aimed at limiting the use of fossil fuels would prove effective in delaying temperature increases over the next 120 years. Specifically, it examines whether a tax on the use of fossil fuels or a ban on the use of coal, shale oil, or synfuels could be effective in delaying a greenhouse warming. These policies are also evaluated for their economic and political feasibility. To put our findings in perspective, alternative, nonenergy approaches to limiting a greenhouse warming are also reviewed.

METHODOLOGY

Evaluating the effectiveness of energy policies to reduce levels of CO_2 requires the estimation of future patterns of energy use, the effect of these patterns on CO_2 emissions, the

fate of CO_2 once emitted, and the relationship between levels of atmospheric CO_2 and temperature. Three models were used in the estimation process:

- a world energy model to project future supply and demand for alternative fuels and to estimate CO_2 emissions based on fuel use mixes;
- a carbon cycle model to translate CO_2 emissions into increases in atmospheric CO_2 concentrations; and
- an atmospheric temperature model to estimate changes in temperature based on increases in atmospheric CO_2 and other greenhouse gases.

We used these models to explore a range of possible assumptions about energy demand and technologies, atmospheric responses, and policy alternatives.

We evaluated both medium-run (by the middle of the next century) and long-run (by 2100) effects, placing greater confidence in the shorter run results. The timing of a 2°C rise is employed as the measure of medium-run effectiveness. A temperature increase of this magnitude by mid-century would represent a dramatic departure from historical trends -- a rate of increase equal to roughly 0.3°C per decade, compared with a rise of 0.04°C per decade during the past 100 years. Over the long run, the absolute temperature rise in 2100 is used as the measure of effectiveness. Rough estimates of technical constraints, costs, and the need for political cooperation are used to judge feasibility.

BASELINE TRENDS

We developed the Mid-range Baseline scenario as a "best guess" of future energy patterns. Under this scenario, atmospheric CO_2 levels would reach 590 ppm, or double pre-industrial levels, by 2060, and a 2°C temperature rise would occur around 2040. By 2100, global warming would approach 5°C. These estimates are particularly sensitive to (1) the assumed temperature response to a doubling of CO_2, and (2) the rate of increase of greenhouse gases other than CO_2 (i.e., methane, nitrous oxide, and chlorofluorocarbons). By varying these factors within reasonable ranges, the projected date of a 2°C warming shifts from roughly 2015 to 2095. In direct contrast, changes in the projected costs of alternative fuels or in fuel users' behavior (i.e., the degree of conservation in response to rising energy prices and other factors) has almost no effect on the estimated timing of a 2°C rise in temperature. Specifically, scenarios reflecting significant reductions in the future cost of nuclear power and renewable energy, increased conservation, and expanded electrification have little influence on the date of a 2°C warming, and only a minor effect on the temperature rise in 2100 (5-10 percent). Similarly, significant reductions in the baseline costs of shale oil or synfuels fail to accelerate a projected 2°C warming, and estimated temperature in 2100 increases by less than 5 percent. These findings attest to the substantial momentum built into temperature trends, due to the effect of other greenhouse gases and to the difficulty in changing fuel-use patterns.

SUMMARY OF FINDINGS

Our analysis of energy and nonenergy policies to slow or limit a global warming produced the following results:

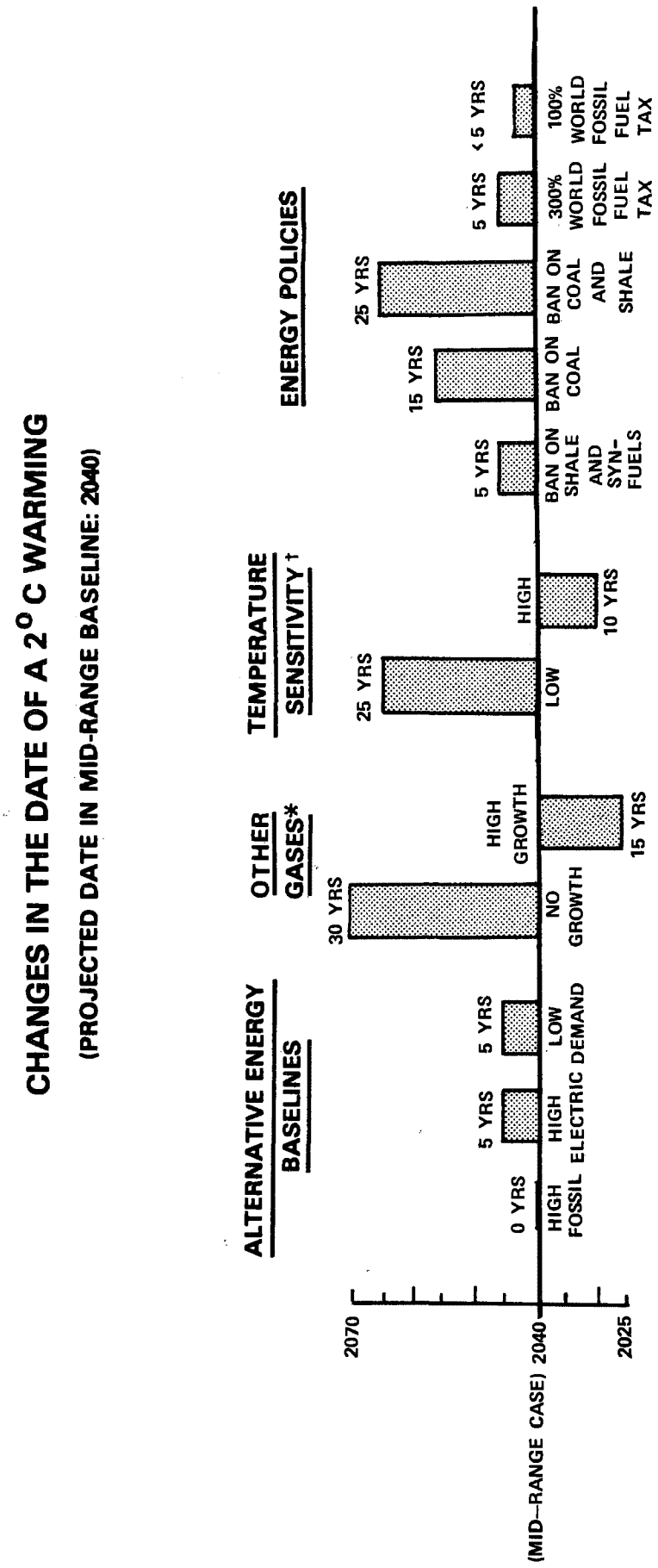
Only One of the Energy Policies Significantly Postpones a 2°C Warming

- Worldwide taxes of up to 300% of the cost of fossil fuels (applied proportionately based on CO_2 emissions from each fuel) would delay a 2°C warming only about 5 years beyond 2040.
- Fossil fuel taxes applied to just certain countries or applied at a 100% rate would not affect the timing of of a 2°C rise.
- A ban on synfuels and shale oil would delay a 2°C warming by only 5 years.
- Only a ban on coal instituted by 2000, would effectively slow the rate of temperature change and delay a 2°C change until 2055. A ban on both coal and shale oil would delay it an additional 10 years -- until 2065.

Major Uncertainties Include Growth of Other Greenhouse Gases and Temperature Sensitivity of the Atmosphere, but Not Baseline Energy Scenarios

- Uncertainties concerning the rate of growth of other greenhouse gases could advance the date of a 2°C warming by 15 years or delay it by 30 years.
- The plausible range of sensitivity of the atmosphere to increases in greenhouse gases creates a 35-year band of uncertainty around the projected year (2040) for a 2°C warming.
- In contrast, alternative energy futures, including significant shifts in the relative costs of fuels, changes in energy demand, and reduced economic growth, cause only minor (i.e., five years or less) changes in the date of a 2°C warming.

These findings are illustrated in the following chart. Each bar represents the number of years the 2°C date is delayed (bar above line) or advanced (bar below line), compared with the Mid-range Baseline projections.



*REFERS TO GREENHOUSE GASES OTHER THAN CO_2: NITROUS OXIDE, METHANE, AND CHLOROFLUOROCARBONS.

†REFERS TO THE TEMPERATURE RISE IN RESPONSE TO A GIVEN INCREASE IN GREENHOUSE GASES ONCE AN EQUILIBRIUM HAS BEEN REACHED.

Bans on Coal and Shale Oil Are Most Effective in Reducing Temperature Increases in 2100

- A worldwide ban on coal (and thus coal-derived synfuels) instituted by 2000 would reduce temperature change by 30% (from 5°C to 3.5°C).
- Together, a ban on shale oil and coal would reduce the projected warming in 2100 from 5°C to 2.5°C.
- Bans on shale oil alone or synfuels alone would be less effective.
- A 100% worldwide tax would reduce warming by less than 1.0°C in 2100.

A Ban on Coal Seems Economically and Politically Infeasibile

- Though detailed estimates of total costs of a ban on coal were beyond the scope of this study, initial approximations based only on asset losses and increases in prices of alternative fuels suggest that a coal ban is economically infeasible.
- A worldwide ban on coal also appears to be politically infeasible. Because the burden would be unevenly distributed (e.g., most of the world's coal is concentrated in only three nations, and use of coal varies dramatically between developed and developing nations), worldwide cooperation required to ban coal is unlikely.

At Best, Nonenergy Options to Limit Global Warming Are Highly Speculative

- Scrubbing CO_2 emissions from power plants is of limited effectiveness and prohibitively expensive.
- Capturing ambient CO_2 through massive forestation would place too great a burden on land, fertilizer, and irrigation requirements.
- In theory, adding SO_2 to the stratosphere might counterbalance the greenhouse warming effect, but at great cost. Moreover, the effectiveness and potential adverse environmental consequences of this proposal require much additional research.

IMPLICATIONS OF FINDINGS

The implications of our findings point to action directed in the following three areas:

Accelerate and Expand Research on Improving Our Ability to Adapt to a Warmer Climate -- This research should focus on enhancing the positive and minimizing the negative aspects of a greenhouse warming. It should also address problems likely to occur during the transitional stage when social and economic systems are adapted to the consequences of increased CO_2 and temperature. A key element of this research must be developing regional climate scenarios that can be used to evaluate the costs and benefits associated with possible changes in climate and that can serve as a baseline against which possible adaptive actions can be evaluated.

Narrow Uncertainties About the Future Effects Greenhouse Gases Other Than CO_2 -- Research relating to other greenhouse gases should focus on developing a better understanding of the natural and man-made sources and sinks of these gases, of their interactions with other atmospheric gases, (especially their effects on atmospheric ozone), and of possible strategies to mitigate their influence on future global warming.

Reducing Uncertainty About the Thermal Sensitivity of the Atmosphere -- Narrowing the range of uncertainty regarding the temperature sensitivity of the atmosphere to increases in greenhouse gases will depend on expanded modeling efforts. Cloud formation and ocean systems must be more realistically represented in climate models, and our ability to use these models in predicting transient warming effects must be improved.

Our analysis underscores the need to reduce remaining scientific uncertainties as quickly as possible. Substantial increases in global warming may occur sooner than most of us would like to believe. In the absence of growing international consensus on this subject, it is extremely unlikely that any substantial actions to reduce CO_2 emissions could or would be taken unilaterally. Adaptive strategies undertaken by individual countries appear to be a better bet. But for these strategies to succeed, much more precise and detailed information will be needed on the timing and regionally disaggregated consequences of a global warming.

Exhibit I

Changing Climate

Report of the Carbon Dioxide Assessment Committee

Board on Atmospheric Sciences and Climate
Commission on Physical Sciences, Mathematics, and Resources
National Research Council

NATIONAL ACADEMY PRESS
Washington, D.C. 1983

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NOTICE The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the Committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The National Research Council was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy under the authority of its congressional charter of 1863, which establishes the Academy as a private, nonprofit, self-governing membership corporation. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

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Contents

Executive Summary

1. Carbon dioxide (CO_2) is one of the gases of the atmosphere important in determining the Earth's climate. In the last generation the CO_2 concentration in the atmosphere has increased from 315 parts per million (ppm) by volume to over 340 ppmv. (Chapters 3, 4)

2. The current increase is primarily attributable to burning of coal, oil, and gas; future increases will similarly be determined primarily by fossil fuel combustion. Deforestation and land use changes have probably been important factors in atmospheric CO_2 increase over the past 100 years. (Chapters 2, 3)

3. Projections of future fossil fuel use and atmospheric concentrations of CO_2 embody large uncertainties that are to a considerable extent irreducible. The dominant sources of uncertainty stem from our inability to predict future economic and technological developments that will determine the global demand for energy and the attractiveness of fossil fuels. We think it most likely that atmospheric CO_2 concentration will pass 600 ppm (the nominal doubling of the recent level) in the third quarter of the next century. We also estimate that there is about a 1-in-20 chance that doubling will occur before 2035. (Chapters 2, 3)

4. If deforestation has been a large net source of CO_2 in recent decades, then the models that we are using to project future atmospheric concentrations are seriously flawed; the fraction of man-made CO_2 remaining airborne must then be lower, and CO_2 increase will probably occur more slowly than it otherwise would. (Chapter 3)

5. Estimates of effects of increasing CO_2 on climate also embody significant uncertainties, stemming from fundamental gaps in our understanding of physical processes, notably the processes that determine cloudiness and the long-term interactions between atmosphere and ocean. (Chapter 4)

6. Several other gases besides CO_2 that can affect the climate appear to be increasing as a result of human activities; if we project

increases in all these gases, climate changes can be expected significantly earlier than if we consider CO_2 alone. (Chapter 4)

7. From climate model simulations of increased CO_2 we conclude with considerable confidence that there would be global mean temperature increase. With much less confidence we infer other more specific regional climate changes, including relatively greater polar temperature increase and summer dryness in middle latitudes (e.g., the latitudes of the United States). (Chapter 4)

8. Results of most numerical model experiments suggest that a doubling of CO_2, if maintained indefinitely, would cause a global surface air warming of between 1.5°C and 4.5°C. The climate record of the past hundred years and our estimates of CO_2 changes over that period suggest that values in the lower half of this range are more probable. (Chapters 4, 5)

9. By itself, CO_2 increase should have beneficial effects on photosynthesis and water-use efficiency of agricultural plants, especially when other factors are not already limiting growth. (Chapters 3, 6)

10. Analysis of the effects of a warmer and drier climate on rainfed agriculture in the United States suggests that over the next couple of decades negative effects of climate change and positive effects from CO_2 fertilization both will be modest and will approximately balance. The outlook is more troubling for agriculture in lands dependent on irrigation. Longer-term impacts are highly uncertain and will depend strongly on the outcome of future agricultural research, development, and technology. (Chapter 6)

11. Changes in temperature and rainfall may be amplified as changes in the annual discharge of rivers. For example, a 2°C warming could severely reduce the quantity and quality of water resources in the western United States. (Chapter 7)

12. (a) If a global warming of about 3 or 4°C were to occur over the next hundred years, it is likely that there would be a global sea-level rise of about 70 cm, in comparison with the rise of about 15 cm over the last century. More rapid rates could occur subsequently, if the West Antarctic Ice Sheet should begin to disintegrate. (Chapter 8)

(b) Such a warming might also bring about changes in Arctic ice cover, with perhaps a disappearance of the summer ice pack and associated changes in high-latitude weather and climate. (Annex 1)

13. Because of their large uncertainties and significant implications, it is important to confirm the various predictions of climate changes at the earliest possible time and to achieve greater precision. This can best be done through carefully designed monitoring programs of long duration emphasizing the ensemble of variables believed to influence climate or to reflect strongly the effect of CO_2. (Chapter 5)

14. The social and economic implications of even the most carefully constructed and detailed scenarios of CO_2 increase and climatic consequences are largely unpredictable. However, a number of inferences seem clear:

(a) Rapid climate change will take its place among the numerous other changes that will influence the course of society, and these other changes may largely determine whether the climatic impacts of greenhouse gases are a serious problem.

(b) As a human experience, climate change is far from novel; large numbers of people now live in almost all climatic zones and move easily between them.

(c) Nevertheless, we are deeply concerned about environmental changes of this magnitude; man-made emissions of greenhouse gases promise to impose a warming of unusual dimensions on a global climate that is already unusually warm. We may get into trouble in ways that we have barely imagined, like release of methane from marine sediments, or not yet discovered.

(d) Climate changes, their benefits and damages, and the benefits and damages of the actions that bring them about will fall unequally on the world's people and nations. Because of real or perceived inequities, climate change could well be a divisive rather than a unifying factor in world affairs. (Chapter 9)

15. Viewed in terms of energy, global pollution, and worldwide environmental damage, the "CO_2 problem" appears intractable. Viewed as a problem of changes in local environmental factors--rainfall, river flow, sea level--the myriad of individual incremental problems take their place among the other stresses to which nations and individuals adapt. It is important to be flexible both in definition of the issue, which is really more climate change than CO_2, and in maintaining a variety of alternative options for response. (Chapter 9)

16. Given the extent and character of the uncertainty in each segment of the argument--emissions, concentrations, climatic effects, environmental and societal impacts--a balanced program of research, both basic and applied, is called for, with appropriate attention to more significant uncertainties and potentially more serious problems. (Chapter 1)

17. Even very forceful policies adopted soon with regard to energy and land use are unlikely to prevent some modification of climate as a result of human activities. Thus, it is prudent to undertake applied research and development--and to consider some adjustments--in regard to activities, like irrigated agriculture, that are vulnerable to climate change. (Chapters 1, 9)

18. Assessment of the CO_2 issue should be regarded as an iterative process that emphasizes carry over of learning from one effort to the next. (Chapter 1)

19. Successful response to widespread environmental change will be facilitated by the existence of an international network of scientists

conversant with the issues and of broad international consensus on facts and their reliability. Sound international research and assessment efforts can turn up new solutions and lubricate the processes of change and adaptation. (Chapter 1)

20. With respect to specific recommendations on research, development, or use of different energy systems, the Committee offers three levels of recommendations. These are based on the general view that, if other things are equal, policy should lean away from the injection of greenhouse gases into the atmosphere.

(a) Research and development should give some priority to the enhancement of long-term energy options that are not based on combustion of fossil fuels. (Chapters 1, 2, 9)

(b) We do not believe, however, that the evidence at hand about CO_2-induced climate change would support steps to change current fuel-use patterns away from fossil fuels. Such steps may be necessary or desirable at some time in the future, and we should certainly think carefully about costs and benefits of such steps; but the very near future would be better spent improving our knowledge (including knowledge of energy and other processes leading to creation of greenhouse gases) than in changing fuel mix or use. (Chapters 1, 2, 9)

(c) It is possible that steps to control costly climate change should start with non-CO_2 greenhouse gases. While our studies focused chiefly on CO_2, fragmentary evidence suggests that non-CO_2 greenhouse gases may be as important a set of determinants as CO_2 itself. While the costs of climate change from non-CO_2 gases would be the same as those from CO_2, the control of emissions of some non-CO_2 gases may be more easily achieved. (Chapters 1, 2, 4, 9)

21. Finally, we wish to emphasize that the CO_2 issue interacts with many other issues, and it can be seen as a healthy stimulus for acquiring knowledge and skills useful in the treatment of numerous other important problems. (Chapter 1)

suggest design changes for overland vehicles, construction equipment, pipelines, and buildings. On a different plane, concern arises about possible loss of habitats and the conservation of nature; polar regions are among the wilder and more pristine environments remaining.

In contrast to polar and sea-level change, not much consideration has been given by those who study increasing CO_2 and climate change to any possible direct effect on human health or the animal population from CO_2 in the air we breathe. The natural a priori concern with the health effects of a doubling or quadrupling of an important gas in the air we breathe--the substance that actually regulates our breathing rate--is relieved by the observation that for as long as people have been living indoors, not to mention burning fuel to heat themselves, they have been spending large parts of their lives--virtually entire lives in the case of people who work indoors and travel in enclosed vehicles--in an atmosphere of elevated CO_2. Doubling or even quadrupling CO_2 would still present a school child with a lesser concentration during outdoor recess than the child faces in today's average classroom.

There is, furthermore, no documented evidence that CO_2 concentrations of five or ten times the normal outdoor concentration damage human or animal tissue, affect metabolism, or interfere with the nervous system. Nor is there a theoretical basis for expecting direct effects on health from the kinds of CO_2 concentrations anticipated.

But even though this answer is reassuring, the question has to be faced. It will occur to people who hear about changes in the atmosphere that their grandchildren are going to breathe. And experiments have not been carried out with either people or large animals whose whole lives, including prenatal life, were spent in an environment that never contained less than, say, 700 ppmv of CO_2. So the question deserves attention, even though there is no known cause for alarm.

Probably more serious is the effect of elevated temperatures on health and welfare. If a 3 or 4°C increase in average temperatures occurs, as might be expected in different parts of the United States with a CO_2 doubling, extreme summer temperatures in warm years might rise by an equal amount. Excess human death and illness are already characteristic of summer "hot spells," and these might be worsened by much higher extreme summer temperatures. And, climatic shifts may change the habitats of disease vectors or the hosts for such vectors.

1.3.3 The Problem of Unease about Changes of This Magnitude

Enveloping our specific and more speculative concerns about impacts of climatic change on water resources, sea level, and other areas discussed is a profound uneasiness about inducing environmental changes of the magnitude envisaged with major increases in atmospheric CO_2 and other greenhouse gases.

To establish a context, consider, for example, the most frequently quoted index--change in global average surface temperature. This crude measure of climate tells us little about what temperature change to expect for specific regions and nothing about the type of climate that

would be experienced. Global average surface temperature has come to such prominence in large part because it represents a relative measure of CO_2 effects among climate models. Indeed, for many models it is the only result with much scientific validity. Nevertheless, changes in average surface temperature may suggest well the nature of our unease.

Increasing CO_2 is expected to produce changes in global mean temperature that, in both magnitude and rate of change, have few or no precedents in the Earth's recent history. Consider the ranges of temperature experienced in various periods in the past (Figure 1.14). A range of less than a degree was experienced in the last century, less than 2°C in the last thousand years, and only 6 or 7°C in the last million years. The development of civilization since the retreat of the last glaciation has taken place in a global climate never more than 1°C warmer or colder than today's. Despite the modest decline of time-averaged global-mean temperatures since the 1940s, we are still in an unusually warm period in the Earth's history. Indeed, according to one source (Jones, 1981), 1981 was the warmest year on record. Thus, the temperature increases of a couple of degrees or so projected for the next century are not only large in historical terms but also carry our planet into largely unknown territory. Increasing CO_2 promises to impose a warming of unusual magnitude on a global climate that is already unusually warm.

Furthermore, the question of threshold responses arises. It is possible that a change in the central tendency of climate will come about smoothly and gradually. It is also possible that discontinuities will occur. For example, Lorenz (1968) and others have suggested the possibility of more than one climatic equilibrium.

As Schelling (Chapter 9) points out, our calm assessment of the CO_2 issue rests essentially on the "foreseeable" consequences of climatic change. Less well-seen aspects remain troubling. We have mentioned the possible release of methane clathrates from ocean sediments. We have also mentioned melting of the central Arctic sea ice. Disappearance of the permanent Arctic ice would result in a marked increase in the thermal asymmetry of the planet, with only one pole still glaciated. Such asymmetric conditions could produce further, unanticipated climatic changes (Flohn, 1982). Warming amplified at high-latitude regions could also affect major features of the oceanic circulation, and these too could lead to unexpectedly different climatic conditions, as well as changes in the capacity of the oceans to absorb CO_2. At the level of ecosystems, surprising changes may also result from climatic shifts.

We are not complacent about global-average temperature changes that sound small; very serious shifts in the environment could well be implied. There is probably some positive association between what we can predict and what we can accommodate. To predict requires some understanding, and that same understanding may help us to overcome the problem. What we have not predicted, what we have overlooked, may be what we least understand. And when it finally forces itself on our attention, it may appear harder to adapt to, precisely because it is not familiar and well understood. There may yet be surprises. Antici-

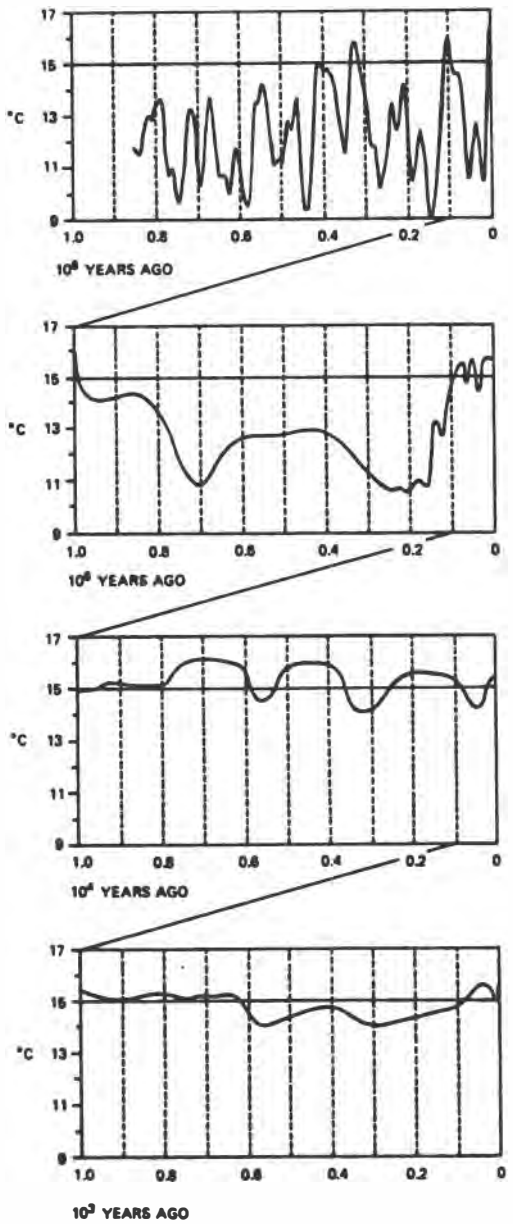


FIGURE 1.14 An approximate temperature history of the northern hemisphere for the last 850,000 years. The panels are at the same vertical scale. The top panel shows the past million years, the second panel amplifies the past 100,000 years, the third panel the past 10,000 years, and the bottom panel the past 1000 years. The horizontal line at 15°C is included simply for reference. Considerable uncertainty attaches to the record in each panel, and the temperature records are derived from a variety of sources, for example, ice volume, as well as more direct data. Spatial and temporal (e.g., seasonal) variation of data sources is also considerable. From Clark (1982). Original data from Matthews (1976), Mitchell (1979), and National Research Council (1975).

pating climate change is a new art. In our calm assessment we may be overlooking things that should alarm us.

