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Folder Title:
Environment: Climate Change [2]

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EXECUTIVE OFFICE OF THE PRESIDENT

15-Jul-1996 02:58pm

TO: Raymond Prince

FROM: Stephen R. Seidel
Council on Environmental Quality

SUBJECT: Draft Questions on Key assumptions

Q: What if key assumptions (e.g., energy prices, economic growth) underlying the setting of a target prove wrong making it much harder and more costly to meet? Shouldn't we condition meeting any binding target on the validity of these key assumptions over time?

A: The United States has cautioned that any target should be realistic, based on a clear view of what can be achieved. Furthermore, we have urged in our proposed framework, that flexible, cost-effective approaches be fully utilized including such possibilities as joint implementation, verifiable banking and trading, and targets defined as rolling multi-year averages. Combining realistic targets with flexible implementation should provide adequate safeguards against unintended impacts of meeting a binding target.

*FC Energy
Env (Climate
Cry)*

Q: The U.S. has recommended a binding, medium-term emissions target which it promises will be realistic and achievable. But what guarantee do American industry and workers have that the U.S. will not have to adopt measures to meet target deadlines that will severely impact profits and employment in certain industries if the Administration's assumptions about growth rates, energy efficiency, technology and other variables prove incorrect?

A: Any commitment that the United States makes to a binding, medium-term emissions target will be conditioned on assumptions about the rate of economic growth, the price of oil, and other economic factors. This type of agreement will ensure that the U.S. is not forced to make uneconomic adjustments to reduce emissions that are above the target simply because GDP growth turns out to be higher than anticipated. The goal here is to improve energy efficiency, not to reward countries that pursue slow growth policies or to punish countries that grow faster than anticipated.

7/12
Ray Pomeroy FAX'd to
Rope Pomeroy, State
Dept



MEMBER

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON, D.C. 20500

July 11, 1996

Handwritten notes:
F.
H.
(Chen)
Chen

MEMORANDUM FOR STEVE SEIDEL, SPECIAL COORDINATOR FOR CLIMATE CHANGE,
COUNCIL ON ENVIRONMENTAL QUALITY

FROM: ALICIA MUNNELL *[Signature]*

SUBJECT: Clearance on U.S. Statement for Climate Conference of Parties

The Council of Economic Advisers generally supports the positions in the proposed U.S. statement. We have two specific changes to recommend:

- page 2, we recommend that a qualifier be placed before the statement on direct risks to human health as a recognition that there continues to be some disagreement among U.S. researchers concerning the likelihood of an increase in vector-borne diseases. For example, the statement could be amended to read:

"Human health may be at risk from projected increases in the spread of diseases like malaria, yellow fever and cholera;"

- page 4, we recommend caution in making comments that suggest or imply significant reductions in greenhouse gas emissions can be realized through so-called "no-regrets" policies, i.e. reductions which have zero, or even negative cost, to the economy. The importance of no-regret policies is dependent on our ability to increase the rate of diffusion of new technology throughout the economy and the size of the over-all reductions called for. Both of these questions are being examined in the on-going analysis referred to in the proposed statement. We, therefore, recommend replacing the next-to-last sentence in bullet one with the following statement:

"Measured adjustments today will enable all nations to mitigate in an economically sensible manner."

We also recommend the last sentence in bullet two be changed to read:

"This is a global problem with global impacts and therefore requires solutions that are fair, and that will ensure prosperity--now and in the future--for all the world's people. [thereby, deleting the phrase "enhanced, not diminished"]"

*Copy
Pruitt*

July 10, 1996

MEMORANDUM

SUBJECT: Clearance on U.S. Statement for Climate Conference of Parties *S Seidel*

FROM: Steve Seidel, Special Coordinator for Climate Change, CEQ

TO: Rosina Bierbaum, OSTP
Mark Chupka, DOE
Dirk Forrister, DOE
Frank Kruesi, DOT
David Gardner, EPA
T.J. Glauthier, OMB
Josh Gottbaum, Treasury
Doug Hall, NOAA
Jennifer Haverkamp, USTR
Jeffrey Hunker, Commerce
Pete Jordan, OVP
Alicia Munnell, CEA
Mary Nichols, EPA
Charlie Rawls, USDA
David Sandalow, NSC/CEQ
Lois Schiffer, DOJ
Ellen Seidman, NEC

Attached for your review is a draft of Tim Wirth's statement for the Climate Convention's Conference of Parties. Comments are due back to me by 2 pm this Friday, July 12th. His speech is strictly embargoed until after it is given on Wednesday, July 17th.