At the same time, one might observe that--barring the kind of surprises mentioned above--the climate changes under consideration are not large in comparison with the climate changes individuals and social groups have undergone historically as a result of migration. Table 1.10 shows U.S. population for 1800, 1860, 1920, and 1980, distributed according to the climatic zones in Figure 1.15. These data have been transformed into a series of maps of the United States in which the areas of our various climatic zones are drawn so as to be proportionate to their populations at various times (see Chapter 9). The maps seemingly depict massive climate change; formerly empty, thus small, climatic zones become heavily populated and grow large. But it is not that deserts have expanded or that the climate has changed from permafrost to rain forest, or from prairie to Mediterranean west coast, or to places where it gets cold but does not quite freeze from where it got a little colder and did freeze. People have moved, and to all climates, to places of enormous extremes like the Dakotas and places of little change like Puerto Rico. People have moved from the seacoast to the prairie, from the snows to the Sun Belt.

Not only have people moved, but they have taken with them their horses, dogs, children, technologies, crops, livestock, and hobbies. It is extraordinary how adaptable people can be in moving to drastically

TABLE 1.10 U.S. Population by Climatic Zone[a,b,c]

Climatic zone[c]	Description	Population 1800	1860	1920	1980
Aw	Tropical wet and dry (Savannah)	0	2,996 (1)	129,741 (1)	2,793,140 (1)
BS and BS_k	Semiarid and steppe	0	64,018 (1)	4,291,664 (4)	21,000,465 (9)
BW_h	Tropical and subtropical desert	0	28,029 (1)	743,263 (1)	4,955,742 (2)
Caf	Humid subtropical (warm summer)	2,034,536 (42)	9,426,517 (32)	32,360,561 (29)	71,932,014 (32)
Cb	Marine (cool summer)	0	39,246 (1)	1,795,406 (2)	4,447,811 (2)
Cs	Dry-summer subtropical (Mediterranean)	0	202,420 (1)	1,636,597 (2)	8,675,763 (4)
Daf	Humid continental (warm summer)	2,348,030 (49)	16,074,866 (54)	59,811,474 (54)	90,882,262 (40)
Dbf	Humid continental (cool summer)	435,665 (9)	3,586,555 (12)	9,394,792 (8)	13,710,636 (6)
H	Undifferentiated highlands	0	184,896 (1)	1,559,963 (1)	9,147,733 (4)

[a]Source: U.S. Census Bureau, 1800, 1860, 1920, 1980. Data compiled by Clark University Cartographic Service.
[b]Figures in parentheses are percentage of total population in that climate zone.
[c]Climatic zones shown in Figure 1.15.

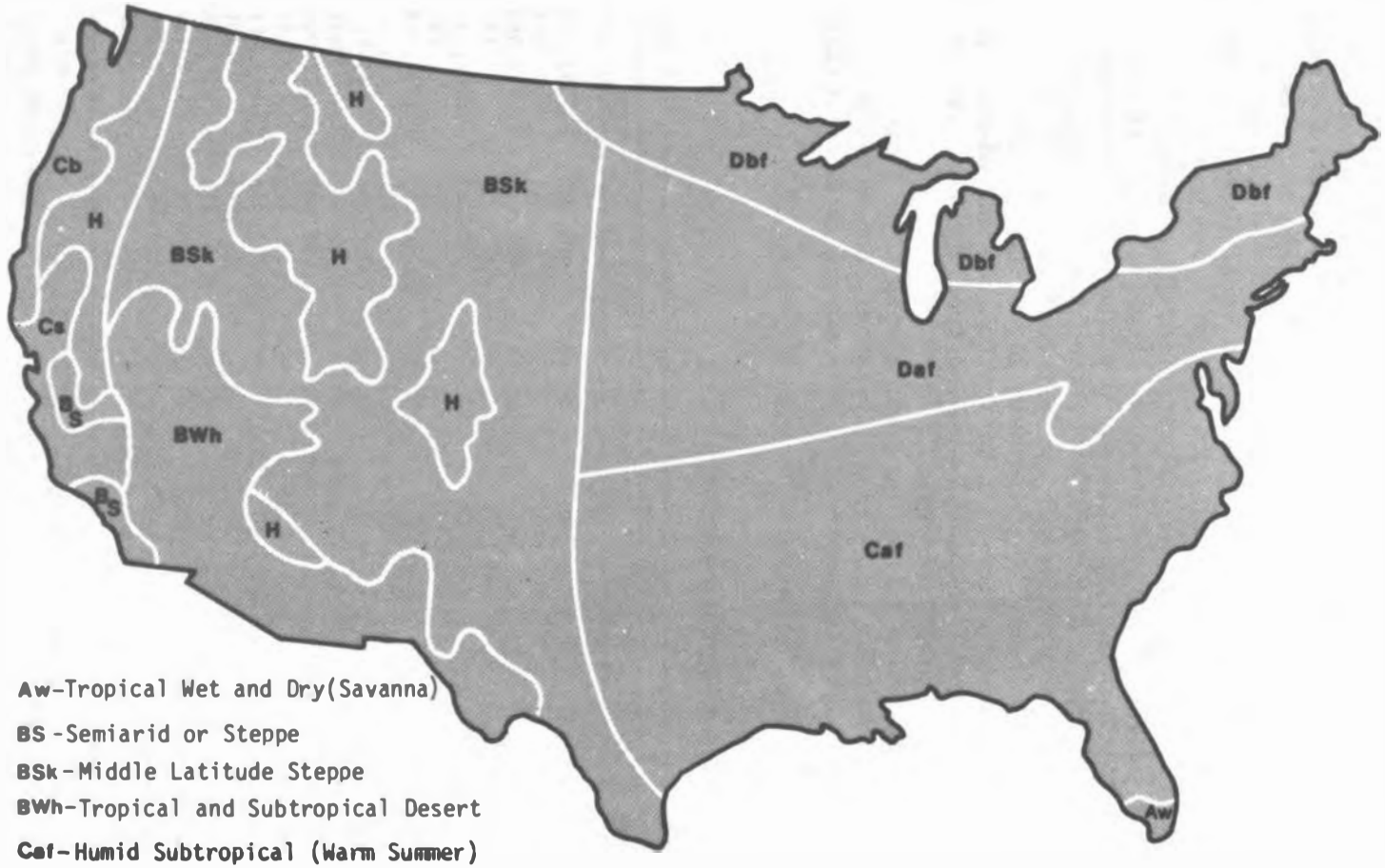


FIGURE 1.15 Climatic zones of the United States. Prepared by Clark University Cartographic Service.

different climates. That adaptability may suggest that if climates change only by shifting familiar climates around the world, it is not altogether different from leaving the climates alone and moving the people around. Of course, when people moved from England to Massachusetts or from the East Coast to the Great Plains, there were substantial difficulties in adapting; and if the climate changes and people stay, they may also have substantial difficulties. But it appears that a change in the climates where people live may not be altogether different from people moving to another climate. It may be that what we have to look forward to is not quite so historically unusual as a human experience as the descriptions from the paleoclimatic record would suggest. We have really become accustomed to marked climate change. For the individual, in contrast to the environment, the idea of climate change in a generation or two is far from novel.

While people may be able to adapt readily to climatic change, they may be unwilling to accept climatic changes imposed on them involuntarily by the decisions of others. Thus, in trying to clarify our unease about CO_2-induced climatic change, it is necessary to point out the potentially divisive nature of the issue. It is important to recognize the distribution of incentives for, and effects of, human-induced climatic changes. Although it might be in the interest of the world economy to restrict, at some cost, the use of fossil fuels, it is probably not in the interest of any single region or nation to incur on its own the cost of reduction in global CO_2. For example, countries that view heavy rains as disasters and countries that view them as water for their crops would have different preferences about which, if any, rains to avoid or restore and whether they or another country should forgo (or burn) fossil fuels to help effect the change. The marginal effects of climatic change on the distribution of wealth may range from quite positive to quite negative. In short, CO_2-induced climatic changes, and more generally weather and climate modification, may be a potent source of international conflict.

1.4 POSSIBLE RESPONSES

So far we have developed an outlook for CO_2-induced climate change and made some tentative evaluations of the seriousness of possible changes in prospect. In the preceding discussions we have occasionally referred to potential societal responses, for example, taxes on CO_2 emissions, agricultural adjustments, and migration. Now we discuss possible responses in a more systematic fashion and offer two sets of comments. One set relates to flexibility in defining the issue, the other to specific categories of response.

1.4.1 Defining the Problem

As Schelling points out in Chapter 9, how one defines a problem or issue often governs or biases the search for solutions and sometimes in a way that puts emphasis on more difficult or less attractive solutions.

Exhibit J

Climate Change

Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act

ON THIS PAGE

Action

On December 7, 2009, the Administrator signed two distinct findings regarding greenhouse gases under section 202(a) of the Clean Air Act:

- Endangerment Finding: The Administrator finds that the current and projected concentrations of the six key well-mixed greenhouse gases ? carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) ? in the atmosphere threaten the public health and welfare of current and future generations.
- Cause or Contribute Finding: The Administrator finds that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

These findings do not themselves impose any requirements on industry or other entities. However, this action was a prerequisite for implementing greenhouse gas emissions standards for vehicles. In collaboration with the National Highway Traffic Safety Administration, EPA finalized emission standards for light-duty vehicles (2012-2016 model years) in May of 2010 and heavy-duty vehicles (2014-2018 model years) in August of 2011.

Resources and Tools

- Findings
- Technical Support Document
- Response to Comment Documents
- Press Release
- Resources
  - Legal Basis (PDF) (1 p, 117K)
  - Health Effects (PDF) (1 p, 95K)
  - Environmental and Welfare Effects (PDF) (1 p, 45K)
  - Climate Change Facts (PDF) (1 p, 39K)
  - Light Duty Vehicle Program (PDF) (1 p, 39K)
  - Timeline (PDF) (1 p, 30K)
- Denial of Petitions for Reconsideration of the Endangerment and Cause or Contribute Findings
- June 26, 2012 Greenhouse Gas Court Decision
- Frequently Asked Questions (PDF) (3 pp, 38K)

You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Findings

These findings were signed by the Administrator on December 7, 2009.? On December 15, 2009, the final findings were published in the Federal Register (www.regulations.gov) under Docket ID No. EPA-HQ-OAR-2009-0171. ?The final rule was effective January 14, 2010.

- Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act (PDF) (52 pp, 308K)

Scientific and technical information summarized to support the Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act can be found here:

- Technical Support Document for the Findings (PDF) (210 pp, 2.5MB)

Response to Comments

EPA's response to public comments received on the Proposed Findings and accompanying Technical Support Document may be found here:

- Volume 1: General Approach to the Science and Other Technical Issues Download a PDF version of Volume 1 (69 pp, 305K)
  - Appendix A. IPCC Principles and Procedures (12 pp, 48K)
  - Appendix B. USGCRP/CCSP Procedures and Responsibilities (30 pp, 151K)
  - Appendix C. NRC Report Development Procedures (25 pp, 4.3MB)
- Volume 2: Validity of Observed and Measured Data Download a PDF version of Volume 2 (93 pp, 507K)
  - Appendix A. Climate Research Unit (CRU) Temperate Data Web Site (5 pp, 61K)
  - Appendix B. CRU Statement on Data Availability (3 pp, 47K)
  - Appendix C. United Kingdom Hadley Centre Statement on Release of CRU Data (1 pp, 28K)
  - Appendix D. Response of Keith Briffa to Stephen McIntyre (2 pp, 40K)
- Volume 3: Attribution of Observed Climate Change Download a PDF version of Volume 3 (58 pp, 283K)
- Volume 4: Validity of Future Projections Download a PDF version of Volume 4 (81 pp, 418K)
- Volume 5: Human Health and Air Quality Download a PDF version of Volume 5 (95 pp, 557K)
- Volume 6: Agriculture and Forestry Download a PDF version of Volume 6 (43 pp, 191K)
- Volume 7: Water Resources, Coastal Areas, Ecosystems and Wildlife Download a PDF version of Volume 7 (65 pp, 290K)
- Volume 8: Other Sectors Download a PDF version of Volume 8 (25 pp, 112K)
- Volume 9: Endangerment Finding Download a PDF version of Volume 9 (37 pp, 159K)
- Volume 10: Cause or Contribute Finding Download a PDF version of Volume 10 (18 pp, 88K)
- Volume 11: Miscellaneous Legal, Procedural, and Other Comments Download a PDF version of Volume 11 (36 pp, 172K)
  - Appendix A. Summary Comments Received Pertaining to Economic Issues (PDF) (3 pp, 21K)

Resources

- Press Release
- Press Kit
  - Legal Basis (PDF) (1 p, 117K)
    - Trasfondo legal (PDF) (2 pp, 32K)
  - Health Effects (PDF) (1 p, 95KB)
    - Efectos a la salud (PDF) (1 p, 79K)
  - Environmental and Welfare Effects (PDF) (1 p, 45K)
    - Efectos medioambientales (PDF) (2 pp, 32K)
  - Climate Change Facts (PDF) (1 p, 39K)
    - Datos sobre el cambio clim?tico (PDF) (2 pp, 33K)
  - Light Duty Vehicle Program (PDF) (1 p, 39K)
  - Timeline (PDF) (1 p, 30K)
- Frequently Asked Questions (PDF) (3 pp, 38K)

To access materials related to the proposed finding, please visit the Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act archive.

Denial of Petitions for Reconsideration

EPA denied ten Petitions for Reconsideration of the Endangerment and Cause or Contribute Findings on July 29, 2010.

Background

On April 2, 2007, in Massachusetts v. EPA, 549 U.S. 497 (2007), the Supreme Court found that greenhouse gases are air pollutants covered by the Clean Air Act. The Court held that the Administrator must determine whether or not emissions of greenhouse gases from new motor vehicles cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. In making these decisions, the Administrator is required to follow the language of section 202(a) of the Clean Air Act. The Supreme Court decision resulted from a petition for rulemaking under section 202(a) filed by more than a dozen environmental, renewable energy, and other organizations.

On April 17, 2009, the Administrator signed proposed endangerment and cause or contribute findings for greenhouse gases under Section 202(a) of the Clean Air Act. EPA held a 60-day public comment period, which ended June 23, 2009, and received over 380,000 public comments. These included both written comments as well as testimony at two public hearings in Arlington, Virginia and Seattle, Washington. EPA carefully reviewed, considered, and incorporated public comments and has now issued these final Findings.

WCMS
Last updated on 8/9/2016

Exhibit K

Financial & Operating Review

ExxonMobil

Energy lives here™

2015

COVER PHOTO: **The Joliet, Illinois, refinery is one of the most energy efficient in the United States and benefits from its proximity to advantaged crude oils.**

Statements of future events or conditions in this report, including projections, targets, expectations, estimates, and business plans, are forward-looking statements. Actual future financial and operating results, including demand growth and energy mix; capacity growth; the impact of new technologies; capital expenditures; production growth; project plans, dates, costs, and capacities; resource additions, production rates, and resource recoveries; efficiency gains; cost savings; and product sales could differ materially due to, for example, changes in oil and gas prices or other market conditions affecting the oil and gas industry; reservoir performance; timely completion of development projects; war and other political or security disturbances; changes in law or government regulation, including environmental regulations and political sanctions; the actions of competitors and customers; unexpected technological developments; general economic conditions, including the occurrence and duration of economic recessions; the outcome of commercial negotiations; the impact of fiscal and commercial terms; unforeseen technical difficulties; unanticipated operational disruptions; and other factors discussed in this report and in Item 1A of ExxonMobil's most recent Form 10-K.

Definitions of "resources" and "resource base," as well as certain financial and operating measures and other terms used in this report, are contained in the section titled "Frequently Used Terms" on pages 90 through 93. In the case of financial measures, such as "Return on Average Capital Employed" and "Free Cash Flow," the definitions also include information required by SEC Regulation G.

"Factors Affecting Future Results" and "Frequently Used Terms" are also available on the "Investors" section of our website.

Prior years' data have been reclassified in certain cases to conform to the 2015 presentation basis.

The term "project" as used in this publication can refer to a variety of different activities and does not necessarily have the same meaning as in any government payment transparency reports.

2015 Financial & Operating Summary

Financial Highlights

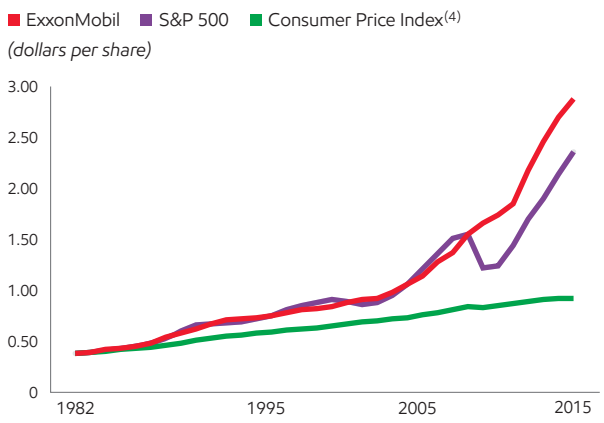
(millions of dollars, unless noted)	Earnings after Income Taxes	Average Capital Employed[1]	Return on Average Capital Employed (%)[1]	Capital and Exploration Expenditures[1]
Upstream	7,101	169,954	4.2	25,407
Downstream	6,557	23,253	28.2	2,613
Chemical	4,418	23,750	18.6	2,843
Corporate and Financing	(1,926)	(8,202)	N.A.	188
Total	**16,150**	**208,755**	**7.9**	**31,051**

Operating Highlights

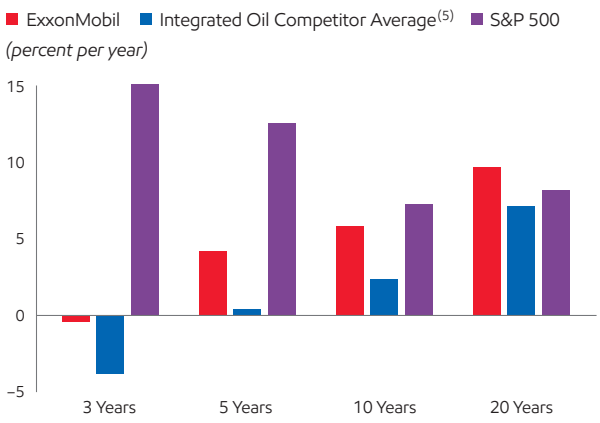
Liquids production *(net, thousands of barrels per day)*	2,345
Natural gas production available for sale *(net, millions of cubic feet per day)*	10,515
Oil-equivalent production[2] *(net, thousands of oil-equivalent barrels per day)*	4,097
Refinery throughput *(thousands of barrels per day)*	4,432
Petroleum product sales *(thousands of barrels per day)*	5,754
Chemical prime product sales[1] *(thousands of tonnes)*	24,713

Our 2015 results demonstrate the value of our strategy and relentless focus on business fundamentals. We achieved strong safety and environmental performance, and our integrated businesses generated solid cash flow to support our investment program and industry-leading shareholder distributions. We maintain a long-term view of the industry and continue to selectively develop a broad portfolio of attractive opportunities. These investments, along with our ongoing drive to lower costs and improve efficiency, position us to deliver long-term shareholder value.

33rd Consecutive Year of Dividend Growth[3]



Total Shareholder Returns[1]



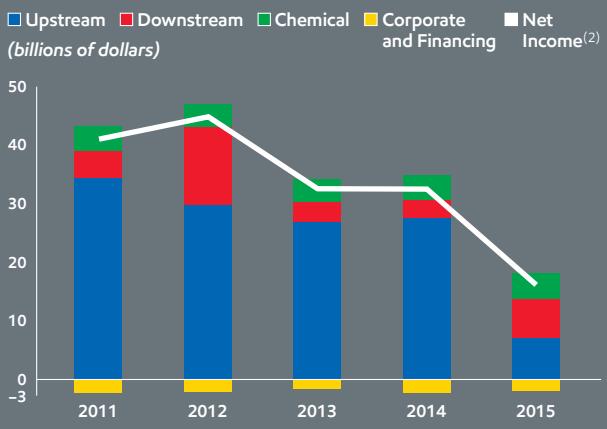
(1) See Frequently Used Terms on pages 90 through 93.
(2) Natural gas converted to oil-equivalent at 6 million cubic feet per 1 thousand barrels.
(3) S&P 500 and CPI indexed to 1982 Exxon dividend.
(4) CPI based on historical yearly average from the U.S. Bureau of Labor Statistics.
(5) BP, Chevron, Royal Dutch Shell, and Total. Competitor data estimated on a consistent basis with ExxonMobil and based on public information.

2015 Financial & Operating Summary

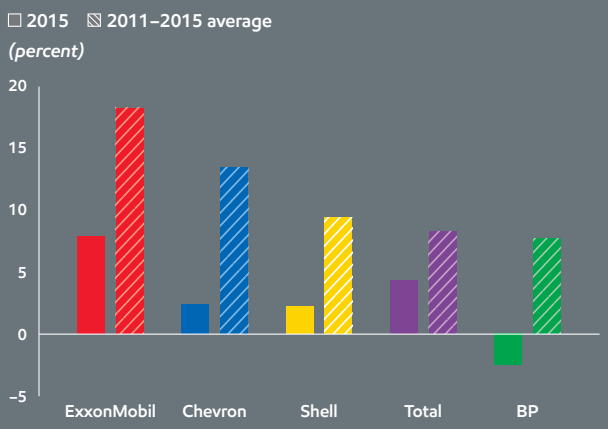
Results & Highlights

- Strong environmental results and leading safety performance supported by effective risk management
- Earnings of $16.2 billion and industry-leading return on average capital employed[1] of 7.9 percent
- Cash flow from operations and asset sales[1] of $32.7 billion, demonstrating the resilience of our integrated business
- Dividends per share increased 5.8 percent in the second quarter of 2015, the 33rd consecutive year of dividend-per-share increases
- Total shareholder distributions[1] of $15.1 billion
- Capital and exploration expenditures[1] of $31.1 billion
- Proved oil and natural gas reserves[1] additions of 1.0 billion oil-equivalent barrels
- Completed six major Upstream projects with working interest production capacity of almost 300 thousand oil-equivalent barrels per day, highlighted by two deepwater projects offshore West Africa and an expansion of the Kearl development in Canada
- Progressed construction of a 400-thousand-tonnes-per-year specialty elastomers project in Saudi Arabia with our joint venture partner to supply a broad range of synthetic rubber and related products to meet growing demand in the Middle East and Asia Pacific
- Approved funding to expand the hydrocracker at our refinery in Rotterdam, Netherlands, utilizing proprietary technology to produce ultra-low sulfur diesel and Group II lube basestocks
- Made a significant oil discovery offshore Guyana, with additional exploration planned in 2016

Functional Earnings and Net Income



Return on Average Capital Employed[1][3]



(1) See Frequently Used Terms on pages 90 through 93.
(2) Net income attributable to ExxonMobil.
(3) Competitor data estimated on a consistent basis with ExxonMobil and based on public information.

PHOTO: In 2015, net production in the Permian Basin grew 24 percent from 2014, and drilling and completion costs fell more than 30 percent.

stream

ExxonMobil's Upstream business encompasses high-quality exploration opportunities across all development types and geographies, an industry-leading resource base, a portfolio of world-class projects, and a diverse set of profitable producing assets.

91 billion

oil-equivalent barrels of total resource base

Upstream

2015 Results & Highlights

- **Achieved strong safety and operational performance**
- **Delivered earnings of $7.1 billion and leading return on average capital employed of 4.2 percent, averaging 27.4 percent over the past 10 years**
- **Proved oil and natural gas reserves additions of 1.0 billion oil-equivalent barrels**
- **Added 1.4 billion oil-equivalent barrels of new resource and maintained a total resource base of 91 billion oil-equivalent barrels**
- **Completed six major Upstream projects, which added almost 300 thousand oil-equivalent barrels per day of working interest production capacity, highlighted by two deepwater projects offshore West Africa and an expansion of the Kearl development in Canada**
- **Made a significant oil discovery offshore Guyana, with additional exploration activities planned in 2016**
- **Progressed a large and diverse portfolio of LNG opportunities by advancing concept selection and engineering work on opportunities in North America, Australia, and Africa**

Strategies

- Apply effective risk management and safety standards to achieve operational excellence
- Capture significant and accretive resources to highgrade the portfolio of opportunities
- Exercise a disciplined approach to investing and cost management
- Develop and apply high-impact technologies
- Pursue productivity and efficiency gains to reduce cost
- Grow profitable oil and gas production
- Capitalize on growing natural gas and power markets

Upstream Statistical Recap

	2015	2014	2013	2012	2011
Earnings *(millions of dollars)*	**7,101**	27,548	26,841	29,895	34,439
Liquids production *(net, thousands of barrels per day)*	**2,345**	2,111	2,202	2,185	2,312
Natural gas production available for sale *(net, millions of cubic feet per day)*	**10,515**	11,145	11,836	12,322	13,162
Oil-equivalent production[1] *(net, thousands of barrels per day)*	**4,097**	3,969	4,175	4,239	4,506
Proved reserves replacement ratio[2][3] *(percent)*	**69**	111	106	124	116
Resource additions[2] *(millions of oil-equivalent barrels)*	**1,378**	3,206	6,595	4,012	4,086
Average capital employed[2] *(millions of dollars)*	**169,954**	164,965	152,969	139,442	129,807
Return on average capital employed[2] *(percent)*	**4.2**	16.7	17.5	21.4	26.5
Capital and exploration expenditures[2] *(millions of dollars)*	**25,407**	32,727	38,231	36,084	33,091

(1) Natural gas converted to oil-equivalent at 6 million cubic feet per 1 thousand barrels.
(2) See Frequently Used Terms on pages 90 through 93.
(3) Proved reserves exclude asset sales.
Note: Unless otherwise stated, production rates, project capacities, and acreage values referred to on pages 16 through 47 are gross.

Business Overview

Our Upstream business includes exploration, development, production, natural gas marketing, and research activities.

ExxonMobil is driven to deliver industry-leading returns through the business cycle. We do this by capturing significant and accretive opportunities to continually highgrade our resource portfolio. We maintain a large, diverse, and balanced portfolio of opportunities to enable selective and profitable growth through a wide range of investment and geopolitical environments. We create value through capital discipline by progressing attractive opportunities. Proven project management systems incorporate best practices developed from our experience of rigorously managing a global project portfolio, from initial discovery phase to production start-up.

Technology is vital to meeting growing global demand for oil and gas. We have a long-standing commitment to apply research and technology to efficiently find, develop, and produce resources from some of the most challenging reservoirs. We benefit from an integrated model, as technology advances in the Upstream, Downstream, and Chemical businesses are used to address challenges across the company.

We focus on improving long-term profitability by investing in higher-margin barrels, maximizing the value of installed capacity, and reducing costs through productivity and efficiency gains. When appropriate, we engage resource owners to develop mutually beneficial fiscal and contractual terms to promote resource development.

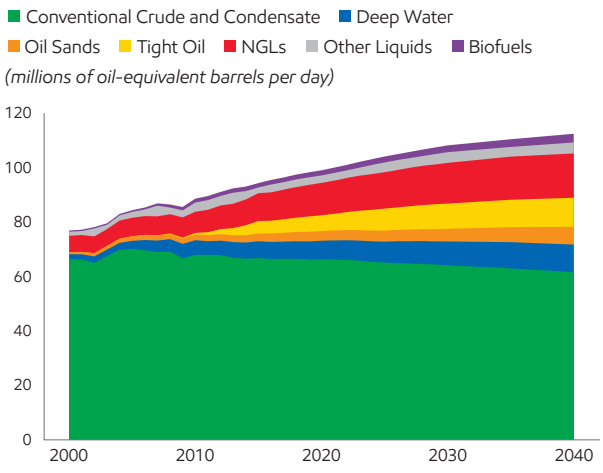
Our Upstream strategies, supported by a relentless focus on effective risk management and safety to achieve operational excellence, are designed to generate superior results over the long term.

Business Environment

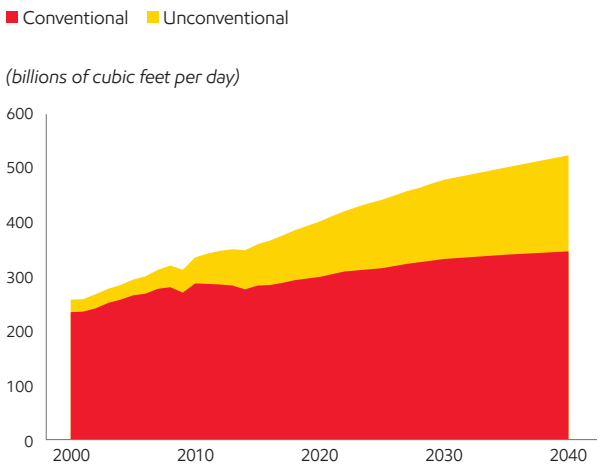
Over the coming decades, energy sources will continue to evolve and diversify, driven by changes in technology, consumer needs, and public policies. Crude oil is projected to remain the single biggest source of energy, while natural gas will play an increasingly important role in meeting global energy needs. Demand for oil is projected to rise by approximately 20 percent from 2014 to 2040, led by increased commercial transportation activity. A growing share of this demand will be met by sources such as deep water, tight oil, and oil sands as a result of advances in technology. Natural gas will be the fastest-growing major energy source through 2040. Global demand for natural gas is projected to rise by close to 50 percent from 2014 to 2040, and gas supplies from unconventional sources are projected to account for about 60 percent of that growth. Liquefied natural gas volumes are expected to triple by 2040, contributing almost 20 percent of global gas supply.

Meeting the world's growing demand for energy presents a tremendous challenge that requires a long-term view, significant investment, and continued innovation to develop conventional and unconventional resources. ExxonMobil is well positioned to meet this challenge.

Global Liquids Supply by Type



Global Natural Gas Supply by Type



Source: ExxonMobil, *2016 The Outlook for Energy: A View to 2040*

Global Upstream Portfolio

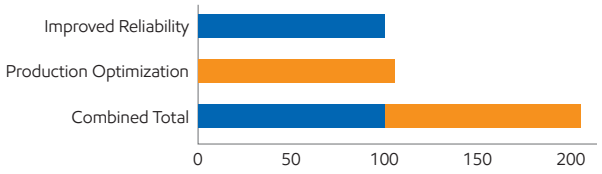
Our quality portfolio, investment discipline, and operational excellence have delivered industry-leading results. We have a globally diverse inventory of 100 projects spanning all development types and advance opportunities that provide attractive returns across a broad set of factors. Once an asset begins producing, we maximize value by increasing recovery, improving reliability, and lowering costs.

Production Volumes

Total net oil-equivalent production of 4.1 million barrels per day was up 3.2 percent from 2014, in line with our volume plans. Net daily liquids production was up 234 thousand barrels or 11 percent, as growth from major projects, work program additions, and higher entitlements more than offset field decline. Net natural gas production was down almost 6 percent due to regulatory restrictions in the Netherlands and field decline, partly offset by new project volumes.

Maximizing Value of Installed Capacity

(thousands of oil-equivalent barrels per day added since 2011)



Production optimization and improved reliability have added a combined 205 thousand oil-equivalent barrels per day of higher-margin production since 2011.

We remain committed to maximizing the value of installed capacity. Since 2011, optimizations such as facility debottlenecks have added 105 thousand oil-equivalent barrels per day of net production. Improved facility reliability added another 100 thousand barrels per day. Simply put, each incremental barrel produced through optimization or uptime is the most profitable. Near-term activity will focus on completing 10 projects between 2016 and 2017, including Gorgon Jansz, Hebron, Sakhalin-1 Odoptu Stage 2, and Upper Zakum 750. We plan to continue developing our large, liquids-rich unconventional resources in the United States, with a focus on the Permian and Bakken areas. We have a deep inventory of opportunities in these plays and are progressing at a measured pace.

The forward-looking projections of production volumes in this document reflect our best assumptions regarding technical, commercial, and regulatory aspects of existing operations and new projects. Factors that could impact actual volumes include project start-up timing, regulatory changes, quotas, changes in market conditions, asset sales, and entitlement volume effects.

Major Developments

ExxonMobil participated in the completion of six major projects in 2015, and we plan to start up another 10 projects by year-end 2017. We also generated significant volume growth from onshore U.S. liquids-rich plays across the Permian and Bakken areas.

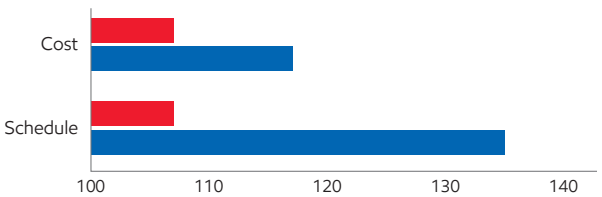
Banyu Urip ▪ (ExxonMobil interest, 45 percent) Located onshore in East Java, Indonesia, the Banyu Urip project consists of 45 wells, an onshore central processing facility, a 60-mile onshore/offshore pipeline, and a floating storage and offloading vessel. In December 2015, production commenced from the central processing facilities. The project is expected to develop 450 million barrels of recoverable oil reserves.

Hadrian South ▪ (ExxonMobil interest, 47 percent) Hadrian South is a subsea tieback to the Anadarko-operated Lucius production facility and is located approximately 230 miles offshore in the Gulf of Mexico. Hadrian South began production in March 2015 and is producing approximately 300 million cubic feet of gas per day and 2 thousand barrels of liquids per day from two wells. Hadrian South is ExxonMobil's deepest subsea tieback, located in water that is nearly a mile-and-a-half deep.

Comparison of 2011–2015 Project Start-Ups

ExxonMobil Operated ExxonMobil Projects Operated by Others

(percent, actual vs. planned)



ExxonMobil completes projects on time and on budget more consistently than competitors.

Major Project Start-Ups[1]

		Facility Capacity (Gross) Liquids (KBD)	Gas (MCFD)	ExxonMobil Working Interest (%)	
2012–2015 (Actual)					
Angola	Cravo-Lirio-Orquidea-Violeta (CLOV)	160	–	20	●
	Kizomba Satellites Phase 1	100	–	40	■
	Kizomba Satellites Phase 2	85	–	40	■
Australia	Kipper Tuna	15	175	40	■
	Turrum	20	200	50	■
Canada	Cold Lake Nabiye Expansion	50	–	100	■
	Hibernia Southern Extension	55	–	27	■
	Kearl Expansion	110	–	100	■
	Kearl Initial Development	110	–	100	■
	Syncrude Aurora North Mine Sustaining Project	215	–	25	▲
	Syncrude Mildred Lake Mine Sustaining Project	180	–	25	▲
Indonesia	Banyu Urip	165	15	45	■
Malaysia	Damar Gas	5	200	50	■
	Telok	–	430	50	■
Nigeria	Satellite Field Development Phase 1	70	–	40	■
	Usan	180	–	30	■
	Erha North Phase 2	65	–	56	■
Norway	Aasgard Subsea Compression	40	415	14	●
Papua New Guinea	PNG LNG	30	1,100	33	■
Russia	Sakhalin-1 Arkutun-Dagi	90	–	30	■
U.S.	Hadrian South	5	300	47	■
	Lucius	100	150	23	●
2016 (Projected)					
Australia	Gorgon Jansz	20	2,765	25	●
Kazakhstan	Kashagan Phase 1[2]	370	450	17	▲
Qatar	Barzan	90	1,400	7	▲
U.S.	Heidelberg	80	80	9	●
	Julia Phase 1	30	–	50	■
	Point Thomson Initial Production System	10	200	62	■
2017 (Projected)					
Angola	AB32 Kaombo Split Hub	250	–	15	●
Canada	Hebron	150	–	36	■
Russia	Sakhalin-1 Odoptu Stage 2	55	–	30	■
U.A.E.	Upper Zakum 750	750	–	28	▲
2018+ (Projected)					
Australia	Gorgon Area Expansion	10	915	25	●
	Scarborough	–	1,030	50	■
Canada	Firebag	380	–	70	■
	Steam-Assisted Gravity Drainage (SAGD)	350+	–	63-100	■
	Syncrude Aurora South Phases 1 and 2	210	–	25	▲
	Syncrude Mildred Lake Extension	210	–	25	▲
	West Coast Canada (WCC) LNG	–	1,600	100	■
Indonesia	Cepu Gas	5	180	41	●
	Natuna[3]	–	1,100		■
Iraq	West Qurna I	1,600	–	33	▲
Kazakhstan	Kashagan Future Phases	1,260	–	17	▲
	Tengiz Expansion	655	–	25	●
Nigeria	Bonga North	200	–	20	●
	Bonga Southwest	200	–	16	●
	Bosi	140	315	56	■
	Owowo West	180	130	27	■
	Satellite Field Development Phase 2	80	–	40	■
	Uge	110	20	20	■
	Usan Future Phases	50	–	30	■
Papua New Guinea	PNG Future	10	570	33	■
Romania	Domino	–	630	50	■
Russia	Sakhalin-1 Future Phases	–	800	30	■
Tanzania	Tanzania Block 2	–	1,000	35	●
U.S.	Alaska LNG	60	3,500	36	▲
	Golden Pass Products LNG Export	–	2,500	30	▲
	Julia Phase 2	30	–	50	■
Vietnam	Ca Voi Xanh	3	375	64	■

KBD = Thousand barrels per day
MCFD = Million cubic feet per day

■ ExxonMobil Operated
● Co-Venturer Operated
▲ Joint Operations

(1) The term "project" as used in this publication can refer to a variety of different activities and does not necessarily have the same meaning as in any government payment transparency reports.
(2) Operations were suspended in 2013.
(3) Working interest pending final agreements.

Global Upstream Portfolio, continued

The Kearl Expansion Project was completed in 2015, doubling bitumen production capacity.

Kearl Expansion • (Combined ExxonMobil and Imperial Oil interest, 100 percent) The Kearl Expansion Project is a continuation of the existing Kearl mine operation to develop a world-class resource in northern Alberta, Canada. Construction of the expansion project was completed in early 2015, and bitumen production began in June 2015. Building upon lessons learned from the initial Kearl development, the expansion project started up ahead of schedule and quickly ramped up to full production capacity of approximately 110 thousand barrels of bitumen per day.

Kizomba Satellites Phase 2 • (ExxonMobil interest, 40 percent) The Kizomba Satellites Phase 2 project is a subsea development of the Kakocha, Bavuca, and Mondo South fields located in Angola's offshore Block 15. First oil was achieved ahead of schedule in March 2015 with production from the Mondo South field. The project is expected to develop approximately 190 million barrels of oil with peak gross production currently estimated at 70 thousand barrels of oil per day.

Erha North Phase 2 • (ExxonMobil interest, 56 percent) The Erha North Phase 2 project is a subsea tieback development to the Erha floating production, storage, and offloading (FPSO) vessel. The project achieved first oil ahead of schedule in September 2015 and is expected to develop an additional 165 million barrels of oil from the currently producing Erha North field.

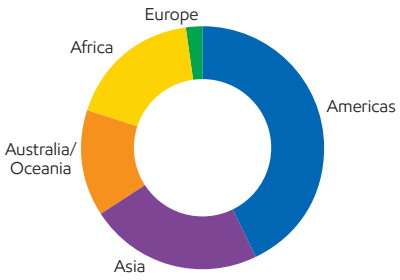
Aasgard Subsea Compression • (ExxonMobil interest, 14 percent) The Aasgard Subsea Compression project located offshore Norway started up in September 2015. This project features the world's first underwater compression system, representing a significant technological achievement for the industry. The project includes two gas compression trains to boost production from the existing Mikkel and Midgard subsea developments.

U.S. Onshore • More than 635 new wells were brought to sales, mainly across the Permian, Bakken, and Ardmore/Marietta areas during 2015, resulting in 15 percent net liquids production growth relative to 2014. Our operating efficiency continues to improve. In the Wolfcamp in the Midland Basin, drilling and completion costs have fallen between 30 and 40 percent from 2014 to 2015.

Upstream Projects

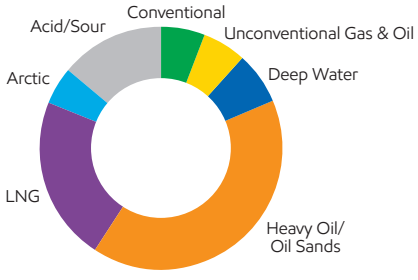
By Geographic Region

(percent, number of projects)



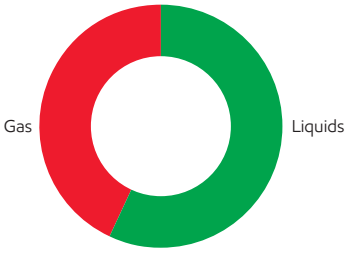
By Development Type

(percent, oil-equivalent barrels)



By Hydrocarbon Type

(percent, oil-equivalent barrels)



Upstream Opportunity Capture

Integration of technical expertise and industry-leading research capabilities enables ExxonMobil to identify and selectively capture the highest-quality resources across all types and environments. The depth and breadth of our worldwide experience as explorers, developers, producers, and technological innovators position us favorably as a partner of choice for resource owners and other organizations.

2015 Opportunity Captures

In 2015, we added 10 new opportunities spanning conventional and unconventional plays to build on our industry-leading resource base. At year-end 2015, our exploration acreage totaled nearly 95 million net acres in 32 countries.

Canada • ExxonMobil was officially awarded three licenses offshore eastern Canada in the 2014 tender, increasing our position by 889,000 net acres. We captured 652,000 net acres over three licenses in the 2015 Newfoundland tender round and were awarded these licenses in early 2016. We also acquired a 35-percent interest in a portion of the EL1123 license, adding 83,000 net acres. Official award of this license is expected in 2016. Onshore, we acquired an additional 10,000 net acres in Alberta's Duvernay Shale.

Equatorial Guinea • ExxonMobil acquired an 80-percent interest and operatorship of 130,000 net acres of deepwater acreage in Block EG-06, expanding our position along the trend of recent discoveries in the region.

Guyana • We captured a 35-percent interest and operatorship of the offshore Canje Block. The block is adjacent to the ExxonMobil-operated Stabroek Block in water depths ranging from 6,500 to 10,000 feet. The transaction was completed in 2016, adding 525,000 net acres in the offshore Guyana trend.

Nigeria • We captured an interest in OPL 247, adding 291,000 net acres. We are the operator of this deepwater block, which is 80 miles offshore. ExxonMobil also signed a Production Sharing Contract (PSC) with the Nigerian National Petroleum Corporation for OML 139, where we operate and hold a 27-percent interest.

Papua New Guinea • ExxonMobil successfully acquired an additional 63,000 net acres of highly-prospective acreage near existing producing assets in the onshore Highlands trend.

Uruguay • We re-entered Uruguay by acquiring a 35-percent, non-operating interest in Block 14, capturing 579,000 net acres in water depths ranging from 6,500 to 11,500 feet.

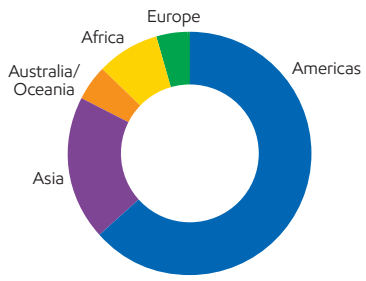
U.S. Offshore • ExxonMobil was awarded 11 Outer Continental Shelf blocks in Sale 235, adding to our acreage position in the Gulf of Mexico by a combined 63,000 net acres.

U.S. Onshore • We executed two agreements to obtain horizontal development rights in 48,000 acres in the core of the Midland Basin. The two agreements include an acquisition and farm-in adjoining XTO's existing acreage position in Martin and Midland Counties, providing rights to all intervals within the basin. ExxonMobil has executed five agreements in the Midland Basin since January 2014, providing the company with more than 135,000 operated net acres.

Resource Base Distribution[1]

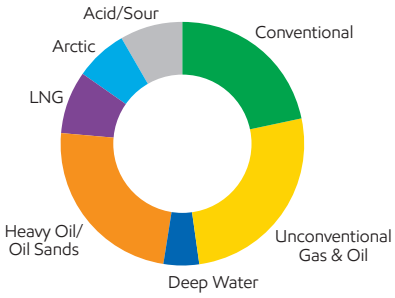
By Geographic Region

(percent, oil-equivalent barrels)



By Development Type

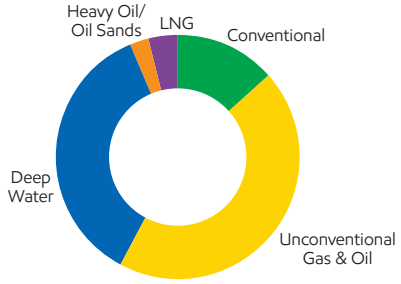
(percent, oil-equivalent barrels)



Resource Additions/Acquisitions[1]

By Development Type

(percent, oil-equivalent barrels added)



(1) See Frequently Used Terms on pages 90 through 93.

Upstream Opportunity Capture, continued

Resources

In 2015, we continued to build our diverse global portfolio of resources and reserves by adding 1.4 billion oil-equivalent barrels. After adjusting for production, asset sales, and revisions to existing fields, the resource base totals approximately 91 billion oil-equivalent barrels. The size and diversity of ExxonMobil's global resource base – the largest held by an international oil company – provide us with unequaled investment flexibility to profitably develop new supplies of energy to meet future demand.

Resource Base Changes[1]

(billions of oil-equivalent barrels)	2015	5-Year Average
Resource Additions/Acquisitions	**1.4**	3.9
Revisions to Existing Fields	**(0.8)**	(0.3)
Production	**(1.5)**	(1.6)
Asset Sales	**(0.2)**	(0.7)
Net change versus year-end 2014	**(1.1)**	1.3

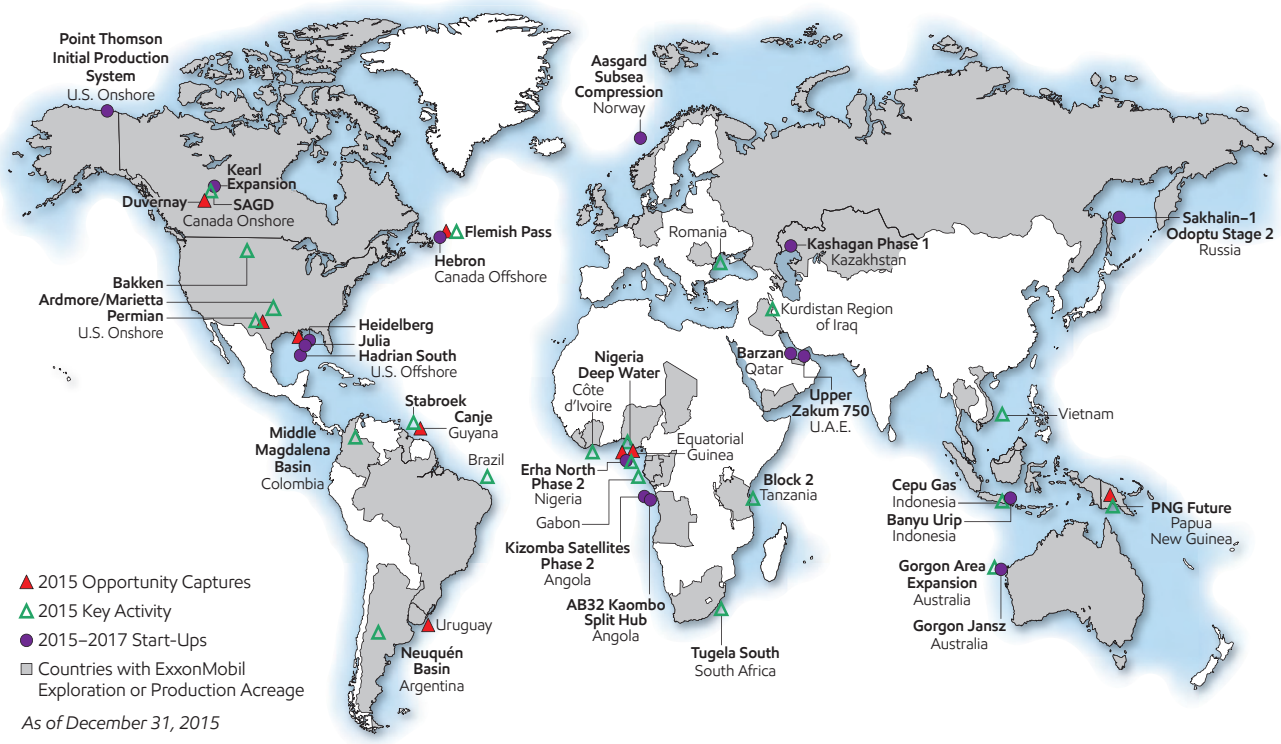
We continue to increase the quality of our resource base through successful exploration drilling, capture of discovered undeveloped resources, strategic acquisitions, and increased recovery from existing fields. In 2015, resources were added in Argentina, Australia, Canada, Guyana, Iraq, Nigeria, Romania, and the United States.

Our exploration drilling program is focused on opportunities with projected profitability that is competitive with or superior to discovered assets in the existing portfolio. Additions from exploration drilling averaged approximately 2 billion oil-equivalent barrels per year over the last decade.

We assess our resource base annually to include new discoveries and changes in estimates for existing resources. Changes may result from additional drilling, revisions to recovery estimates, application of new technologies, or ongoing and rigorous geoscience and engineering evaluations. Resource base volumes are adjusted downward for volumes produced during the year and resources associated with asset divestments. Adjustments may also occur with changes to fiscal regimes, equity, or depletion plans.

The largest components of ExxonMobil's resource base remain conventional oil and gas, unconventional oil and gas, and heavy oil/oil sands resources, which comprise 73 percent of the total. LNG and deepwater developments account for about 13 percent of the total resource base. The remaining 14 percent consists of Arctic and acid/sour gas resources.

Global Upstream Portfolio



As of December 31, 2015

(1) See Frequently Used Terms on pages 90 through 93.

Proved Reserves

Our resource base includes nearly 25 billion oil-equivalent barrels of proved oil and gas reserves, which equates to 27 percent of our resource base. These reserves represent a diverse portfolio distributed across all geographic regions and development types, with liquids comprising almost 60 percent. Proved developed reserves, or reserves with installed production facilities, account for 73 percent of the proved reserves base. Our average reserves life of 16 years at current production rates leads competition, giving us greater financial flexibility in this challenging environment.

ExxonMobil has a successful track record of proved reserves replacement, demonstrating the strength of our global strategy to identify, evaluate, capture, and advance high-quality opportunities. Over the past 10 years, we replaced 115 percent of the reserves we produced, including the impact of asset sales. We added 18.1 billion barrels to proved reserves (67 percent liquids) while producing 15.7 billion oil-equivalent barrels. Proved reserves additions reflect funding and development of high-quality, long-life projects across geographies and development types.

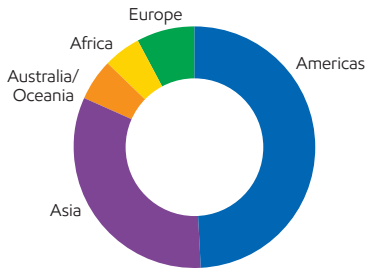
Revisions to proved reserves additions have averaged 0.5 billion barrels per year over the past 10 years, driven by effective reservoir management, technological advances, and a strong focus on maximizing the value of base production. Proved reserves additions in 2015 replaced 67 percent of production, including a 219-percent liquids reserve replacement ratio. Looking forward, we will continue to selectively and patiently develop our industry-leading resource base as we progress an inventory of 100 projects. Proved reserve estimates are managed by a team of experienced reserve experts and are the result of a rigorous and structured management review process.

We made a significant discovery offshore Guyana with the Liza-1 well, drilled by the Deepwater Champion drillship.

Proved Reserves Distribution[1]

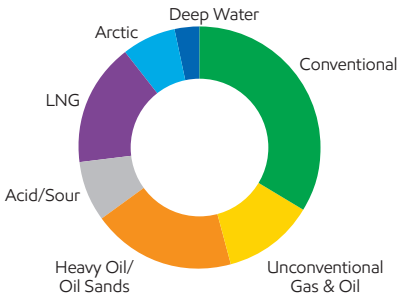
By Geographic Region

(percent, oil-equivalent barrels)



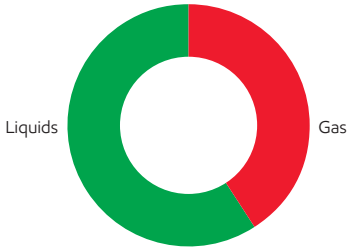
By Development Type

(percent, oil-equivalent barrels)



By Hydrocarbon Type

(percent, oil-equivalent barrels)



(1) See Frequently Used Terms on pages 90 through 93.

Worldwide Upstream Operations

ExxonMobil has an active exploration or production presence in 36 countries and production operations in 24 countries.

The Americas

Our Americas portfolio includes conventional onshore fields, ultra-deepwater developments, numerous unconventional gas and oil opportunities, and oil sands and heavy oil plays. Operations in the Americas accounted for 35 percent of net oil-equivalent production.