Comments can be sent to me by fax at 456-6546 or phone at 395-3706.

DRAFT STATEMENT

**Second Conference of the Parties
Framework Convention on Climate Change**

**Geneva, Switzerland
July 17, 1996**

Thank you, Mr. Chairman. Let me begin by congratulating you, Mr. Chimutengwende, on your selection as Chair of the Conference. My government appreciates your willingness to assume this important role and the leadership you have brought to this task. I also want to take this opportunity to congratulate the distinguished representative from Germany, Angela Merkle, for the remarkable job that she did in guiding the work under this Convention over the past several years. The task of moving forward more than 150 nations is difficult enough. In this instance, however, the challenge has been compounded by the fact that we are dealing with what is probably the most complicated scientific, environmental, economic and political challenge in history. The community of nations are in your debt for hosting us and helping us reach the mandate agreed upon in Berlin last year.

Since Berlin, our deliberations have benefitted from the careful, comprehensive and (I feel compelled to say) uncompromised work of the Intergovernmental Panel on Climate Change, whose efforts serve as the foundation for international concern and whose clear warnings about current trends are the basis for the sense of urgency which my government holds in these matters. In this regard, Mr. Chairman, I want to note that the United States is proud of the more than \$1 billion annual investment it has been making in recent years on global change research. This is a cost we have taken on in order to enhance our own and the world's understanding of the Earth's atmospheric, oceanic and biological systems and represents not only the seriousness with which we view these matters, but also

the willingness of President Clinton and the American people to help pioneer progress on behalf of the environment.

My government took very seriously the IPCC's recently issued Second Assessment Report, which underscored and amplified the panel's initial work -- refining estimates and revealing new understandings that serve to signal even louder alarm bells. From our perspective, the most salient of these findings are as follows:

- The chemical composition of the atmosphere is being altered by anthropogenic emissions of greenhouse gases.
- The continued buildup of these gases will enhance the natural greenhouse effect and cause the global climate to change.
- Based on these facts and additional underlying science, the second assessment reported that "the balance of evidence suggests that there is a discernible human influence on global climate." This seemingly innocuous comment is in fact a remarkable statement: for the first time ever, the world's scientists have reached the unavoidable conclusion that the world's changing climatic conditions are more than the natural variability of weather. Human beings are altering the Earth's natural climate system.

In turn, the best scientific evidence indicates that such a warming will have profound consequences for the economy and the quality of life of this and future generations:

Human health is at risk from projected increases in the spread of diseases like malaria, yellow fever and cholera;
Food security is threatened in certain regions of the world;
Water resources are expected to be increasingly stressed, with substantial economic, social and environmental costs in regions that are already water-limited, and perhaps even political costs where there is already conflict over limited resources.

Coastal areas -- where a large percentage of the global population lives -- are at risk to sea level rise.

In our opinion, the IPCC has clearly demonstrated to policymakers that action must be taken to address this challenge and that, as agreed in Berlin, more needs to be done through the Convention. This problem cannot be wished away. The science is in. The obligation of policymakers is to respond with the same thoughtfulness that has characterized the work of the world's scientific community.

Unhappily, Mr. Chairman, while the established international scientific process is working well, the international policy process, as established under the Convention, has not been as successful. The shortcomings of the Convention -- its failure to address the post-2000 period, for example -- were well explored in Berlin and do not bear repeating today. The most salient fact is now more apparent than ever: the current Convention structure has not achieved the results that were anticipated and planned for in good faith; few nations in either the developed or developing world have been fully successful in meeting their commitments under articles 4.1 and 4.2 of the Convention. We have to do better.

Over the past year, the United States has been engaged at home and internationally in serious analysis on the successes and failures of the current Convention structure, as well as on the practicallity of the various proposals for next steps that have been put forward in recent discussions. While we still have much work to do, our analysis and consideration of this issue to date have led us to certain conclusions about the form of an agreement we hope these negotiations will consider and pursue. In the months ahead, our ongoing analysis and assessment will allow us to more precisely articulate the specific contents that the United States could support.