Americas Highlights

	2015	2014	2013
Earnings *(billions of dollars)*	**(1.9)**	7.1	5.6
Proved Reserves *(oil-equivalent barrels, billion)*	**12.2**	12.7	12.0
Acreage *(gross acres, million)*	**48.0**	46.0	46.2
Net Liquids Production *(million barrels per day)*	**0.9**	0.8	0.7
Net Gas Available for Sale *(billion cubic feet per day)*	**3.4**	3.7	3.9

United States

ExxonMobil is a leading reserves holder and producer of oil and natural gas in the United States. We maintain a significant position in all major producing regions, including offshore Gulf of Mexico, the Gulf Coast, onshore Texas and Louisiana, the mid-continent, California, Alaska, and Appalachia. Our U.S. portfolio includes mature conventional assets, emerging unconventional developments, and new deepwater developments. With a focus on technological improvements, operational efficiency, and high-quality drilling programs, we are extending the lives of our base producing fields, some of which have been onstream for decades. Our portfolio is further enhanced by activity in unconventional plays, nine of which are estimated to contain recoverable resources of greater than 1 billion oil-equivalent barrels. Additional developments are also planned for ExxonMobil's extensive deepwater Gulf of Mexico acreage position.

Gulf of Mexico/Gulf Coast

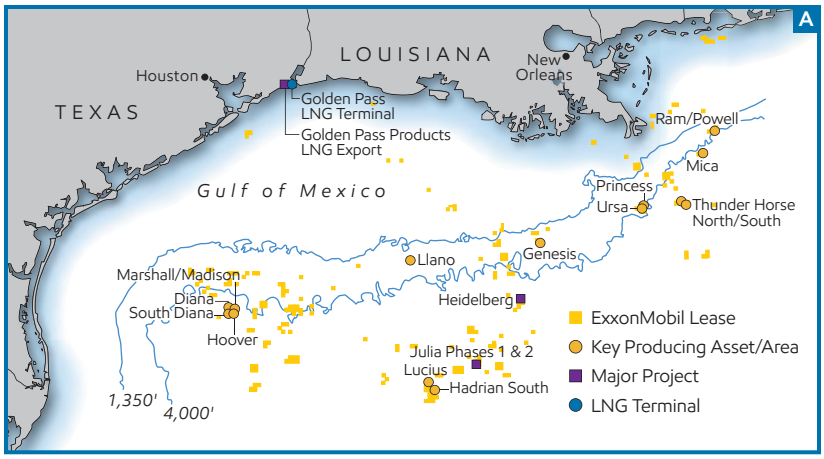
2015 net average production in the Gulf of Mexico was 64 thousand barrels of liquids per day and 257 million cubic feet of gas per day.

Deep Water ▪ In the deepwater Gulf of Mexico, we operate the Hoover platform, which is located in more than 4,800 feet of water and produces oil and gas from the Hoover field and several subsea tiebacks. In addition, we are a partner in seven deepwater fields, including the co-venturer-operated Thunder Horse field (ExxonMobil interest, 25 percent), where drilling is ongoing.

Activity continues in the Keathley Canyon (KC) area. We participate in the Anadarko-operated Lucius development (ExxonMobil interest, 23 percent) and operate the Hadrian South development (ExxonMobil interest, 47 percent) as a subsea tieback to the Lucius platform. Both Lucius and Hadrian South production started up in early 2015.

Also in this area, ExxonMobil and our co-venturers continue to progress concept selection activities for development of the Hadrian North oil discovery (ExxonMobil interest, 50 percent), which is situated in blocks KC-918 and KC-919.

The Julia Phase 1 project (ExxonMobil interest, 50 percent) in the Walker Ridge (WR) area is a subsea tieback to the Chevron-operated Jack-St. Malo host facility on block WR-718. Project execution continues with subsea construction activities. Start-up is planned for 2016.



ExxonMobil also participates in the Anadarko-operated Heidelberg project (ExxonMobil interest, 9 percent). The project develops resources located in a five-block unit in the Green Canyon area via subsea tieback to a spar facility. Well-drilling activities commenced in 2014, and the project started up in January 2016.

ExxonMobil was awarded 11 Outer Continental Shelf (OCS) blocks in Lease Sale 235, which was held in 2015. We continue to evaluate our substantial exploration portfolio of 1.1 million net acres in the Gulf of Mexico with investments in advanced seismic data to further enhance our understanding of the subsurface.

Conventional ▪ The Mobile Bay development offshore Alabama contributed net production of 99 million cubic feet of gas per day during 2015. There are 610 billion cubic feet of remaining reserves, and we continue to cost-effectively produce from this resource.

LNG ▪ Golden Pass Products LLC, a joint venture between ExxonMobil and Qatar Petroleum, is seeking federal authorization to construct an LNG export facility with the capability to export up to 15.6 million tonnes per year of LNG. This world-class LNG export project will involve an import facility at Sabine Pass, Texas, as well as modifications to the existing Golden Pass LNG terminal. It will also allow for import or export of natural gas in response to market conditions. The project received approval to export to any country that has a Free Trade Agreement (FTA) with the United States in 2012 and is awaiting approval to export to non-FTA countries. In 2014, environmental permit applications were submitted to the Federal Energy Regulatory Commission, and in 2015, front-end engineering design was completed.

U.S. Onshore Texas and Louisiana

ExxonMobil is a leading producer in Texas and Louisiana with strong positions in all of the major conventional and unconventional plays, including the Permian Basin. In 2015, onshore net production in Texas and Louisiana averaged 118 thousand barrels of liquids per day and 1.4 billion cubic feet of gas per day.

Subsea pile installation at the Julia Phase I project in the Gulf of Mexico.

Worldwide Upstream Operations, continued

Conventional ▪ ExxonMobil is a leading producer and leaseholder in the Permian Basin, holding 1.5 million net acres. We operated four conventional drilling rigs in 2015, and we completed 184 wells across multiple fields, including Russell, Goldsmith, Fullerton, Cornell, and Mahoney. More than 55 workover rigs were also active in the Permian, increasing production by opening up additional zones with fracture stimulation treatments. We are optimizing development and expanding infrastructure to facilitate production growth, including expansion of water-handling and gas-processing capacity.

Since 2014, we have signed five agreements that have roughly doubled our operated Wolfcamp position in the Permian Basin to more than 135,000 net acres.

Unconventional ▪ Unconventional development in the Permian was a key focus in 2015 and will drive our U.S. production in the future. Two strategic transactions captured horizontal drilling rights in 48,000 acres, adding to our already strong unconventional Permian position highlighted by the Wolfcamp, Spraberry, and Bone Springs formations. In 2015, we operated 11 unconventional Permian rigs. With this investment, our net production grew 24 percent during 2015 on a large base. We remain encouraged by our development of the prolific Wolfcamp formation in the Midland Basin, where we have increased ultimate recoveries while substantially reducing drilling and completion costs.

ExxonMobil holds 227,000 net acres in the Haynesville/Bossier Shale of East Texas and Louisiana, where we continue to capture benefits from our drilling and completion improvements.

In the Barnett Shale play in North Texas, we continue to develop and maintain our leasehold of 202,000 net acres. In the Freestone tight gas trend, where ExxonMobil holds 273,000 net acres, we remain focused on operating efficiently and making disciplined investments to offset decline.

Mid-Continent

ExxonMobil produces oil and gas throughout the mid-continent states, including Arkansas, Colorado, Kansas, Montana, New Mexico, North Dakota, Oklahoma, Utah, and Wyoming. Average net production from this area was 126 thousand barrels of liquids per day and 1.2 billion cubic feet of gas per day in 2015.

Conventional ▪ The LaBarge development (ExxonMobil interest, 100 percent) in Wyoming comprises the Madison, Tip Top, and Hogsback fields, along with the Shute Creek Gas Plant. It includes one of the world's largest helium recovery and physical solvent gas sweetening plants. A project to improve environmental performance of the Shute Creek Gas Plant's compressor engines started up in early 2012, helping us reach record carbon dioxide sales of 350 million cubic feet per day in 2015. The LaBarge facilities processed an average of 700 million cubic feet of inlet gas per day in 2015.

Unconventional ▪ The Bakken remained one of our most active unconventional programs in 2015, with well completions and production volumes again reaching all-time highs. ExxonMobil currently holds 574,000 net acres of high-quality resource in this play. We operated 11 drilling rigs in 2015, and net production in the Bakken increased 24 percent.

In 2015, we remained active in the liquids-rich Woodford Shale in the Ardmore and Marietta basins of southern Oklahoma. We operated eight rigs across our 323,000 net acres. We continue to progress infrastructure projects to optimize production from this area.

Production from our LaBarge development is processed at the Shute Creek Gas Plant in Wyoming.

Exhibit L

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.

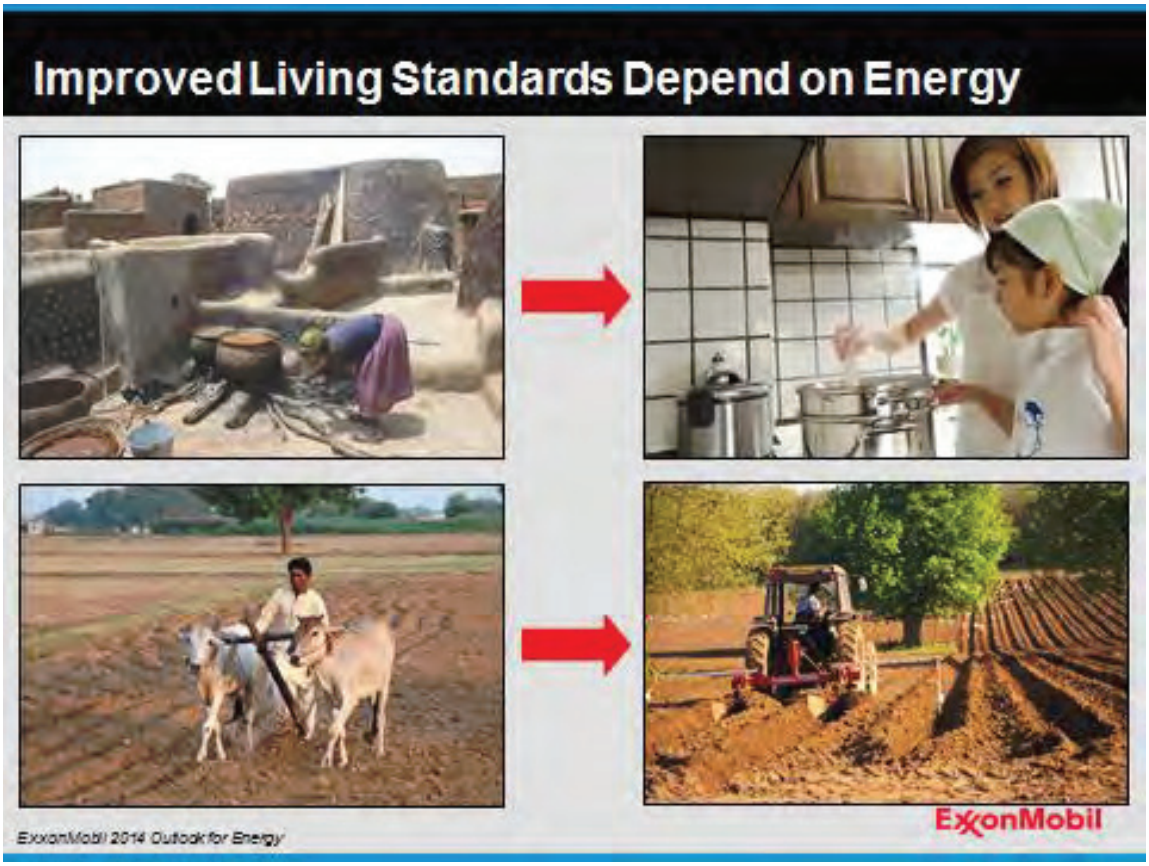
As detailed below, ExxonMobil makes long-term investment decisions based in part on our rigorous, comprehensive annual analysis of the global outlook for energy, an analysis that has repeatedly proven to be consistent with the International Energy Agency *World Energy Outlook*, the U.S. Energy Information 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.

[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.

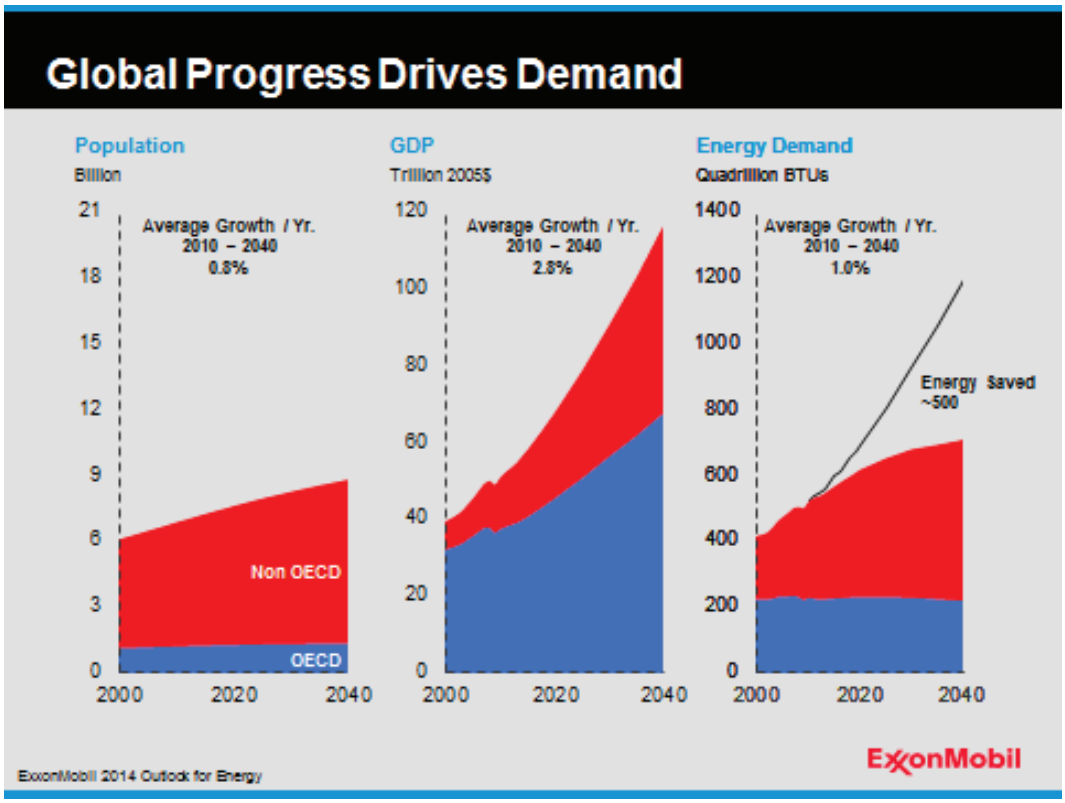
ExxonMobil's current *Outlook for Energy* extends through the year 2040, and contains several conclusions that are relevant to questions raised by stakeholder organizations. Understanding this factual and analytical foundation is crucial to understanding ExxonMobil's investment decisions and approach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

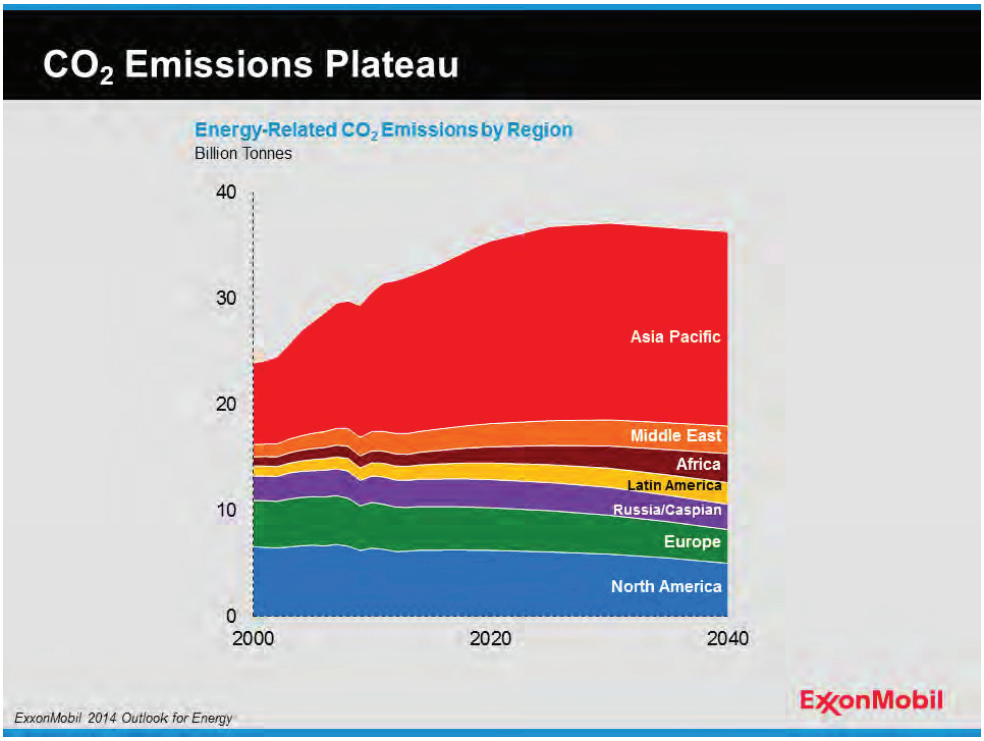
largely the poorest and least developed of the world's countries that benefit most from this anticipated growth. However, this level of GDP growth requires more accessible, reliable and affordable energy to fuel growth, and it is vulnerable populations who would suffer most should that growth be artificially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

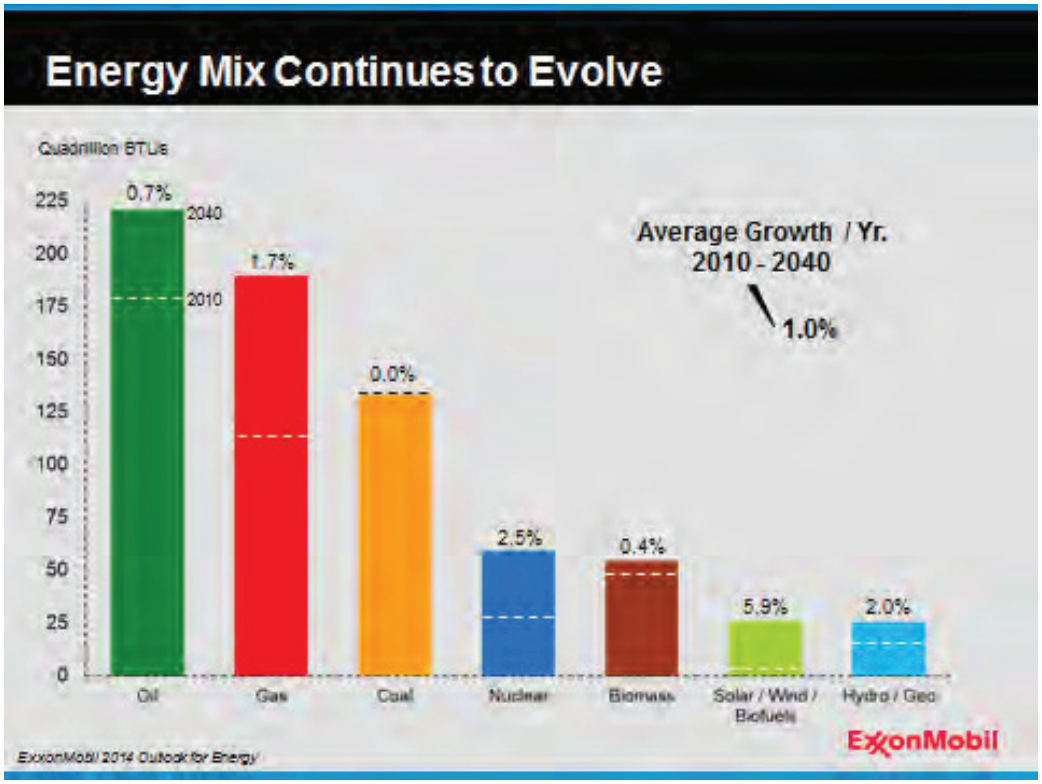


As part of our Outlook process, we do not project overall atmospheric GHG concentration, nor do we model global average temperature impacts.[4] However, we do project an energy-related CO2 emissions profile through 2040, and this can be compared

[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.

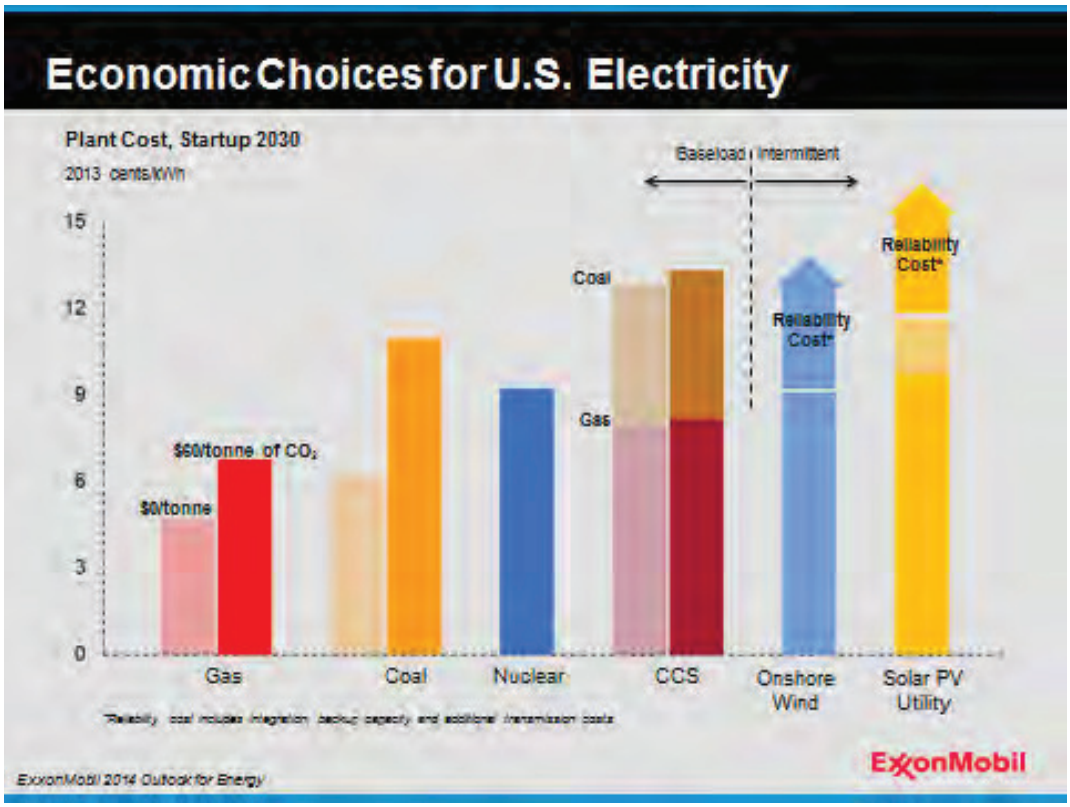
to the energy-related CO2 emissions profiles from various scenarios outlined by the Intergovernmental Panel on Climate Change (IPCC). When we do this, our Outlook emissions profile through 2040 would closely approximate the IPCC's intermediate RCP 4.5 emissions profile pathway in shape, but is slightly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

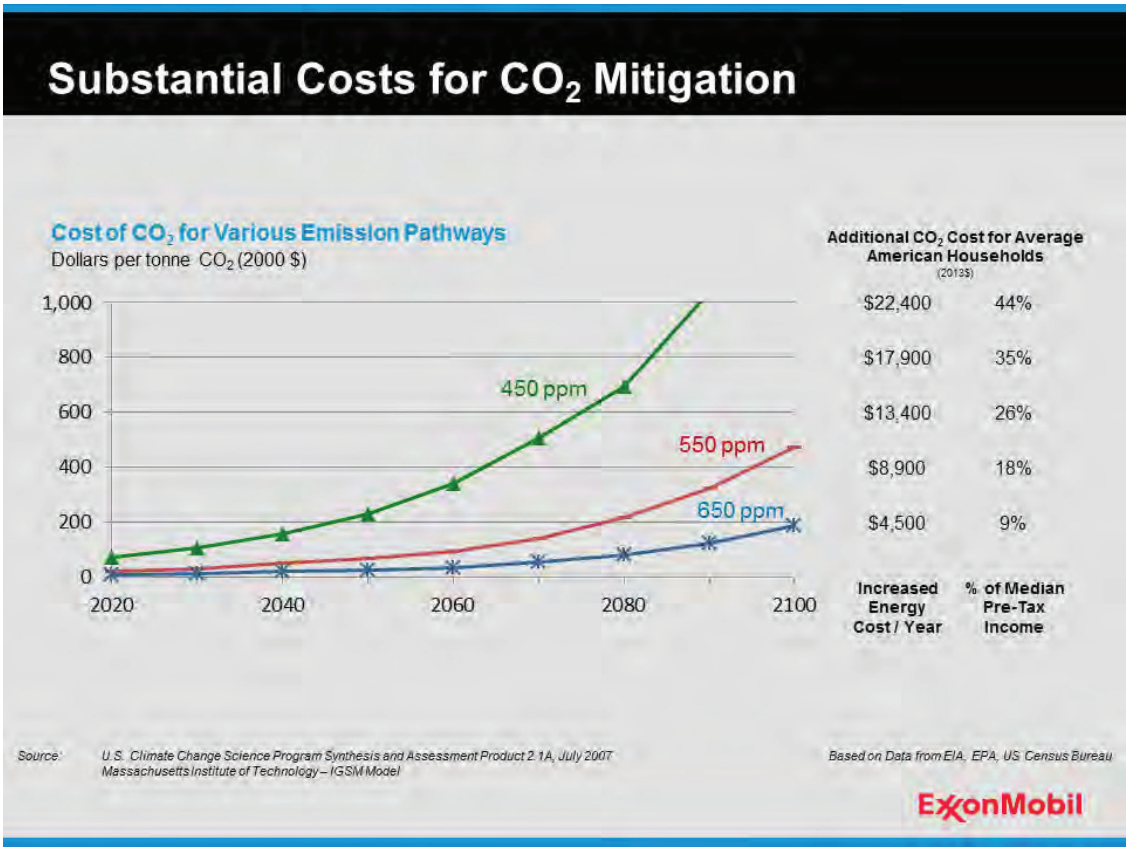
4. Carbon Budget and Carbon Asset Risk Implications

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.

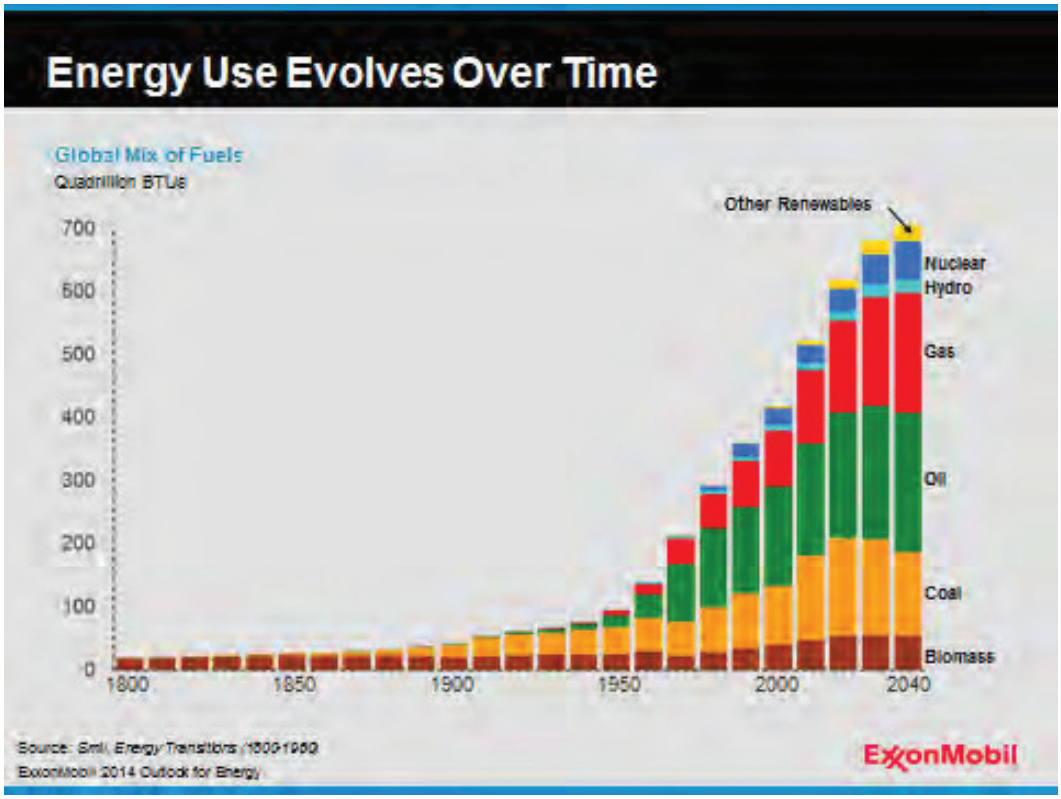


In 2008, the International Energy Agency estimated that reducing greenhouse gas emissions to just 50 percent below 2005 levels by 2050 would require $45 trillion in added energy supply and infrastructure investments.[6] In this scenario, the IEA estimated that *each year* between 2005 and 2050 the world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

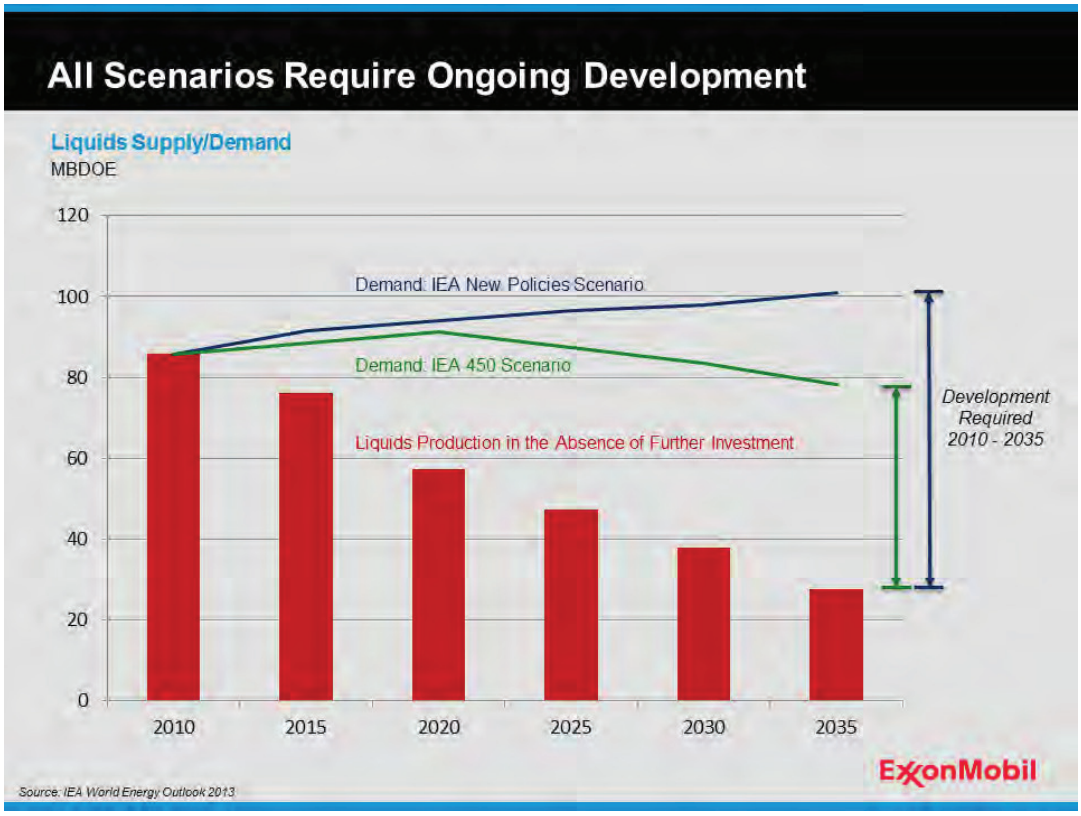
[6] See *IEA Energy Technology Perspectives 2008, Scenarios & Strategies to 2050*.

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]

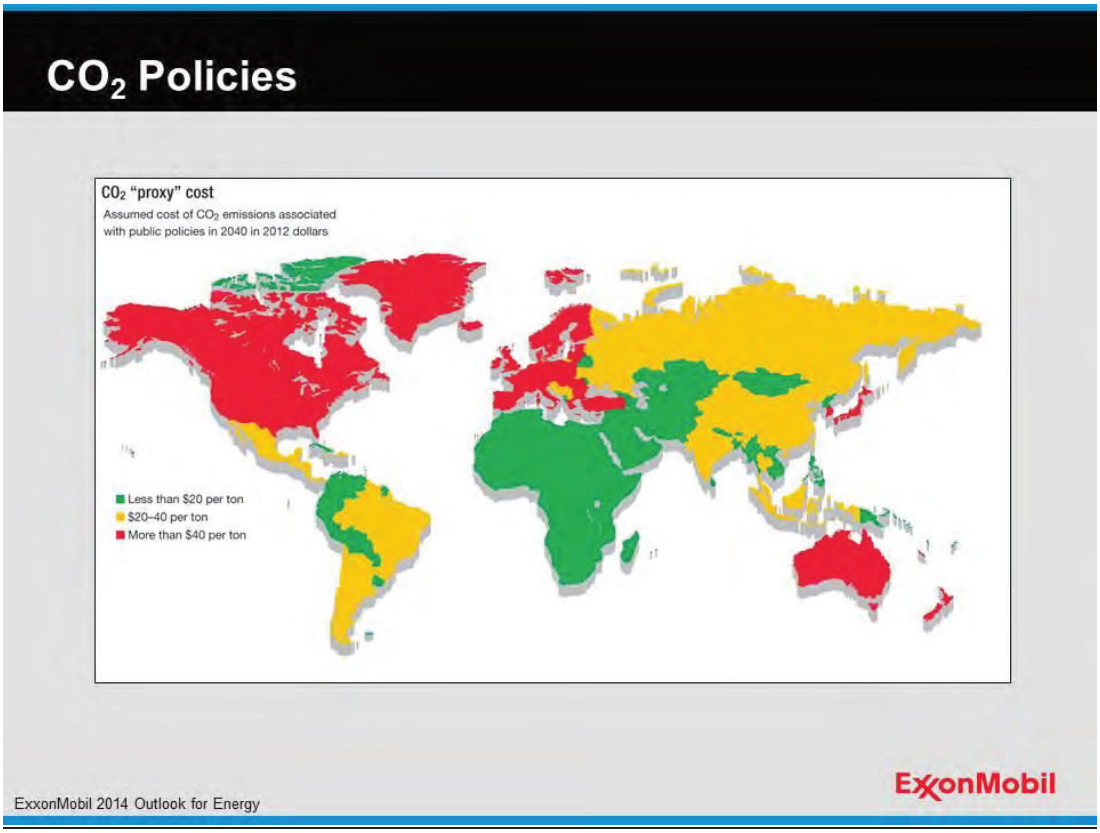
6. Planning Bases and Investments

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.

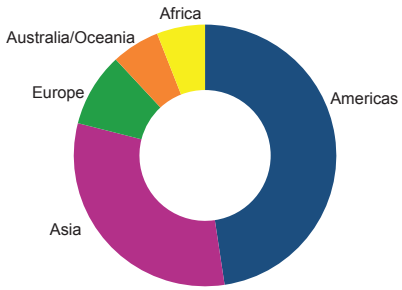
Appendix

EXXONMOBIL PROVED RESERVES - AT DECEMBER 31, 2013

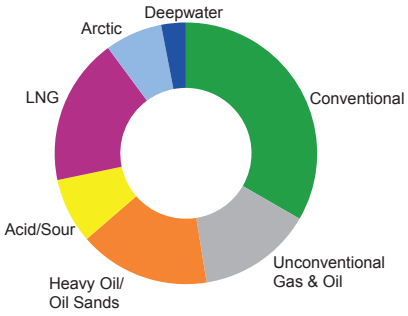
	United States	Canada/ S. Amer. (2)	Europe	Africa	Asia	Australia/ Oceania	Total	Worldwide	Canada/ S. Amer. (2)	Canada/ S. Amer. (2)	Total
	Crude Oil							Natural Gas Liquids (2)	Bitumen	Synthetic Oil	
Total liquids proved reserves (1) **(millions of barrels)**	2,338	284	273	1,193	3,308	155	7,551	1,479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

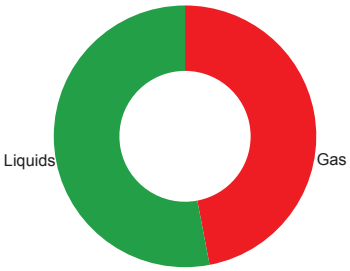
By Region



By Resource Type

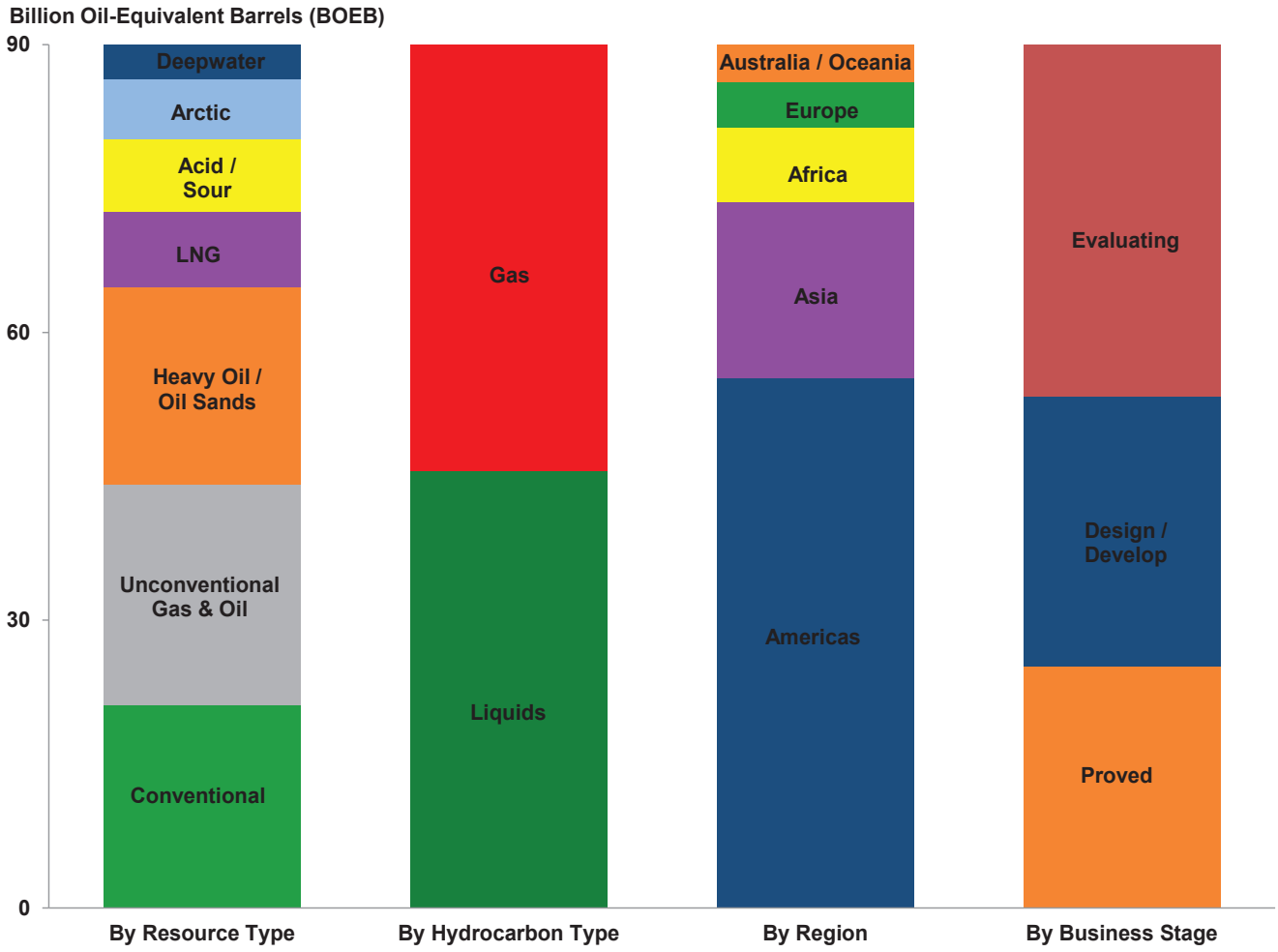


By Hydrocarbon Type



(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)



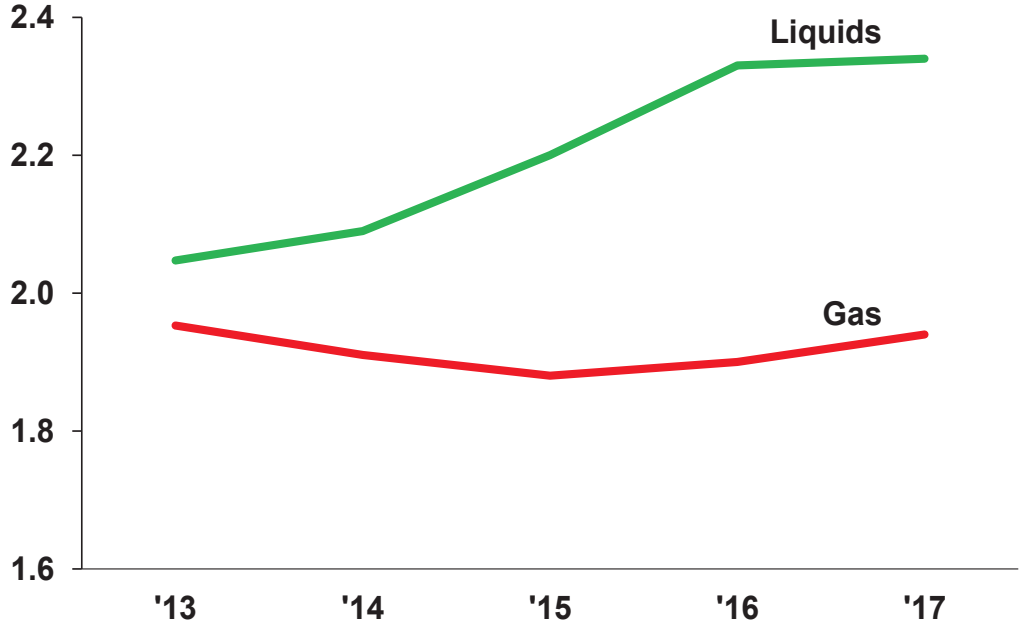
(1) Source: 2013 ExxonMobil Financial & Operating Review (page 21) and 2014 Analyst Meeting (slide 49).

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



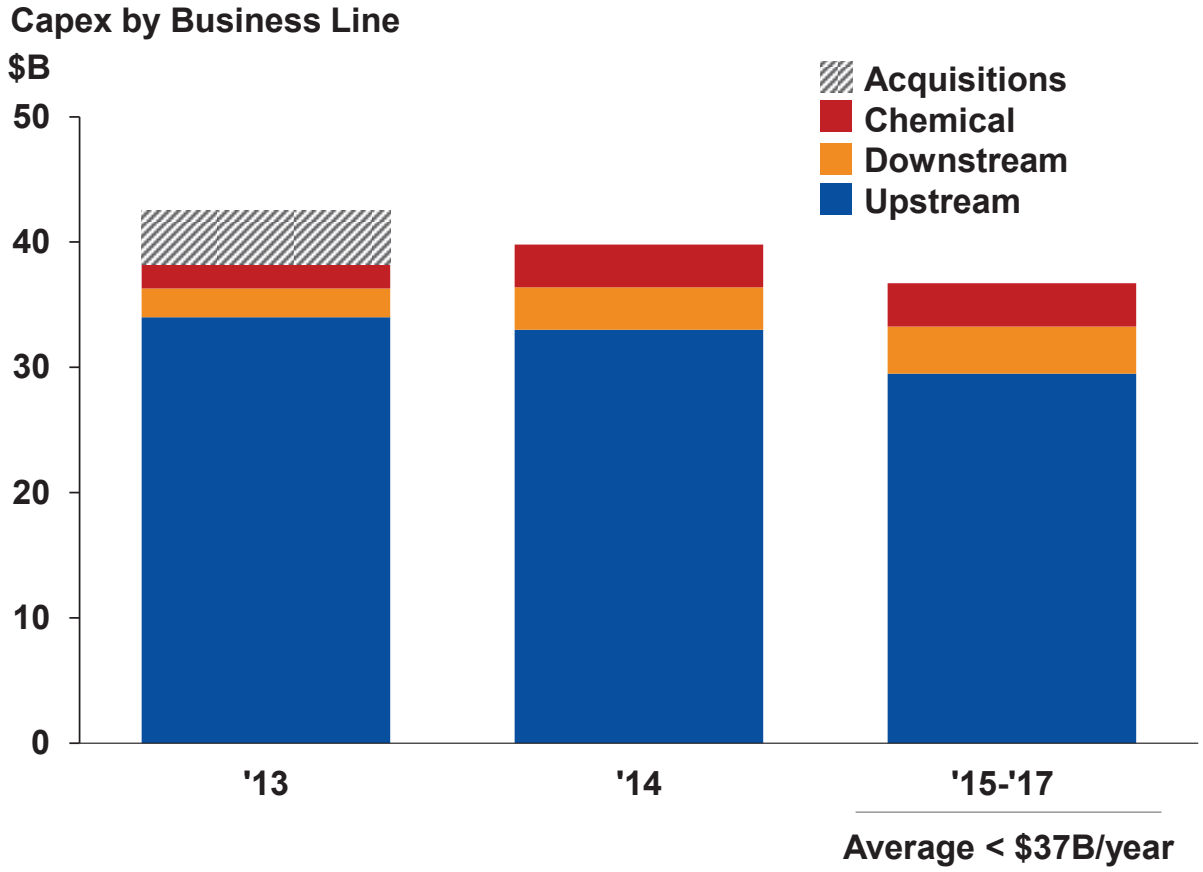
	'13	'14	'15	'16	'17
Total	4.0	4.0	4.1	4.2	4.3

- 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

Well-to-wheels GHG emissions: Oil sands compared to other crude oils (Wide boundary—$kgCO_2e$/barrel of refined product)

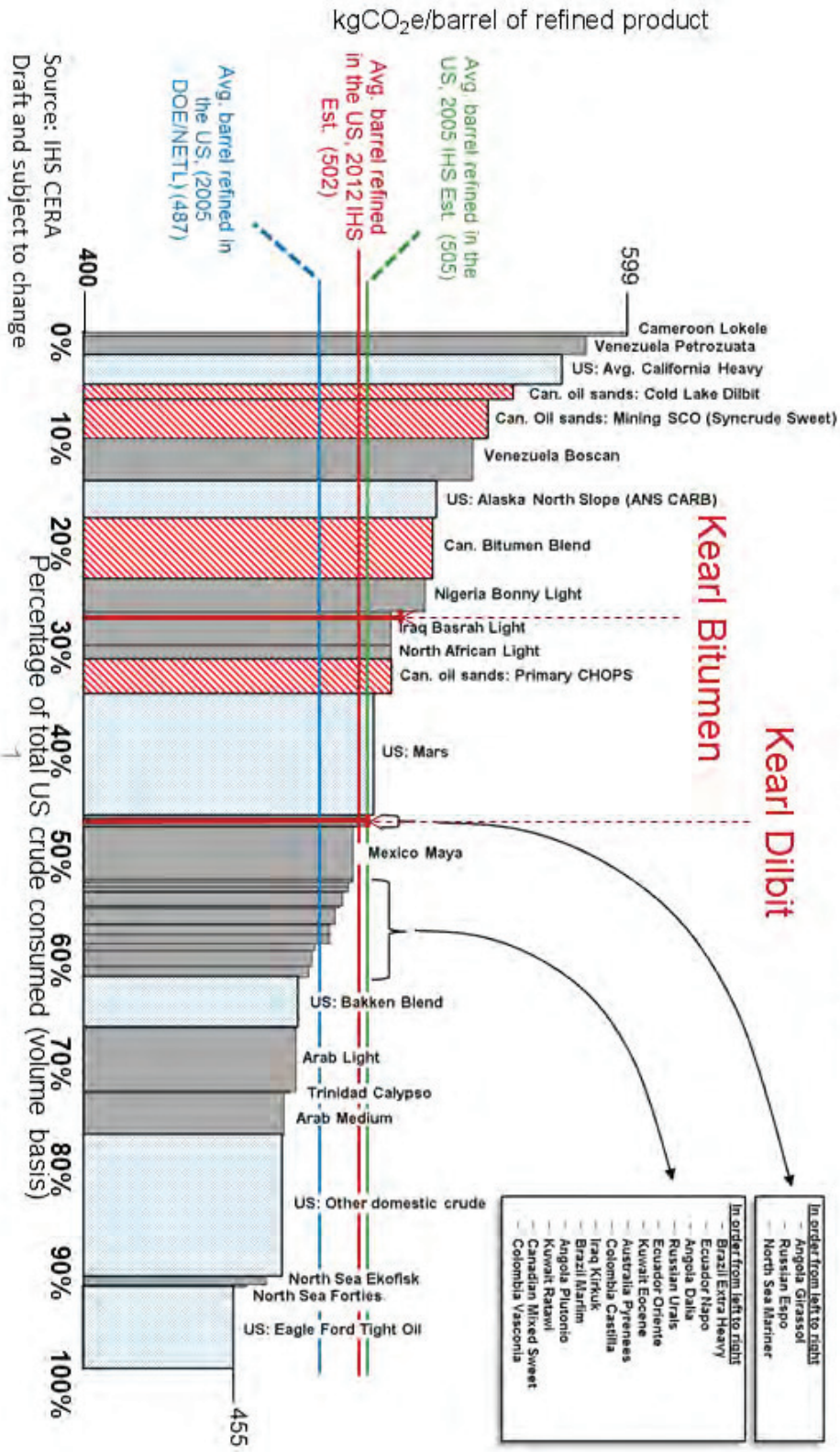


Exhibit M

2015 Sustainability report

Statoil

2015

Sustainability report

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Cover photo: Øyvind Hagen

Contents

Climate change

How Statoil aims to stay competitive in the low-carbon future.

Our position on climate change

Meeting the low-carbon challenge.

Statoil recognises the ambition to limit the average global temperature rise to below two degrees centigrade compared to pre-industrial levels. This will require a transition to a low-carbon economy over the next few decades and involve significant action from all parts of society, including companies, consumers and governments. The energy system, in particular, will have to undergo dramatic change in order to shrink its carbon emissions, while continuing to supply the growth in demand for energy in emerging markets.

The Paris Agreement on climate change negotiated in December 2015 provides the prospect of improved policy support around the world for accelerating the shift to low-carbon solutions. As a major provider of oil and gas, we recognise that we have a key role to play in making this transition work. We welcome the agreement and believe we are well positioned to play our part.

Our shareholders are increasingly asking for greater transparency about the measures we are taking to respond to climate risk and to ensure that our business model evolves in line with changing realities and expectations. In May 2015, our Annual General Meeting passed a shareholder resolution calling for greater disclosure around all aspects of how we are responding to climate change. Our initial response can be seen in this report.

Our approach to climate change

There are four key aspects to Statoil's response to climate change and we will explore each of these in more detail in this section of the report:

- Climate policy: supporting the development of viable policies and regulatory frameworks to accelerate an orderly transition to a low-carbon economy.
- Climate risk and portfolio resilience: ensuring that Statoil's business model evolves in parallel with the energy transition, allowing us to embrace low-carbon solutions as an opportunity rather than a threat, while monitoring the regulatory, market, technological and physical impact of climate change.
- Emissions management: prioritising maximum carbon efficiency and energy savings across the entire value chain, linked to executive compensation (see page 7).
- Low-carbon technologies: harnessing our technological capacity to develop and explore a broad array of low-carbon energy solutions.

In 2015, we joined the Oil and Gas Climate Initiative, a voluntary, CEO-led grouping that aims to accelerate and guide the industry's shift towards a low-carbon world. This complements our participation in other significant initiatives such as the World Bank's Global Gas Flaring Reduction Initiative and the Climate and Clean Air Coalition Oil and Gas Methane Partnership, to mention a few (box, left).

The Oil and Gas Climate Initiative (OGCI)

The OGCI is a CEO-led voluntary initiative set up in 2014 to accelerate and guide collective efforts towards a low-carbon future. It is made up of oil and gas companies that want to contribute to climate change solutions.

www.oilandgasclimateinitiative.com

The Global Gas Flaring Reduction partnership (GGFR)

The GGFR partnership is a World Bank initiative that aims to eliminate global flaring by 2050. Flaring of associated gas is a considerable source of CO_2 emissions from the oil and gas industry.

www.worldbank.org/en/programs/gasflaring reduction

The Climate and Clean Air Coalition Oil and Gas Methane Partnership (CCAC OGMP)

The Climate and Clean Air Coalition (CCAC) is led by the United Nations Environment Programme and consists of several country partners and other key institutions.

Through the Oil and Gas Methane Partnership, the CCAC works with leading oil and gas companies to achieve substantial global methane reductions.

new.ccacoalition.org

The Business Partnership for Market Readiness (B-PMR)

The International Emissions Trading Association's Business Partnership for Market Readiness (B-PMR) supports countries to assess, prepare, and implement carbon pricing instruments in order to scale up greenhouse gas mitigation. It also serves as a platform for countries to share knowledge and work together to shape the future of cost-effective climate change mitigation.

www.thepmr.org

"The Oil and Gas Climate Initiative's Joint Collaborative Declaration highlights the pivotal role that Statoil, and the oil and gas industry, can play in being part of the solution to climate change by harnessing your power and technical expertise to reduce greenhouse gas emissions. I am very grateful for your leadership at this time, and for your strong personal engagement to managing the impact of climate change – this is a fundamental obligation, and though there are many obstacles there is also great opportunity."

Ms. Christiana Figueres

Executive Secretary of the United Nations Framework Convention on Climate Change

Supporting climate policies

We work with governments, other companies and civil society organisations to facilitate the development of viable policies and regulatory frameworks.

Three key positions inform our climate advocacy efforts:

- Climate policy measures should be predictable, transparent and internationally applied in order to provide incentives for lower-carbon technologies, ensure cost effectiveness and create a level playing field in global markets.
- A price on greenhouse gas emissions based on the "emitter pays" principle should be the preferred climate policy framework, as we regarded this as the most effective measure.
- Climate policy measures should be technology and fuel-neutral to maximise innovation through market competition. Targeted public investment into research and development and market scaling support is needed to stimulate relevant new and emerging technologies. The level of support should be reduced over time and removed entirely for competitive technologies.

We firmly believe that a carbon price is the right way to incentivise the supply and use of lower-carbon options, enabling the world to move faster to a sustainable energy system, while meeting growing energy demand along the way. In Norway, Statoil operates successfully with a relatively high carbon tax (see page 15). We have shown that it's possible to prosper in a world of carbon pricing.

We are working with governments, businesses and organisations to develop policies for effective carbon pricing around the world. In June 2015, Statoil's CEO Eldar Sætre —together with the CEOs of BG Group, BP, ENI, Shell and Total—made a joint call for putting a price on carbon in an open letter addressed directly to the United Nations (UN) and heads of state.

The letter is available at www.statoil.com/en/NewsAndMedia/News/2015/Pages/01Jun_carbon.aspx.

In the EU, we have publicly declared our support for the approved 40% greenhouse gas emissions reduction target by 2030, as well as a significant strengthening of the EU Emissions Trading Scheme. Additionally, we are working through the World Bank's Business Partnership for Market Readiness (box, previous page) to contribute to the development of well-designed carbon pricing schemes in many countries.

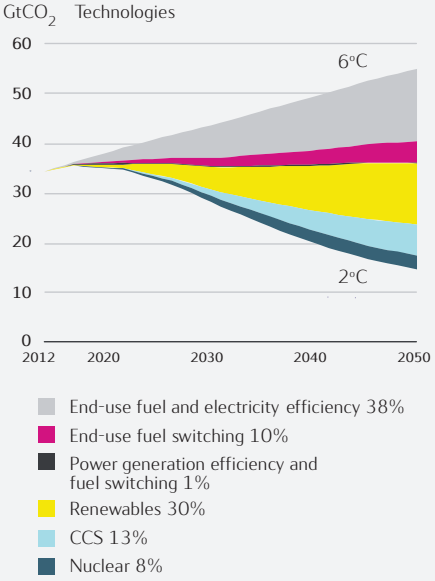
Transparency is important to us. We openly engage with academics, politicians and industry peers in discussions around climate policy measures and how we can contribute to a low-carbon future.

An overview of our engagement with policy makers on climate change policy is available in our 2015 CDP reply, available at www.statoil.com/en/EnvironmentSociety/Sustainability.

Climate risk and portfolio resilience

The place of oil and gas in a low carbon future.

Contribution of technologies to global cumulative CO_2 reductions



Source: IEA data from Energy Technology Perspectives 2015 © OECD/IEA, modified by Statoil

If there is a concerted global effort to limit climate change over the next few decades, energy companies will be among the most strongly affected. We will have to respond to radical changes in our business environment, while continuing to supply energy to a growing world population and rapidly developing economies.

According to the Intergovernmental Panel on Climate Change (IPCC), limiting the average global temperature rise to two degrees centigrade above pre-industrial levels by 2100 will likely require a 40-70% reduction in greenhouse gas emissions by 2050 and net zero emissions well before the end of the century. To achieve this, there will be significantly stricter energy and climate regulations that will increase the cost of producing fossil fuels, while incentivising greater carbon efficiency and low-carbon solutions.

The pace and impact of this long-term shift is not a given and will depend on many factors: geopolitics, the implementation of energy and climate policies, resource shortages, technological progress and economic growth.

Shareholders are increasingly concerned to understand the impact that stricter climate change regulation and the physical impact of climate change may have on different parts of our business over the longer term. This entails getting a clearer picture of the pathway that we and other energy companies intend to take to ensure that our portfolio of assets remains relevant and profitable as realities and expectations change.

As a major provider of oil and gas, we are already responding to the prospect of higher carbon costs and stricter climate regulations. We focus on carbon efficiency in our own operations and incorporate a price on carbon in our investment analysis. We have been exposed to carbon taxation in Norway since 1991. We have also started to expand our portfolio of low-carbon energy solutions and to enhance the market value of existing low-carbon products, establishing a new business area, *New Energy Solutions*, in 2015.

Energy perspectives

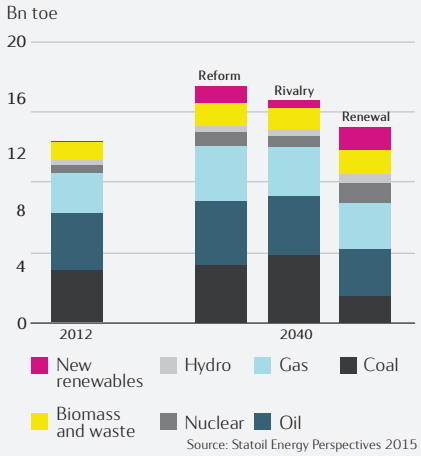
In our *Energy Perspectives 2015* report, we analysed three possible scenarios for the 25 years to 2040, each of which would have a different impact on our business.

The "Reform" scenario represents a gradual approach to tightening up climate change policy – one that would not be sufficient to ensure sustainability, but with significantly stricter energy and climate policies than today.

The "Rivalry" scenario represents a failure to achieve a global agreement (such as the Paris agreement on climate change) and the further fragmentation of national efforts by governments relying more heavily on their own energy resources.

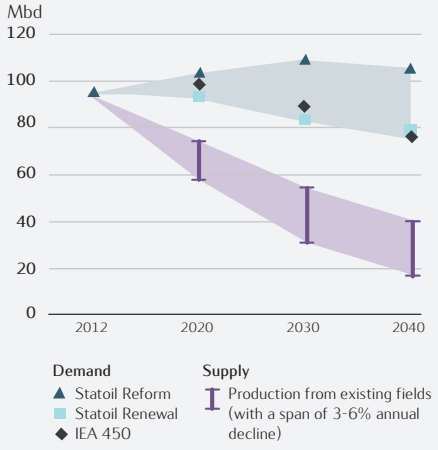
The "Renewal" scenario describes a rapid energy transition based on a global commitment to stay within a two-degree target. Since this scenario in most respects is the most challenging to oil and gas companies – we will explore its impact in more detail.

World energy demand per fuel



Source: Statoil Energy Perspectives 2015

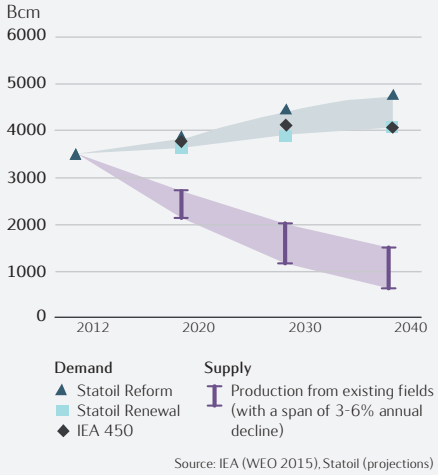
Global oil demand and supply from existing fields*



* Excl. bio-fuels

Source: IEA (WEO 2015), Statoil (projections)

Global gas demand and supply from existing fields



Source: IEA (WEO 2015), Statoil (projections)

The Renewal scenario involves:

- a 40% reduction in carbon emissions by 2040, with peak emissions in 2020
- ongoing decline in energy intensity, reducing energy demand growth to 0.2% a year
- global mechanisms for reducing emissions and pricing carbon
- the phasing out of fossil fuel subsidies worldwide
- the focused financing of low and zero carbon energy systems including carbon capture and storage

A mix of policy, regulatory, behavioural and technological developments would transform the global energy system by 2040. Electricity would be widely used in all sectors of society, including transport, and represent 30% of final energy consumption, up from 19% today. It would be produced by smart, decentralised, efficient and consumer-centric infrastructures and involve cost-efficient energy storage.

The power sector would be significantly decarbonised. Renewables would represent 57% of electricity production up from 21% today, with solar and wind becoming universally cost competitive, with the challenges of intermittency overcome. Coal would represent only 10% of electricity generation (down from 40% today), with growth in China and India fuelled by alternative energy sources.

The transport sector would rely heavily on electrification, sustainable biofuels and other alternative vehicle technologies. This would reduce the share of oil in private road transport to less than 30% in Europe and North America and to around 50% in China and India.

The impact on oil and gas

Under the conditions described in our Renewal scenario, the global energy mix in 2040 would shift with a significantly lower share of coal and a significantly higher share of renewables and nuclear energy. Oil and gas would each account for a 24% share in 2040 – representing a reduction in oil usage (from 31% in 2012) and a rise in gas consumption (from 22%).

Nevertheless, oil and gas together still account for 48% of the global energy mix in 2040 – down from 53% in 2012. The IEA projects quite similar trends in its "450 ppm scenario" (hereafter "IEA 450 scenario"), with oil and gas together accounting for around 43% of the global energy mix in 2040 (World Energy Outlook (WEO) 2015). The IEA 450 scenario is compatible with a global warming of maximum of two degrees Celsius with more than 50% probability (two degree scenario).

In summary, in the Renewal scenario:

- Oil demand could fall by around 0.6% per year if there is a radical rethinking of transportation, but will still represent almost a quarter of the energy mix and be used for materials, transportation and other purposes.
- Natural gas demand could grow by 0.6% a year over the first few decades of the energy transition as coal-based power stations are closed and alternative energy systems are developed, but this would require the introduction of carbon pricing and technology-neutral policies.
- Renewable sources of energy are expected to grow very rapidly, with wind power supply growing by over 9% a year and solar by almost 16%.
- Carbon capture and storage could play an increasing role from the late 2020s, if solutions are found to develop it on a large scale.

These shifts are significant and require both short-term action and careful monitoring and responsiveness over the longer term. But they do not represent an immediate threat to Statoil's business. Oil and gas fields currently in production will provide just 20% of the oil and gas volume needed in 2040. In particular, the fear of "stranded assets" if oil and gas companies continue to explore for new reserves does not take into account the fact that the demand for oil and gas would be much

Monitoring climate change impact

These are factors we monitor as we shape our asset portfolio for a low-carbon future

Regulatory

- Carbon pricing
- Regulations and/or cap on greenhouse gas emissions
- Tax systems and incentives, including for renewable energy
- Restrictions on access to and maturation of resources

Market

- Oil and gas prices
- Shift in demand for transportation fuels
- Cost of production and development
- Transition from coal to gas in the power sector
- Competitive potential of renewables

Technological breakthrough

- Progress in scaling up carbon capture and storage (CCS)
- Development of energy storage technologies
- Carbon utilisation for new products or processes
- Emergence of disruptive low-carbon technologies

Physical

- Impact on our assets of more frequent extreme weather events
- Assessment of emergency response plans for extreme weather conditions
- Impact on water availability

Our approach to portfolio resilience

- We proactively identify and manage carbon risks and opportunities
- We focus on making our oil and gas production cost- and carbon efficient
- We invest in low-carbon solutions
- Our investments and projects are tested against stricter climate regulations
- We have flexibility in future investments

higher than what can possibly be produced from existing, producing oil and gas fields (graph, previous page).

New fields are urgently needed just to replace capacity. This is why continued exploration and investment in oil and gas production has to continue, along with increasing investments in low-carbon technologies such as renewables. Not all resources will be developed, however – we are exploring to find the most competitive barrels and that definition will be shaped by a combination of factors: the realities of oil and gas prices, the development of new technologies and the speed of decarbonisation.

Identifying climate related business risk and opportunities

We are responding now to enhance our resilience in a future environment with higher carbon costs and stricter climate regulations. Both our corporate executive committee and our board of directors frequently discuss the business risks and opportunities associated with climate change, including regulatory, market, technological and physical risk factors.

To ensure that we take relevant risk factors into account, we apply tools such as internal carbon pricing, scenario planning and stress testing of projects against various oil and gas price assumptions. We regularly assess how the development of technologies and changes in regulations, including the introduction of stringent climate policies, may impact the oil price, the costs of developing new oil and gas assets, and the demand for oil and gas. These assessments are incorporated into our scenarios (see *Monitoring climate change impact*, left). We are aware that disruptive technologies could potentially change our market fundamentally.

Asset portfolio resilience

We have analysed the sensitivity of our portfolio of projects to low oil price and high carbon price assumptions, using both our own planning assumptions and the assumptions laid out in the IEA Current Policies scenario, the IEA New Policies scenario and the IEA 450 scenario (WEO 2015). The analysis covers all accessed acreage, from exploration licences to fields in production, over the lifetime of the projects.

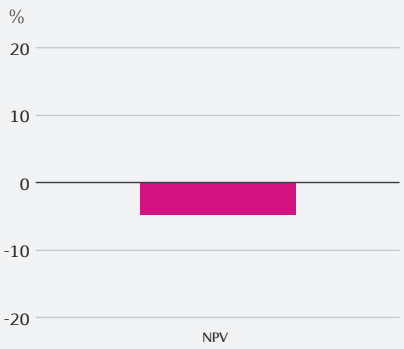
The analysis has been conducted using our own economic planning tool and assumptions, and the IEA's assumptions, which may differ from future oil, gas and carbon prices. Accordingly, there can be no assurance that the assessment is a reliable indicator of the actual impact of climate change on Statoil.

Energy scenarios are not predictions of the future, but analytical tools that we use as input to our strategy and planning. Various scenarios demonstrate the uncertainty in foreseeing future developments, and that several futures are possible.

In our analysis, we have replaced our own planning assumptions for carbon cost, oil and gas prices with the equivalent assumptions in these IEA scenarios. However, the projects and other operating conditions have not been further optimised beyond current status. We have assumed that non-sanctioned projects (exploration prospects and leads) with a negative net present value (NPV) will not be executed. Production, revenues, operating expenses and investments for these projects have been removed from the analysis.

We have tested our project portfolio for sensitivity towards carbon prices as set out in the different scenarios. We have used Statoil's internal carbon price as the minimum carbon price and in addition tested for sensitivity towards the IEA carbon price assumptions in the cases where the IEA carbon price is higher than our own carbon price.

Portfolio sensitivity in a two degree scenario (IEA 450 scenario)

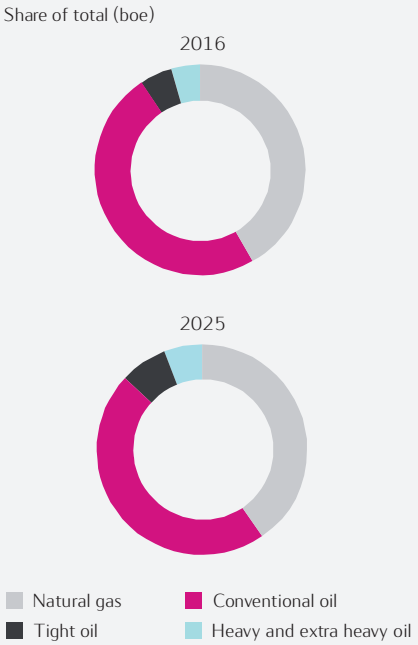


The graph demonstrates the combined effect on NPV of changes in oil and gas prices and CO_2 prices as set out in the IEA 450 scenario, taking into account portfolio changes due to the NPV effect on particular projects.

The base case (0%) represents the NPV using Statoil's planning assumptions.

It should be noted that changes to our economic planning assumptions, as well as changes to the IEA scenarios, will influence the impact on the NPV in future years' analysis.

Forecast production of oil and gas by category



Equity production, including expected production from accessed exploration acreage.

Our analysis demonstrated that the main contributor to changes in NPV for our asset portfolio is variations in oil and gas prices.

In our assessment, we have focused on the impact of the IEA 450 Scenario ("two degree scenario"). However, we have also analysed the resilience of our portfolio towards the IEA Current Policies scenario and the IEA New Policies scenario. In the two latter scenarios, we see a positive impact on our NPV compared to our own planning assumptions.

In our analysis, the IEA 450 scenario would have a negative impact of about 5% on Statoil's NPV compared to our own planning assumptions as of December 2015 (graph left). This reflects sensitivity to oil and gas prices and carbon price as well as changes to the portfolio due to the NPV effect on particular projects. The projects and other operating conditions have not been further optimised beyond current status.

The impact of the assumptions in the energy scenarios varies between projects and production segments.

- Our conventional oil and gas projects in general carry low climate related regulatory risk. This is due to the relatively low carbon intensity and already high CO_2 cost for many of these projects. Over 60% of our equity production takes place in Norway. These projects are subject to relatively high CO_2 costs of approximately NOK 520 per tonne of CO_2 (approximately USD 64 based on the annual average exchange rate in 2015), reflecting the cost of the Norwegian offshore CO_2 tax in addition to EU ETS quotas. We also incorporate a price on carbon in our investment analysis for international projects. Because of this, a significant increase of the cost of carbon to USD 125 per tonne of CO_2 equivalent in 2035 (as stipulated in the IEA 450 scenario) would only marginally impact the NPV for our conventional oil and gas portfolio.

- Our projects in shale oil and heavy and extra heavy oil are less robust towards higher carbon prices due to their higher carbon intensity. However, the greater flexibility in cost and production of shale oil and extra heavy oil to some extent counterbalances this impact in terms of resilience compared to other projects.

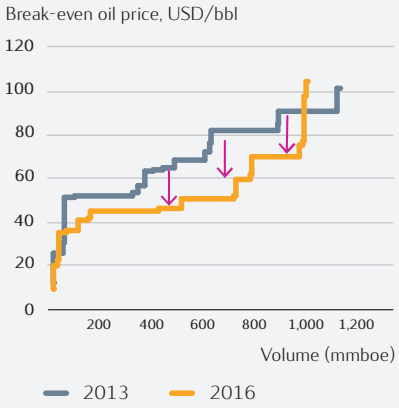
- Our low-carbon projects will benefit from stricter climate policies, subsidies and restrictions on emissions. This can open up opportunities for growth within renewable energy and other low-carbon energy solutions. Reaching scale on floating offshore wind farms will depend on continued subsidies. The successful introduction of carbon capture and storage on a large scale will also depend on the willingness to finance emission reductions by governments and private actors, as well as cost reductions due to technological advances.

To summarise, our analysis demonstrates that the IEA 450 scenario would have a limited impact on the resilience of our asset portfolio, compared to our own planning assumptions.

We are managing the business risks and opportunities brought by a low-carbon future on the basis of the following principles:

Carbon efficiency and large scale natural gas production: We are an industry leader in carbon efficiency and we aim to maintain a very large proportion of low carbon-intensity assets in our portfolio such as conventional oil and natural gas (pie chart, left). That is why we have set a long-term carbon intensity target for production (page 17).

Non-sanctioned projects 2013 → 2016



The chart covers our total non-sanctioned portfolio (operated and non-operated) where projects have been continued since 2013 and have expected production start by the end of 2022.

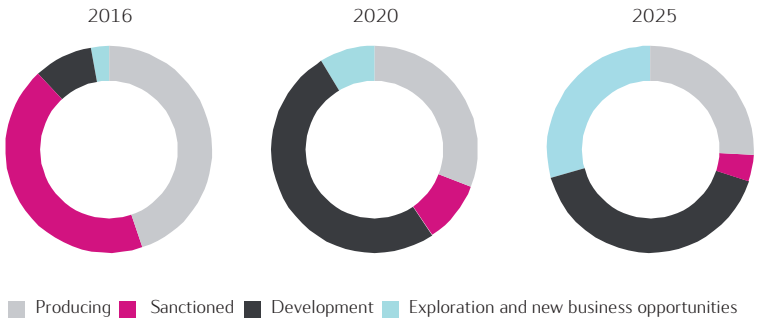
Gas accounts for 41% of our production. Over time, decarbonisation will require the world to move on from natural gas, but over the next few decades switching from coal, the most carbon-intensive fossil fuel, to natural gas can help cut emissions from electricity generation in half. This is because natural gas is less carbon intensive than other hydrocarbons because it contains more hydrogen relative to carbon.

Cost efficiency: Our comprehensive efficiency and cost reduction programme launched in 2013 has achieved cost reductions of USD 1.9 billion (NOK 15.3 billion) per year by the end of 2015, through various means including innovation through standardisation and simplification. As an example, we have significantly reduced the average break-even oil price of both our operated project portfolio sanctioned since 2013 and our non-operated project portfolio (illustration, left). We aim to achieve accumulated cost reductions of USD 2.5 billion (NOK 20.2 billion) per year from 2016.

Flexibility: We have significant flexibility to adjust investments over the next years, with only a small proportion of our forecast (i.e. expected) investments for 2025 already allocated. The share of investments allocated to producing fields and sanctioned projects (i.e. projects for which investment decisions have been made), decreases significantly in 2025 (pie charts, below).

Capex flexibility

Forecast investments by current maturity



How we manage our emissions

Our approach to increasing carbon efficiency.

As a large producer of oil and gas, and therefore a significant emitter of greenhouse gases, we can and must contribute to providing more energy with lower emissions. Energy use for power and heat generation represents the largest direct source of greenhouse gas emissions from our operations. Flaring, venting and leakages represent smaller, but nevertheless significant, sources of emissions. Our efforts to reduce our direct emissions include:

- Improving energy efficiency
- Reducing methane emissions
- Eliminating routine flaring
- Scaling up carbon capture and storage

Carbon intensity target

In 2015, we established a 2020 carbon intensity target of 9 kg CO_2/barrel of oil equivalent (boe) for our upstream (exploration and production) activities. The target is long-term, because carbon reduction initiatives may take years to implement. We believe that the target is ambitious, but achievable, and it reflects our ambition to be an industry leader in carbon efficiency.

To further enhance this ambition, upstream carbon intensity has been incorporated as a key performance indicator at corporate level for 2016. Our performance management model and the link to executive incentives are described on page 7.

Our performance in 2015 demonstrates that we are on our way to meeting our carbon intensity target. The carbon intensity of our upstream production improved to 10kg CO_2 per barrel of oil equivalent (graph, top left) – less than 60% of the industry average of 18kg as measured by the International Association of Oil and Gas Producers (IOGP) (Environmental Performance Indicators, 2014 data).

In addition to our upstream target, we have segment based targets because carbon intensity varies significantly between different types of oil and gas. Carbon intensity data and targets per production segment are described on page 41.

Our targets are subject to significant uncertainty because they relate to events and circumstances that will occur in the future. Changes in our asset portfolio and production disturbances can affect the result for a particular year.

Greenhouse gas emissions

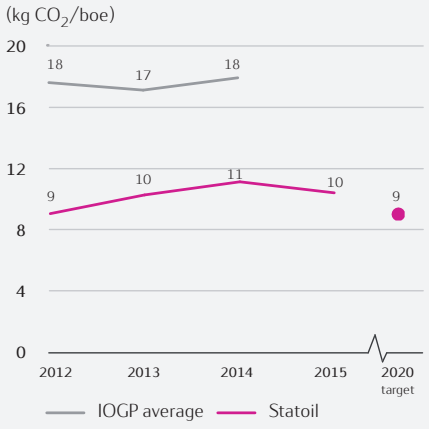
Our operated production increased to 1,073 mmboe in 2015, up from 997 mmboe in 2014. Total emissions of carbon dioxide therefore increased slightly to 15.4 million tonnes in 2015 (graph, left). Methane emissions decreased significantly, from 40.6 thousand tonnes in 2014 to 36.3 thousand tonnes in 2015 (page 19).

Our direct (scope 1) greenhouse gas (GHG) emissions remained stable at 16.3 million tonnes. GHG emissions include emissions of carbon dioxide and methane. Other greenhouse gases are not included, as these are assessed to be insignificant for Statoil.

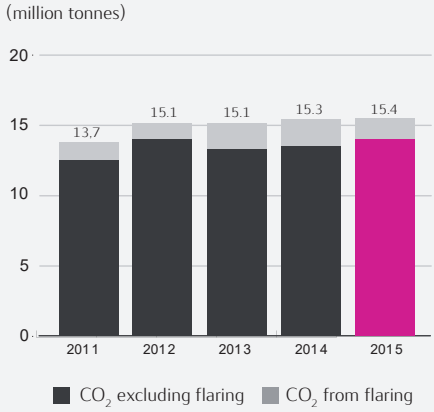
Scope 2 GHG emissions, which include emissions from energy imported from third parties, were 0.3 million tonnes CO_2 equivalents in 2015, using a location based emission factor. More information about scope 2 GHG emissions and emission factors used is available on page 41.

In 2015, we paid approximately NOK 4 billion in CO_2 tax and emission quotas.

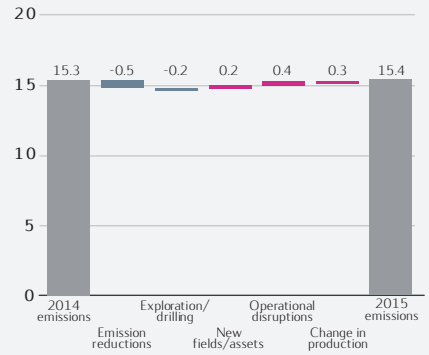
CO_2 intensity (upstream)

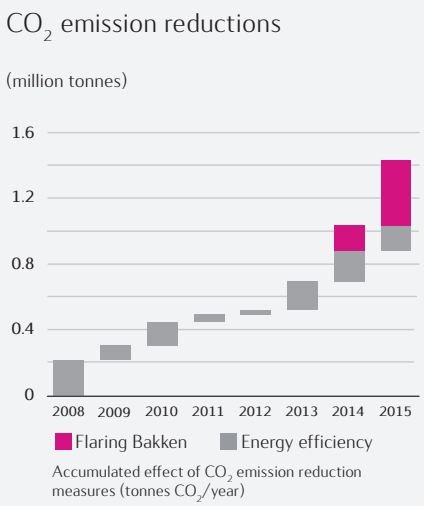


CO_2 emissions



Changes in CO_2 emissions





Subsea technology milestone

Ten years ago, two of Statoil's subsea oil fields at *Åsgard* in the Norwegian Sea were near closure since the reservoir pressure was too low to allow continued production.

Compressing injection gas on the existing platform was not an option. Building a modern new compression platform would have resulted in additional CO_2 emissions of about 90,000 tonnes per year.

We decided to develop a technology to compress the gas at the seabed close to the wellhead. In 2015, Statoil completed this ground-breaking project, together with Aker Solutions, creating the world's first subsea gas compressions operation.

The technology has extended the reservoir's life to 2032, boosted oil recovery and reduced carbon intensity from 16kg to 9kg of CO_2 per produced barrel of oil equivalent.

Over the fields' lifetime, the avoided emissions will amount to around 1.4 million tonnes. The project is also the first step to realising an energy-efficient subsea processing plant.

Emission reductions

We follow up progress towards our carbon intensity target through emission reduction initiatives. For 2015, our target was to save 330,000 tonnes of CO_2 per year. Through systematic work in our internal energy efficiency network, we managed to implement initiatives accounting for nearly 550,000 tonnes of CO_2 per year.

Reduced flaring at *Bakken* (USA), was the most significant contributor to emission reductions in 2015. This contributed to almost 70% (over 370.000 tonnes) of the total emission reductions.

Energy efficiency improvements at our offshore and onshore facilities in Norway amounted to the rest of the reductions. As an example, at our processing facility *Kårstø* (Norway), we reduced emissions by over 20,000 tonnes of CO_2 per year by optimising the operation of a stabiliser tower.

Our reduction target for 2016 is to save another 220,000 tonnes of CO_2 per year. We expect to achieve these reductions through targeted projects to improve energy efficiency and reduce flaring, all with a positive net present value.

Energy efficiency on the Norwegian continental shelf

For our offshore operations in Norway, we are committed to delivering energy efficiency measures with total savings of 1.2 million tonnes of CO_2 per year between 2008 and 2020. The original target set in 2008 was to save a cumulative total of 800,000 tonnes of CO_2 per year by 2020. Over 250 large and small energy efficiency projects implemented by the end of 2015 enabled us to achieve that target already in 2015. As a result, we have raised the 2020 target by 50%.

Here are some examples of how we have improved energy efficiency:

Rebuilding compressors at Volve and Sleipner

We rebuilt a compressor at Volve in 2015 to optimise energy efficiency, and as a result we were able to shut down a gas turbine. These two measures combined ensured annual savings of 48,000 tonnes of CO_2. At Sleipner, rebuilding a compressor ensured emission reductions of 14,000 tonnes of CO_2 per year.

Åsgard subsea compression

New developments represent an opportunity for avoiding emissions. One example is Åsgard, where seabed compression of gas avoids emissions of about 90,000 tonnes of CO_2 per year compared to compressing the gas on a new compressor platform (box, left).

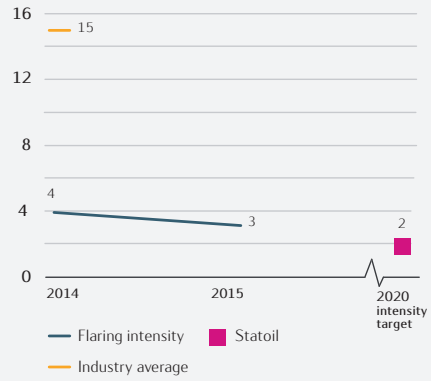
Eliminating routine flaring

We aim to avoid continuous production flaring in our operations. In 2012, as part of our commitment to the UN Sustainable Energy for All initiative, we announced a 2020 flaring intensity target of 2 tonnes of gas flared per 1,000 tonnes of hydrocarbons produced. We expect to meet this target. Through our collaboration with the Global Gas Flaring Reduction Partnership, we have set an additional target of bringing down continuous production flaring to zero by 2030.

At *Bakken*, USA, we have significantly reduced our flaring level over the past few years. We are working together with neighbouring partners and technology providers to develop flaring reduction solutions. We are required to coordinate our drilling operations with pipeline construction, to reduce the need for flaring. In 2015, we reduced our flaring volumes at *Bakken* with more than 40% compared to 2014, reaching a flaring level below 10% of produced gas in the last quarter of 2015. We thereby surpassed the state of North Dakota's established target to reduce flaring to less than 10% of produced gas by 2020.

Flaring intensity upstream

(tonnes of gas flared per 1.000 tonnes of hydrocarbons produced)

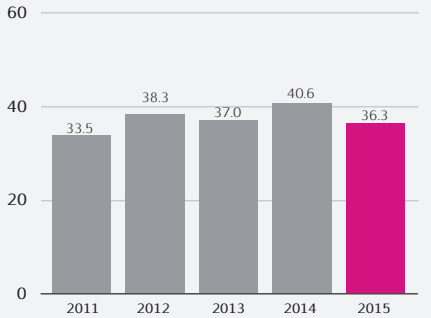


Why methane is important

- Methane (CH_4) is the main component of natural gas.
- It is a short-lived, but potent, greenhouse gas with a global warming potential that is at least 25 times greater than that of CO_2 over a 100 year period and at least 72 times greater over a 20 year period.
- Methane emissions occur throughout the oil and gas value chain.
- Sources can include venting, inefficient flares and leakages from processing equipment.

CH_4 emissions

(thousand tonnes)



In 2015, our total flaring volume was approximately 0.4 million tonnes of flared hydrocarbons, and our flaring intensity was approximately 3 tonnes of gas flared per 1,000 tonnes of hydrocarbons produced (or 0.3% of our production). This is significantly lower than the industry average of 15 tonnes of gas flared per1,000 tonnes of hydrocarbons produced (graph, left), as measured by the International Association of Oil and Gas Producers (IOGP) (Environmental Performance Indicators, 2014 data).

Safety flaring constitutes over 60% of our flaring, mostly from our offshore operations in Norway. In Norway, regulation combined with close proximity to gas infrastructure have been key to eliminating production flaring.

Reducing methane emissions

Addressing methane emissions is one of the most effective short term climate measures we can implement, and a pre-requisite for ensuring that gas is seen as a credible part of the future, lower carbon, energy mix. Methane emissions from oil and gas activities are receiving increasing interest in many countries, including in Norway and the USA, where most of our operated production takes place.

Methane emissions occur as a result of venting or leakages. As methane can be emitted from a variety sources, it can be challenging to accurately quantify emissions. This raises doubt about the magnitude of emissions.

In 2014 Statoil joined the Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership (OGMP) as a founding partner. Through this initiative, we are committed to systematically addressing methane emissions and report on annual progress. We submitted our initial implementation plan to the Partnership in June 2015, confirming the participation of all our Norwegian offshore operations. In the initial phase, we are focusing on our operated offshore installations in Norway. The results of the work done in 2015 to identify, quantify and mitigate methane emission sources will be reported to the initiative in May 2016.

We have also been involved in a collaborative project led by the Norwegian Environmental Agency to improve the identification and documentation of direct methane emission sources, assess quantification methods and identify reduction opportunities. As a result, the quantification methodologies used to report methane emissions to the Norwegian regulator are expected to be updated in 2017.

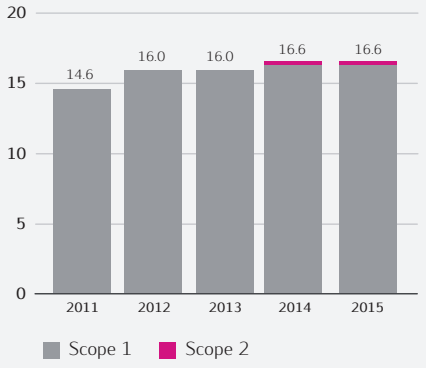
Through our participation in these initiatives, we have systematically assessed direct methane emissions for our offshore assets in Norway. We are using this learning to inform the planning of new facilities, through updates to our governing documents. This is intended to anchor best practice for methane reductions already in the design phase.

In 2015, we implemented emission reduction programmes for our US onshore assets, based upon learning from our participation in the University of Texas/Environmental Defense Fund study in 2014. The objective is to reduce fugitive methane emissions from the most dominant sources, including tank batteries, pneumatic devices and process leakages. As an example, *Eagle Ford* and *Marcellus* have several hundred pneumatic controllers. Our preventative maintenance programmes are being enhanced to include leak detection and repair activities for these devices and other equipment.

In order to improve technologies used for methane emissions management, we also joined the Environmental Defense Fund's Methane Detectors Challenge. Partners in the Challenge are supporting the identification and testing of new, cutting-edge methane sensing technologies that could help further reduce methane emissions.

GHG emissions scope 1 and 2*

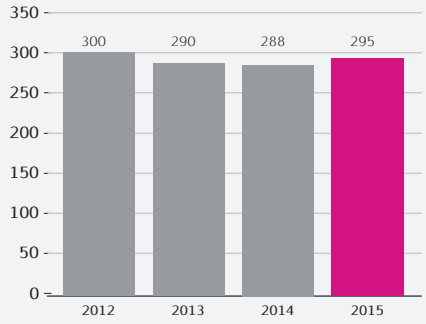
(million tonnes CO_2 equivalents)



*Scope 2 emissions are reported from 2014

GHG emissions scope 3*

(million tonnes CO_2 equivalents)



*Scope 3 based on Statoil equity production

Emissions from our products

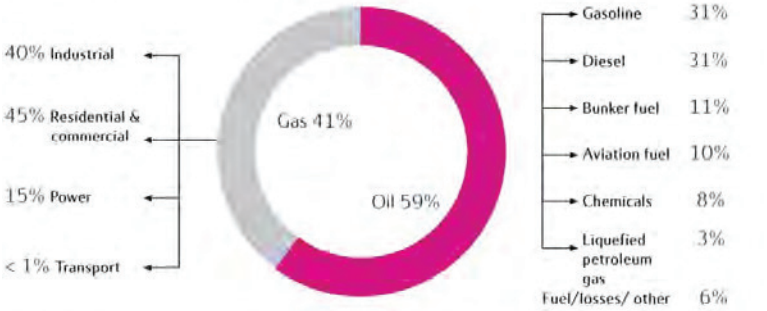
The greenhouse gas emissions related to the use of our products are almost twenty times as high as the direct emissions related to our production. These emissions come from use of our products in transportation, power generation, buildings and materials.

To significantly reduce greenhouse gas emissions related to the use of our products, technological development and efforts from many sectors are needed. Providing gas as a substitute for coal is one way in which we can contribute to an overall reduction of product emissions from fossil fuels (see graph, page 12). Another way is to support fuel and efficiency improvements in those parts of the transportation sector where we have significant involvement.

Energy efficiency is important for us when selecting suppliers and vessels for transportation. We work closely with our suppliers to explore new technologies, and in 2014 we entered into long term charter contracts for 14 new "eco-design" vessels to be delivered in the next few years. Two shuttle tankers under this programme were delivered in 2015. In addition, a supply vessel was converted to a liquefied natural gas engine.

Between 2011 and 2015, emissions from vessel operations and helicopter services provided by our suppliers for our Norwegian offshore activities decreased from 460,000 tonnes of CO_2 to about 365,000 tonnes of CO_2 (16% reduction, adjusted for activity level).

How are Statoil's products used?



Based upon equity production figures. Gas usage figures are based on an assessment of Statoil's equity production and sales agreements. Oil usage figures are based on typical Brent Blend refining yield.

Low carbon technologies

The energy transition opens up new business opportunities.

Our approach to business and growth opportunities within renewables and new energy solutions includes both commercial investments and research and development (R&D):

- We have made investments in offshore wind projects.
- We continue to be engaged in carbon capture and storage (CCS).
- A significant proportion of our R&D efforts address energy efficiency, carbon capture and renewables.
- We have established an R&D partnership with GE to find sustainable solutions for the oil and gas industry.

In May 2015, Statoil announced a new business area for *New Energy Solutions* to drive further profitable growth within these areas. This reflects our aspirations to gradually complement our oil and gas portfolio with profitable renewable energy and other low-carbon energy solutions.

Renewable energy

Within renewables, we are focusing on strengthening our technology position in floating as well as fixed foundation offshore wind power. Statoil has been actively involved in offshore wind projects for more than ten years. We are looking to develop profitable offshore wind projects in selected markets, where the political support for renewable energy and the market incentive mechanisms are favourable.

Over the past few years, the market has become more mature, with increased competition for accessing incentives. Adopting an auctioning principle for awarding contracts has become a common approach. Developers must compete by providing plans for renewable energy at the lowest cost. This approach pushes the industry to further reduce costs and subsequently reduce the need for financial support from governments. We are working to increase cost competitiveness.

Our current offshore wind portfolio consists of ownership shares in the operating fields *Sheringham Shoal and Hywind Demo* and the development of the *Dudgeon, Hywind Scotland* and the *Dogger Bank* projects. The operating wind farms currently deliver renewable energy to more than 200,000 households in the UK. This number is expected to increase to more than 600,000 households when Dudgeon comes on stream in 2017.

In addition to these operations and projects, we are looking at future offshore wind prospects in Europe. Our ambition is to grow profitably and potentially expand into other sources of renewable energy. We will seek new opportunities to deliver attractive returns through innovation and venture activities. As an example, we are looking into pioneering hybrid concepts where offshore wind supplies power to offshore oil and gas installations. As a first step, Statoil has joined the WIN WIN Joint Industry Project, led by DNV GL, which will study the feasibility of a wind powered subsea water injection system.

In February 2016, Statoil launched a USD 200 million venture capital fund dedicated to investing in growth companies in renewable energy.

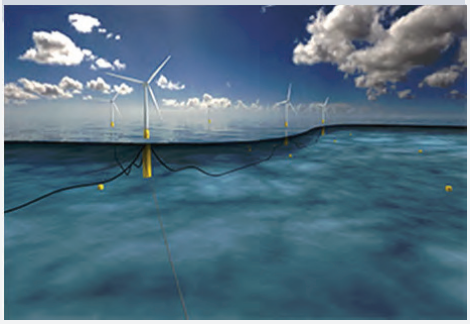
We monitor emerging technologies to assess their potential impact on the future energy landscape. This includes onshore wind, solar energy and energy storage technologies, but in a longer time perspective we are also following the development of more immature options such as hydrogen value chains, new CO_2 utilisation technologies and new marine renewable energy solutions.

Floating innovations

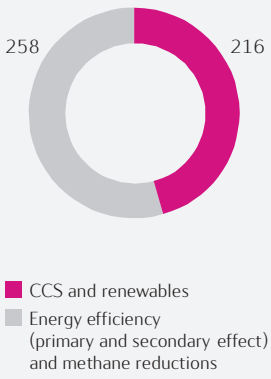
We have tested our unique floating offshore wind technology over the past six years through the single *Hywind Demo* turbine installed off the west coast of Norway.

Now we are building the *Hywind Scotland* offshore wind farm which is expected to produce 140 GWh per year and supply 20 000 Scottish households with renewable power. This is the world's first floating offshore wind park with several turbines installed and the next step towards developing a full scale commercial park. Costs have been reduced by as much as 70% from the demo to *Hywind Scotland* and cost parity for floating wind with other energy sources is targeted by 2030.

The Hywind technology opens up vast areas of development in places where conventional bottom fixed structures are not feasible. One of these areas is offshore Japan, where feasibility studies are underway.



Low carbon R&D expenses 2015
(operating expenses, NOK million)



New Energy Solutions

In operation:

- Hywind Demo 2.3 MW offshore floating wind, Norway, installed
- Sheringham Shoal, 317MW offshore wind (220,000 homes), UK, installed 2012, ownership share 40%
- Sleipner CCS, Norway, installed
- Snøhvit CCS, Norway, installed
- Technology Centre Mongstad, Norway

Planned:

- Dudgeon, 402MW offshore wind, start up 2017
- Hywind Scotland, 30MW offshore floating wind, start up 2017
- Doggerbank, 4,800MW offshore wind, consented in 2015

Total renewable energy delivered 2015
(based on Statoil's equity share)

0.5 TWh

CO_2 captured and stored (accumulated):

19.5 million tonnes

Renewable energy venture capital fund:

USD 200 million

Cleaner Energy Initiative of the Year

Powering Collaboration was recognised by the Petroleum Economist with their "Cleaner Energy Initiative of Year" award.

The award, presented in September 2015, recognises outstanding efforts to promote cleaner energy and reduce pollution as well as carbon footprint.

Carbon capture and storage

Our engagement in CCS is an integrated part of our business. It is currently the main technology for decarbonising fossil fuels and we have been using it in some of our operations for more than twenty years. Our aim is to contribute to the development of commercial scale CCS projects, and we continue to enhance our knowledge and experience through ongoing research and operating activities.

The main focus for our carbon capture activities is related to the *Technology Centre Mongstad*, where proprietary and open technologies for CO_2 capture from flue gases have been successfully tested. We have shared the results with the international CCS community, contributing to an increased confidence in capture technologies.

We have installed CCS technology at *Sleipner* and *Snøhvit* in Norway. The accumulated volume of carbon captured and stored from these two assets was some 19.5 million tonnes by the end of 2015.

We are also investigating carbon reuse opportunities, related both to enhanced oil and gas recovery and the conversion to fuel and chemical technologies. This would improve the financial context for carbon capture and could potentially open up new business opportunities.

Energy efficiency

Many of our low carbon R&D efforts are related to improving energy efficiency, with more than 50 individual projects having energy efficiency benefits as a direct or indirect objective. Through energy efficiency improvements, we can combine emissions reductions with production efficiencies and cost savings.

R&D efforts related to energy efficiency and methane reduction initiatives represented more than half of our low carbon technology R&D expenses in 2015 (chart, previous page). Our total R&D expenses in 2015 were NOK 2.7 billion.

Sub-sea compression and processing which leads to considerable energy savings, and the development of more efficient gas turbines and more efficient turbine washing technology, are some focus areas. Another example is the Powering Collaboration partnership (below).

Powering Collaboration

The Powering Collaboration programme, launched in early 2015, is a step up in Statoil's collaboration with General Electric (GE). The programme aims to drive an industrial response to significant challenges associated with global energy production, including CO_2 and methane emissions and water usage.

Leveraging the companies' collective resources and competences, the programme focuses on developing new approaches to create efficient, low-cost technologies that can be broadly implemented.

Nearly 20 projects are underway, including new technologies in both offshore and onshore operations. Projects include the development of a lighter, more compact compressor engineered to deliver more power and lower emissions as well as more competitive solutions to capture energy from heat generated in operations. We are also testing the use of liquefied CO_2 stimulation to reduce water usage and increase production in shale wells. Other projects include piloting a new methane emission monitoring system and testing a new water treatment technology that uses oilfield wastes to treat water, produce electricity and capture CO_2.

The partnership is using crowdsourcing to reach out to innovators around the world to source ideas. The first two open innovation challenges addressed reduced use of sand and water in onshore shale operations. GE Oil & Gas and Statoil will help fund the commercial development of the winning approaches.

Exhibit N

May 16, 2014

Royal Dutch Shell plc
PO Box 162
2501 AN The Hague
The Netherlands
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To whom it may concern,

We are writing this letter in response to enquiries from shareholders regarding the "carbon bubble" or "stranded assets" issue. We have recently discussed this issue with a wider group of shareholders at our annual Socially Responsible Investor event (April 10th, 2014) and this material can be found at the following publically available link.

http://www.shell.com/global/aboutshell/investor/news-and-library/presentations-2014/socially-responsible-investors-briefing-london-april-10-2014.html

Shell believes that the risks from climate change will continue to rise up the public and political agenda. We are already taking steps to minimize our emissions, and we are preparing the company for when legislation and markets will support more significant action to mitigate CO2.

However, we concur with the view in the recent Intergovernmental Panel on Climate Change ("IPCC") report that there is a high degree of confidence that global warming will exceed 2°C by the end of the 21st century. Yet this is not to argue that today's low level of action will continue at this pace. Indeed, changes in regulatory priorities could well be relatively sudden. However, because of the long-lived nature of the infrastructure and many assets in the energy system, any transformation will inevitably take decades. This is in addition to the growth in energy demand that will likely continue until mid-century, and possibly beyond. The world will continue to need oil and gas for many decades to come, supporting both demand, and oil & gas prices. As such, we do not believe that any of our proven reserves will become "stranded".

While the "stranded asset" notion may appear to be a strong and thought-through case, it does have some fundamental flaws and there is a danger that some interest groups use it to trivialize the important societal issue of rising levels of CO2 in the atmosphere. The methodology has significant gaps, not least a failure to acknowledge the significant projected growth in energy demand, the role of CCS, natural gas, bioenergy and energy efficiency measures. Energy demand growth, in our view, will lead to

fossil fuels continuing to play a major role in the energy system – accounting for 40-60% of energy supply in 2050 and beyond, for example. The huge investment required to provide energy is expected to require high energy prices, and not the drastic price drop envisaged for hydrocarbons in the carbon bubble concept.

Our New Lens scenarios show that the world can tackle and resolve the climate issue over the course of this century, but not in less time than that. Our scenarios take as pre-determined that climate change will rise up the public and political agenda.

There is no doubt that we need a more robust and thoughtful societal debate on addressing CO2 emissions, but it needs to be one that recognises the possible and pays heed to the reality of the world today and is a frank acknowledgement of the cost to society inherent in large scale shifts of the energy system.

As highlighted by the recent IPCC working group III report, action needs to be taken on:

- Reducing emissions from power generation
- Adopting carbon capture and storage ("CCS") technology
- Increasing the role of bio-derived forms of energy

In summary, Shell does not believe that any of its proven reserves will become "stranded" as a result of current or reasonably foreseeable future legislation concerning carbon. There is a risk that focusing on "stranded assets" or the concept of the "carbon bubble" distracts attention away from the reality of a growing population, increasing prosperity and growing energy demand. A fundamental transition of the energy system will be needed but that will take considerably longer than some alarmist interpretations of the unburnable carbon issue would have the public believe. Shell is focused on finding real solutions based on current energy realities to the widely acknowledged and real threat of climate change.

Shell is actively managing its CO2 footprint through:

- growing our natural gas business
- investing in low carbon bio-fuels
- investing in CCS
- investing in the energy efficiency of our own operations

We take account of future regulatory and price uncertainty into decision making by using project screening values of $70 to $110 USD / barrel for Brent crude, as well as a $3 to $5 / mmbtu range for Henry Hub gas. In addition we put a $ 40 / tonne screening value on the CO2 emitted by our projects and, for those with a high exposure to carbon pricing/legislation, we perform in-depth analysis of the potential risks to profitability.

In summary

Shell is actively managing its CO2 footprint through:

- growing our natural gas business
- investing in low carbon bio-fuels
- investing in CCS
- investing in the energy efficiency of our own operations

We take account of future regulatory and price uncertainty into decision making by using project screening values of $70 to $110 USD / barrel for Brent crude, as well as a $3 to $5 / mmbtu range for Henry Hub gas. In addition we put a $ 40 / tonne screening value on the CO2 emitted by our projects and, for those with a high exposure to carbon pricing/legislation, we perform in-depth analysis of the potential risks to profitability.

Shell does not believe that any of its proven reserves will become "stranded" as a result of current or reasonably foreseeable future legislation concerning carbon. There is a risk that focusing on "stranded assets" or the concept of the "carbon bubble" distracts attention away from the reality of a growing population, increasing prosperity and growing energy demand. A fundamental transition of the energy system will be needed, but that will take considerably longer than some alarmist interpretations of the unburnable carbon issue would have the public believe. Shell is focused on finding real solutions based on current energy realities to the widely acknowledged and real threat of climate change.

Yours Sincerely,

Dr JJ Traynor

Executive Vice President, Investor Relations

Royal Dutch Shell plc

Definitions and cautionary note:

Reserves: Our use of the term "reserves" in this presentation means SEC proved oil and gas reserves.

Resources: Our use of the term "resources" in this presentation includes quantities of oil and gas not yet classified as SEC proved oil and gas reserves. Resources are consistent with the Society of Petroleum Engineers 2P and 2C definitions.

Organic: Our use of the term Organic includes SEC proved oil and gas reserves excluding changes resulting from acquisitions, divestments and year-average pricing impact.

Resources plays: our use of the term 'resources plays' refers to tight, shale and coal bed methane oil and gas acreage.

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate entities. In this letter "Shell", "Shell group" and "Royal Dutch Shell" are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to subsidiaries in general or to those who work for them. These expressions are also used where no useful purpose is served by identifying the particular company or companies. "Subsidiaries", "Shell subsidiaries" and "Shell companies" as used in this letter refer to companies over which Royal Dutch Shell plc either directly or indirectly has control. Companies over which Shell has joint control are generally referred to "joint ventures" and companies over which Shell has significant influence but neither control nor joint control are referred to as "associates". In this letter, joint ventures and associates may also be referred to as "equity-accounted investments". The term "Shell interest" is used for convenience to indicate the direct and/or indirect (for example, through our 23% shareholding in Woodside Petroleum Ltd.) ownership interest held by Shell in a venture, partnership or company, after exclusion of all third-party interest.

This letter contains forward-looking statements concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management's current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market risks and statements expressing management's expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as "anticipate", "believe", "could", "estimate", "expect", "goals", "intend", "may", "objectives", "outlook", "plan", "probably", "project", "risks", "schedule", "seek", "should", "target", "will" and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this letter, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell's products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; and (m) changes in trading conditions. All forward-looking statements contained in this letter are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Royal Dutch Shell's 20-F for the year ended December 31, 2013 (available at www.shell.com/investor and www.sec.gov). These risk factors also expressly qualify all forward looking statements contained in this presentation and should be considered by the reader. Each forward-looking statement speaks only as of the date of this letter, 16 May 2014. Neither Royal Dutch Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this letter.

We may have used certain terms, such as resources, in this letter that United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. U.S. Investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website www.sec.gov. You can also obtain these forms from the SEC by calling 1-800-SEC-0330.

The New Lens Scenarios are part of an ongoing process used in shell for 40 years to challenge executives' perspectives on the future business environment. We base them on plausible assumptions and quantification, and they are designed to stretch management to consider even events that may be only remotely possible. Scenarios, therefore, are not intended to be predictions of likely future events or outcomes and investors should not rely on them when making an investment decision with regard to Royal Dutch Shell plc securities.

Exhibit O

NEWS ADVISORY

Luther Strange

Alabama Attorney General

FOR IMMEDIATE RELEASE
March 30, 2016

For More Information, contact:
Mike Lewis (334) 353-2199
Joy Patterson (334) 242-7491

STATE AG's STRANGE, PRUITT CONDEMN ATTEMPTS TO SILENCE THOSE WHO DISAGREE WITH PRESIDENT OBAMA'S ENERGY AGENDA

(MONTGOMERY) – Alabama Attorney General Luther Strange and Oklahoma Attorney General Scott Pruitt released the following statement Wednesday:

"Yesterday, Al Gore, New York Attorney General Eric Schneiderman, and a small handful of other East Coast State Attorneys General announced what they called an "unprecedented coalition" that "vows to defend climate change progress made under President Obama and to push the next President for even more aggressive action" by seeking to criminally investigate energy companies for disputing the science behind global warming.

"We won't be joining this effort, and we want to explain why. Reasonable minds can disagree about the science behind global warming, and disagree they do. This scientific and political debate is healthy, and it should be encouraged. It should not be silenced with threats of criminal prosecution by those who believe that their position is the only correct one and that all dissenting voices must therefore be intimidated and coerced into silence. It is inappropriate for State Attorneys General to use the power of their office to attempt to silence core political speech on one of the major policy debates of our time.

"We are proud to be a part of a different coalition, one driven by respect for the rule of law, rather than by ambition to use the law to silence voices with which we disagree. Our coalition of 29 states is leading the fight to challenge the legality of President Obama's plan to kill off fossil fuels – his so-called "Clean Power Plan." The 29 states and state Attorneys General who are part of this effort respect our proper role, which is not to pick winners and losers in the energy sector nor to silence those who disagree with us, but rather to ensure that the EPA is acting consistent with the power granted to it by Congress and to fulfill our statutory duties to ensure that the consumers in our states have access to reliable, affordable energy. In fulfilling these duties, the 29 states and their Attorney Generals understand that all sources of energy should be considered – not just those that we may prefer for one policy reason or another – so that we give ourselves the best possible chance to achieve our goal of energy independence, with reliable and affordable energy available at the lowest possible cost to our citizens."

--30--

Exhibit P

OFFICE OF THE ATTORNEY GENERAL
State of Louisiana

JEFF LANDRY

RECENT NEWS

3/30/2016 11:47:00 AM

Attorney General Jeff Landry Slams Al Gore's Coalition

BATON ROUGE, LA – Louisiana Attorney General issued the following statement after yesterday's press conference by former Vice President Al Gore and those state Attorneys General supportive of the EPA's power plant regulation halted last month by the United States Supreme Court:

"While I was not surprised to see these Attorneys General announce their intention to continue working in support of the unlawful and misguided Clean Power Plan – I was disturbed by their parallel announcement to 'use all tools at [their] disposal to fight for Climate Progress,' including the unfettered investigation of individual coal, oil, and natural gas companies' past or current climate opinions, views, or research. It is one thing to use the legal system to pursue public policy outcomes; but it is quite another to use prosecutorial weapons to intimidate critics, silence free speech, or chill the robust exchange of ideas.

We have seen powerful forces at work nationally targeting, most recently and visibly, our nation's coal industry. It is now abundantly clear that the crosshairs have shifted to our country's oil and natural gas industries.

In contrast to yesterday's news conference by 16 state Attorneys General from largely non-oil and gas producing states, Louisiana stands with more than 29 states and state agencies who remain in steadfast opposition to the EPA's Clean Power Plan. I will continue to work my fellow Attorneys General from across the country to ensure Louisiana workers, job creators, and consumers are not burdened by the EPA's overreach or threatened by this new and disturbing development of unleashing the prosecutorial arsenal to quell dissent on such an important issue of public debate."

Exhibit Q

Kansas AG Takes On Al Gore's Alarmism — Won't Join Ant-Exxon 'Publicity Stunt'

Posted By Michael Bastasch On 10:49 AM 04/04/2016 In | No Comments

Kansas Republican Attorney General Derek Schmidt had some harsh words for Democratic attorneys general who recently joined former Vice President Al Gore to call for more investigations into ExxonMobil's stance on global warming.

"I want to assure you that the State of Kansas is not participating in the Gore group's initiative, which one reporter at the New York news conference likened to a 'publicity stunt,'" Schmidt wrote in a letter to the Kansas Corporation Commission.

Schmidt sent the letter Friday after 17 Democratic attorneys general met in New York City to announce they would fight to support the Environmental Protection Agency's so-called Clean Power Plan from legal challenges. New York AG Eric Schneiderman, who led the group, also called for more investigations into Exxon's alleged misleading of the public over global warming science.

Currently, New York, California, Massachusetts and the U.S. Virgin Islands are investigating Exxon's activities surrounding global warming, which are all inspired by reporting from InsideClimate News and Columbia University. Schmidt said he would not be joining the other AGs in investigating Exxon.

"Eleven of the 17 attorneys general who participated are the same folks who took part in the 2010 sue-and-settle lawsuit that used federal courts to try to force the adoption of the federal energy regulations that became the 'Power Plan,'" Schmidt wrote.

"If anything was 'unprecedented' about the event this week it was the strictly partisan nature of announcing state 'law enforcement' operations in the presence of a former vice president of the United State who, presumably, has no role in the enforcement of the 17 states' securities or consumer protection laws," he wrote.

At the AG event, Gore claimed Exxon was committing "fraud" by supposedly covering up, for decades, science about how bad global warming would get all while funding groups opposed to energy regulations and those skeptical of climate science.

New York AG Schneiderman even suggested harsher punishments than financial penalties for companies that mislead the public on global warming.

"Financial damages alone may be insufficient," Schneiderman said during the Tuesday event in New York City Tuesday. "The First Amendment does not give you the right to commit fraud."

For months, Democratic politicians have been calling for the Department of Justice (DOJ) to launch a Racketeer Influenced and Corrupt Organizations Act, or RICO, investigation into groups they see as casting doubt on the theory of catastrophic global warming. RICO is what the DOJ used to go after the tobacco industry for misleading the public about the dangers of smoking.

"But, this vast denial apparatus that propagates the false doubt, that props up the phony science, that gets these yahoos who can't survive … peer-reviewed scrutiny onto Fox News, onto the cable shows, saying that their scientists, they create an artificial conflict about this and that's why I think there's doubt," Rhode Island Democrat Sen. Sheldon Whitehouse, the main proponent of using RICO against skeptics and fossil fuel groups, told attendees at a League of Conservation Voters event in 2015.

"A lot of people haven't seen through the scam that's being perpetrated," Whitehouse said. "So that's one of the reasons I hope that we get another lawsuit out of the Department of Justice, like the one they brought against the tobacco industry that showed that the whole fraudulent scam was a racketeering enterprise, held them accountable for it."

There are, however, major constitutional concerns with launching a RICO probe into groups who disagree with Democrats on global warming. Either way, Schmidt pledged not to go along with the Democratic crusade against Exxon.

"In Kansas, we won't take our eye off the ball," Schmidt wrote. "The federal administration's attempt to impose central economic planning over our nation's energy sector threatens to significantly drive up the cost of electricity for hard-working Kansas families and businesses."

Follow Michael on Facebook and Twitter

Exhibit R

WASHINGTON Examiner

West Virginia AG 'disappointed' in probes of Exxon Mobil

By KYLE FELDSCHER (@KYLE_FELDSCHER) • 4/5/16 3:17 PM

The investigation by three attorneys general into what Exxon Mobil knew about climate change and when is driven by political desire to push climate change policies, West Virginia's attorney general said Tuesday.

Speaking on the "Inside Shale Weekly" radio show in West Virginia, Patrick Morrisey said he was deeply disappointed by the attorneys general from New York, Massachusetts and the U.S. Virgin Islands investigating Exon Mobil for possibly covering up its knowledge of climate change.

Morrisey said he believed the attorneys general are abusing the powers of their office and said he was "disappointed."

"They're looking at additional measures in order to address their policy ideas, but that's not what it's about to be attorney general," he said. "You cannot use the power of the office of attorney general to silence your critics."

New York Attorney General Eric Schneiderman announced he is investigating what Exxon Mobil knew and when, and reports indicate California Attorney General Kamala Harris began doing

the same in January. Last week, Massachusetts Attorney General Maura Healey and U.S. Virgin Islands Attorney General Claude Earle Walker announced they would do the same.

The investigations stem from media reports that Exxon Mobil learned in 1977 from a senior scientist that burning fossil fuels would warm the planet. A year later, the company began researching how carbon dioxide released from the burning of fossil fuels would affect the planet.

Six years after the internal document was produced, Exxon Mobil went on the offensive, according to the report. The company began paying for efforts that would cast doubt on climate change, including founding the Global Climate Coalition.

At the same time, the company was building climate change projections into the company's future plans. Among those plans was future drilling in the Arctic because the polar ice caps would melt.

Exxon Mobil has repeatedly denied the claims and has cast aspersions on the media reports, noting that Inside Climate News received funding from the Rockefeller Brothers Fund, which works against climate change.

Morrisey, who is one of the 30 attorneys general suing the Obama administration to block the Clean Power Plan regulations on power plants, said he believed the attorneys general are acting because they're concerned the regulation may be struck down.

The Supreme Court stayed the plan in February until legal challenges are completed. Morrisey said he thinks the attorneys general got "more aggressive" after that.

"They want to eliminate fossil fuels and that should not be driving anything," Morrisey said. "I won't speak to whether it does, but it should not be driving any legal activity."

Exhibit S

Kline, Scot

From: Michael Meade <Michael.Meade@ag.ny.gov>
Sent: Tuesday, March 22, 2016 4:51 PM
To: Kline, Scot; Morgan, Wendy
Cc: Lemuel Srolovic; Peter Washburn; Eric Soufer; Damien LaVera; Daniel Lavoie; Natalia Salgado; Brian Mahanna
Subject: RE: Climate Change Coalition

A couple of updates to report back to the group. First, after a follow up conversation with our AG, Al Gore will now be joining us for part of the day on 3/29. This will certainly add a little star power to the announcement!

We will also be joined by MA AG Healey, which will bring our total number of AG's to a grand total of 7. I'm waiting to hear back from New Mexico, which is our possible 8th Attorney General. On the staff side, a total of 16 states (including DC and USVI) will be joining us for the meetings.

From: Kline, Scot [mailto:scot.kline@vermont.gov]
Sent: Tuesday, March 22, 2016 11:41 AM
To: Michael Meade; Morgan, Wendy
Cc: Lemuel Srolovic; Peter Washburn; Eric Soufer; Damien LaVera; Daniel Lavoie; Natalia Salgado; Brian Mahanna
Subject: RE: Climate Change Coalition

Mike:

Looks good. One suggestion. We are thinking that use of the term "progressive" in the pledge might alienate some. How about "affirmative," "aggressive," "forceful" or something similar?

Thanks.

Scot

From: Michael Meade [mailto:Michael.Meade@ag.ny.gov]
Sent: Monday, March 21, 2016 2:59 PM
To: Kline, Scot <scot.kline@vermont.gov>; Morgan, Wendy <wendy.morgan@vermont.gov>
Cc: Lemuel Srolovic <Lemuel.Srolovic@ag.ny.gov>; Peter Washburn <Peter.Washburn@ag.ny.gov>; Eric Soufer <Eric.Soufer@ag.ny.gov>; Damien LaVera <Damien.LaVera@ag.ny.gov>; Daniel Lavoie <Daniel.Lavoie@ag.ny.gov>; Natalia Salgado <Natalia.Salgado@ag.ny.gov>; Brian Mahanna <Brian.Mahanna@ag.ny.gov>
Subject: Climate Change Coalition

Wendy and Scott,

Below are the broad goals and principles that we'd like to lay out as part of the coalition announcement next week. The filing of the brief and the defense of the EPA regs will highlight these principles. Let us know if you have any thoughts or edits to this. If it looks okay to you, I'll forward this around to the other offices when we have a draft release ready to go out. I'll also be asking the offices to contribute a quote from their respective AG's for the press release.

Let me know if you have any questions or comments.

Mike

****

Climate Coalition of Attorneys General

Principles:

- **Climate Change is Real**

The evidence that global temperatures have been rising over the last century-plus is unequivocal.

- **Climate Change Pollution Is The Primary Driver**

Natural forces do not explain the observed global warming trend.

- **People Are Being Harmed**

Climate change represents a clear and present danger to public health, safety, our environment and our economy -- now and in the future.

- **Immediate Action Is Necessary**

Climate change – and its impacts – is worsening. We must act now to reduce emissions of climate change pollution to minimize its harm to people now and in the future.

Pledge:

We pledge to work together to fully enforce the State and federal laws that require progressive action on climate change and that prohibit false and misleading statements to the public, consumers and investors regarding climate change.

- **Support Progressive Federal Action; Act Against Federal Inaction**

Support the federal government when it takes progressive action to address climate change, and press the federal government when it fails to take necessary action.

- **Support State and Regional Action**

Provide legal support to progressive state and regional actions that address climate change, supporting states in their traditional role as laboratories of innovation.

- **Defend Progress**

Serve as a backstop against efforts to impede or roll-back progress on addressing climate change.

- **Support Transparency And Disclosure**

Ensure that legally-required disclosures of the impacts of climate change are fully and fairly communicated to the public.

- **Engage The Public**

Raise public awareness regarding the impacts to public health, safety, our environment and our economy caused by climate change.

Exhibit T

From: Peter Washburn <Peter.Washburn@ag.ny.gov>
Sent: Friday, March 25, 2016 11:49 AM
To: Lemuel Srolovic; Kline, Scot; Morgan, Wendy
Cc: Michael Meade
Subject: Afternoon Discussion: State Responses
Attachments: Question Responses.docx

Wendy, Scot, Lem –

For this afternoon's discussion. See attached responses received from participating states re: what they are looking to add to/get out of the afternoon discussion.

As an overall summary, the responses demonstrate a strong desire among the states to learn what each other are up to -- a validation of the value of this meeting – as well as to support and sustain coordination on individual and collective efforts into the future – a validation of the value of a coalition.

Attorneys General Climate Change Coalition

Questionnaire Responses

(1) What do you hope to get or learn during the afternoon? We want to make sure we cover what we can of your particular interests.

CT (Matthew Levine) – I hope to learn more about the substance of the disclosure investigation and the legal theories to support taking any action. It would also be helpful to understand the magnitude of such an action and the resources available to undertake it.

DC (Elizabeth Wilkins) – I am interested in hearing generally what other states are doing on climate change-related efforts and, in particular, in how they've staffed these efforts if they do not have a section dedicated to environmental issues.

IL (James Gignac) – Nothing more specific than what the agenda items are designed to draw out (discussion of coordination, possible new initiatives, etc.).

MA (Melissa Hoffer) – We'd like to learn the status of other states' investigations/plans and potential avenues for information sharing and coordination.

ME (Jerry Reid) – I am interested in learning more about potentially unfair and deceptive trade practices of Exxon as they relate to global warming, and the level of interest among our states in pursuing these claims.

OR (Paul Garrahan) – We look forward to learning about NY's oil company investigation, primarily. And to hear any other ideas you and other states may have. And to build our working relationship.

RI (Greg Schultz) – I am most interested in personally meeting the various state AAGs that I have worked with since 2009 on Clean Air Act and Climate Change issues. I would also be interested in looking ahead to our challenges for this year and beyond, such as possible other EPA-related actions and rulemaking, etc.

USVI (Claude Earl Walker) – We are eager to hear what other attorneys general are doing and find concrete ways to work together on litigation to increase our leverage.

VA (Daniel Rhodes) – We are mostly interested in hearing about efforts ongoing in the other jurisdictions present and how Virginia may complement those efforts and move forward here.

WA (Laura Watson) – We are interested in the discussion about utility efforts to barrier renewables. I am told that this has not been a problem in our state, or at least not a problem that we currently have the tools to address. I am interested in hearing what types of issues other states are seeing and what tools they are using to address those.

We are also interested in finding out whether other states are taking action on ocean acidification or whether this is largely a West Coast issue at this point.

We are also wondering whether other states are looking at the insurance side of things. Are states running into issues with insurance companies limiting coverage for climate-related claims?

(2) Please provide a very brief description of the office activities you will describe at the 1:45 segment of the agenda. We'd like to group related activities together. You will have 2-3 minutes to describe your activities.

CT (Matthew Levine) – I can briefly describe the various legal actions that Connecticut has participated in (many of which we have joined with New York and the extended coalition of States). I can also discuss Connecticut's extensive efforts to combat climate change through actions by our agency and shifting to renewable sources of energy. We have been successful in defending several legal challenges to the State's commitment to increase renewables sources of energy.

DC (Elizabeth Wilkins) – DC has not previously taken many affirmative steps to combat climate change. To the degree that we have had any involvement, it has been because we represent our Department of Energy and Environment in front of our Public Service Commission on matters related to creating incentives for more widespread use of sustainable energy.

IL (James Gignac) – Climate and energy-related activities of the Illinois Attorney General's Office include:

- Participation in federal multi-state cases involving air quality and carbon emissions;
- Enforcement actions and state regulatory matters involving coal-burning power plant emissions and coal ash;
- FERC and MISO issues involving capacity payments to coal plants;
- Financial challenges of coal industry (both mining and power sectors);
- Involvement in state level policy and regulations on energy efficiency, renewables, and utility business models

MA (Melissa Hoffer) – Advancing clean energy and making smart energy infrastructure investments (addresses our positions on new gas pipelines, LTKs for cleaner energy); promoting utility customer choice (solar incentives, grid mod); readiness and resilience (storm response, grid mod).

ME (Jerry Reid) – Maine has long participated with New York, Massachusetts and other like-minded states in litigation to bring about meaningful federal regulation of greenhouse gas emissions. Today this is primarily in the form of litigation supporting EPA in challenges to the Clean Power Plan.

OR (Paul Garrahan) – I assume this item is asking what work out offices are doing on climate change issues? Other than our CAA litigation with other states, we are also defending Oregon's Clean Fuels Program (low carbon fuel standards) at the 9th Circuit (after successfully getting the challenge dismissed by the district court) and at the Oregon Court of Appeals (rule making challenge). We also continue to defend the state in a public trust doctrine case asserting that the state has not taken sufficient steps to cut GHG emissions. That case is also currently at the Oregon Court of Appeals (for a second time).

RI (Greg Schultz) – I'm not sure exactly what you are looking for here. Perhaps I could discuss the challenges of working in a small state with limited environmental staff. For instance, as part of a 3-person Environmental and Land Use Unit within the RIAG's office, I prosecute a wide variety of civil environmental enforcement actions in state court; defend state agencies on environmental and related matters; litigate state's rights in land, including public rights-of-way, beaches and parks; counsel state agencies on environmental matters, including rulemaking; represent the State in multi-state environmental litigation, etc.

USVI (Claude Earl Walker) – We just finished litigation against Hess Oil over an enforcement matter relating to Hess's decision to close its oil refinery in St. Croix, Virgin Islands, after receiving billions of dollars in tax breaks. As part of our $800 million settlement, we were able to create an environmental response trust that will deal with clean-up of the site and help convert part of it to solar development, we hope. We also have issued a subpoena to ExxonMobil and are preparing third party subpoenas on the common issue of its potential misrepresentations regarding its knowledge of climate change.

VA (Daniel Rhodes) – No response.

WA (Laura Watson) – As you know, Washington State is one of the parties to the multi-state litigation defending the Clean Power Plan. We have also intervened in a lawsuit in defense of Oregon's low carbon fuel standard. We are looking at possible causes of action based on fossil fuel company disclosures and have just started looking at possible common law causes of action (e.g., nuisance suits). Other than that, the bulk of our climate work consists of providing legal support to our clients in the Governor's Office and the Department of Ecology. Specifically, we are supporting a regulatory effort to cap carbon emissions from transportation fuels, natural gas, and stationary sources. We are also providing legal support related to the development of environmental impact statements for two large coal export facilities proposed in Washington and three proposed oil terminals.

(3) Specific items you would like to discuss in the discussion of expanding the coalition's work beyond the federal/EPA advocacy and litigation.

CT (Matthew Levine) – None.

DC (Elizabeth Wilkins) – Nothing to add – DC will most likely be primarily in listening mode as this work is new for us.

IL (James Gignac) – Consider how to increase our office's coordination on matters involving DOE, FERC, and ISOs/RTOs. How we can be better link the consumer and environmental interests of our offices in these venues? Similarly, regarding state energy and climate policies, can we strengthen or bolster our office's sharing of knowledge, materials, experts, etc. on things like energy efficiency, renewable portfolio standards, demand response, net metering, and utility rate design? Finally, I would be interested in talking with any other states (time permitting) dealing with coal mine or power plant closures and issues of jobs, property taxes, decommissioning or clean-up, and site re-use.

MA (Melissa Hoffer) – See above.

ME (Jerry Reid) – None.

OR (Paul Garrahan) – We don't have any particular ideas, other than our interest in the possible oil company litigation, but we are open to other possibilities.

RI (Greg Schultz) – I am open for any discussion. I would like to hear from the NHAG and other states on their MTBE litigation.

USVI (Claude Earl Walker) – We are interested in identifying other potential litigation targets.

VA (Daniel Rhodes) –Not sure we have specific items for the afternoon discussion at this time but likely will be prompted by the discussions. We would be very interested in any discussion and thoughts about resource sharing through collaborative thinking in the formation of coalition building.

WA (Laura Watson) – I think I probably covered this in response to the first question. The only thing I'd add is that we're interested in the legal theories under section 115 of the federal Clean Air Act, although it looks like the focus in the agenda is on non-federal actions.

(4) Will any consumer protection or securities staff be participating? Fossil fuel company disclosure investigations raise consumer protection and securities issues as well as climate change. If enough folks from that part of your offices are participating, we could plan a break out session for them.

CT (Matthew Levine) – We will not have someone from our Consumer protection division but I work closely with that group and am getting familiar with the consumer protection and securities issues related to climate change and we would likely be the group (environment) that works on these issues.

DC (Elizabeth Wilkins) – I will be the only person from DC participating.

IL (James Gignac) – Not in the meeting itself, but we have do have consumer protection staff interested in learning more about the issues. We do not have securities staff.

MA (Melissa Hoffer) – No.

ME (Jerry Reid) – No.

OR (Paul Garrahan) – Yes. Sr AAG Tim Nord will attend from our consumer protection unit.

RI (Greg Schultz) – No.

USVI (Claude Earl Walker) – Yes, we will have our outside counsel/Special Assistant Attorney General, who has specialized in consumer protection work.

VA (Daniel Rhodes) – No response.

WA (Laura Watson) – Our CP folks will not be attending but I have been in contact with them and intend to report back to them after the meeting. I've reviewed our office's internal analysis on the various causes of action available in Washington State and can contribute at least generally to the discussion.

(5) Any other thoughts about the afternoon's working session?

CT (Matthew Levine) – None.

DC (Elizabeth Wilkins) – None.

IL (James Gignac) – None.

MA (Melissa Hoffer) – None.

ME (Jerry Reid) – None.

OR (Paul Garrahan) – We look forward to the discussion.

RI (Greg Schultz) – I would be interested in discussing the possibility of setting up additional AG meetings with NESCAUM (Northeast States for Coordinated Air Use Management) on regional air issues (NESCAUM works closely with state air agencies on a variety of air issues). I work closely with my state air agency, but never seem to sit down with them to discuss their specific issues and concerns.

USVI (Claude Earl Walker) – None.

VA (Daniel Rhodes) – None.

WA (Laura Watson) – None.

Exhibit U

From: Morgan, Wendy
Sent: Wednesday, March 30, 2016 5:29 PM
To: Peter Washburn; Kline, Scot
Subject: RE: Follow-up thank you letter

You can have it "signed" by Scot if you want – it was a very environmental group ☺

From: Peter Washburn [mailto:Peter.Washburn@ag.ny.gov]
Sent: Wednesday, March 30, 2016 5:28 PM
To: Kline, Scot <scot.kline@vermont.gov>
Cc: Morgan, Wendy <wendy.morgan@vermont.gov>
Subject: Re: Follow-up thank you letter

Good point. Should it be "signed" by you or wendy?

Message sent from a Blackberry device

From: Kline, Scot [mailto:scot.kline@vermont.gov]
Sent: Wednesday, March 30, 2016 04:42 PM
To: Peter Washburn
Cc: Morgan, Wendy <wendy.morgan@vermont.gov>
Subject: RE: Follow-up thank you letter

Peter:

Thanks for the draft. Your idea of a thank you is a great one. The draft looks good. One small suggestion. On the "Exxon/Fossil Fuel Company Investigations" can we drop the word "Investigations" from that so it would just be the "Exxon/Fossil Fuel Companies" working group. Not all of the states have yet opened a formal investigation and there is some sensitivity here (and I suspect in some other states) to saying or indicating we have.

Thanks.

Scot

From: Peter Washburn [mailto:Peter.Washburn@ag.ny.gov]
Sent: Wednesday, March 30, 2016 3:01 PM
To: Morgan, Wendy <wendy.morgan@vermont.gov>; Kline, Scot <scot.kline@vermont.gov>
Subject: Follow-up thank you letter

Wendy/Scott – For your review, below is a draft of a thank you and follow-up letter to yesterday. As Lem is out until Monday, the plan would be for me to send this out on behalf of him and you.

* * *

On behalf of Attorneys General Schneiderman and Sorrell, we would like to thank you for participating in yesterday's meeting. We thought the day was very productive, and created a foundation for strengthening and furthering collaboration among our offices in addressing climate change.

We'd also like to remind you that the coalition's first call is scheduled for **Tuesday, April 12th at 1pm EST.** Call-in information will be forwarded in advance.

In addition to generally discussing issues and interests related to the coalition's next steps during this call, we'd like to firm up participation in and plans for working groups. The two working groups formed yesterday, and the states expressing interest in participating on them, are listed below:

Exxon/Fossil Fuel Company Investigations
CA, CT, DE, IL, MA, ME, NM, NY, RI, USVI, VT, and WA

Roadblocks To Renewables
CT, IL, MA, NY, and RI

Finally, we'll soon be forwarding a common interest agreement for your review, with the goal of everyone signing on in advance of the April 12th call.

Thank you again for participating in yesterday's coalition kick-off meeting – we look forward to continuing to work with you on this critical effort.

Lem Srolovic, NY

Scott Kline/Wendy Morgan, VT