We begin, Mr. Chairman, from the following base set of principles, which will guide our consideration of proposals and we believe should guide our multilateral negotiations:

- First, our negotiations must be about proposals that will result in protection of the environment. The current structure has been largely unsuccessful in this regard. We are not interested in grand rhetorical goals that are impossible to realize. We want the negotiations to focus on outcomes that are real and achievable. Sound policies pursued in the near term will allow us to avoid the prospect of truly draconian and economically disruptive policies in the future. Measured adjustments today will enable all nations to adapt in an economically prosperous manner. Denial and delay will only make our economies vulnerable in the future.
- Second, the United States will continue to seek solutions that are flexible and cost-effective, as we have consistently. We are not enthusiastic and will not accept proposals that are offered for competitive, not environmental reasons. Serious proposals in the future must be fairly focussed, not thinly veiled attempts to gain economic advantage. This is a global problem with global impacts and therefore requires solutions that are fair, and that will ensure enhanced, not diminished prosperity -- now and in the future -- for all the world's people.
- And third, the agreement should lay the foundation for continuing progress by all nations in the future. The United States is immovable in its belief that international cooperation on this challenge will continue for years and decades to come and that all nations will have to become more ambitious in contributing to the solution to this challenge as we move forward and gain greater experience. We believe

that, while this is a long-term challenge, short-term signals about the importance of this challenge must be sent unmistakably to the public and private sectors everywhere -- climate change is a serious problem and will require sustained long-term investment and the full creativity of the marketplace to be addressed successfully.

President Clinton has urged all Americans and all nations to prepare the economy for the 21st century. Meeting this challenge requires that the genius of the private sector be brought to bear on the challenge of developing the technologies that are necessary to ensure our long-term environmental and economic prosperity.

Based on these principles -- environmental protection, economic prosperity, flexibility, fairness and comprehensiveness -- the United States recommends that future negotiations focus on an agreement that sets a realistic, achievable and binding medium-term emissions target. In addition, our view is that it will be necessary to continue working toward a longer-term concentration goal (e.g. for the next 50-100 years), as set out in the Convention's objective. We believe that the medium-term target must be met through maximum flexibility in the selection of implementation measures, including the use of joint implementation and trading mechanisms.

Having outlined in broad terms the basic components of an agreement we could support, I want to underscore the expectation of the United States that the agreement be realistic and achievable. Our preliminary analysis of several targets that have been tabled for consideration suggests that some proposals are neither realistic or achievable -- either because they would compromise other important principles, such as the need for flexibility in implementation, or because they involve timeframes and objectives that are not consistent with national and international prosperity. Our job in the months ahead is to

search for agreement on a next step that will produce results that are consistent with our environmental and economic aspirations.

Others have suggested that the negotiations move toward consideration of some ambitious mandatory, internationally coordinated policies and measures. In particular, suggestions are emerging for annexes to the agreement outlining specific actions that relevant Parties would be required to undertake, such as, for example, agreed fiscal or regulatory policies. In our view, the significant differences in national circumstances and individual national approaches to these matters suggest that few, if any individual measures are likely to be applicable to all countries. Therefore, the United States opposes mandatory harmonized policies and measures. We are open to the possibility of exploring consensus on agreed procedural measures, for example those that might be necessary to implement an international trading regime or ensure enhanced reporting.

Finally, Mr. Chairman, I want to discuss what has been and remains a difficult component of the negotiations but it is essential if we are to make progress over the long-term in preventing harmful climate changes. The United States is committed in these negotiations to ensuring that all countries take steps to limit emissions, consistent with the mandate agreed upon last year in Berlin. We look forward to working together to develop strategies for advancing implementation of this Convention and stand ready to continue our efforts to provide technical expertise to work with developing countries to reduce greenhouse gas emissions. This will be a major issue in the months ahead and we expect it to be taken up in earnest, as with the other issues I have mentioned, in December.

In summary, we have come to the conclusion that the current structure of the Convention is less than ideal. Performance under the current regime -- or lack thereof --

suggests that a new model must be considered. Next steps must be structured in a way that will help produce the desired results -- not more rhetorical hopes. We believe that circumstances warrant the adoption of a realistic but binding target, leaving it to individual governments to decide the most appropriate measures needed to meet the agreed target. We are convinced that the target must be both realistic and binding because it is only through the surety of a commitment of this nature that governments will take their obligations seriously and the only way we can be assured of progress.

We are also convinced that it is the target that should be binding, not the individual measures, thus allowing maximum flexibility in implementation. Continued use of non-binding targets that are not met makes a mockery of the treaty process. It leaves the impression that rhetoric is what counts rather than real emission reductions -- an outcome that is both unacceptable and counterproductive.

Mr. Chairman, the United States is committed to making the international climate change process work. As I indicated today, the science is increasingly convincing: it is evident that concern about global warming is real and that we must continue to take steps to address this problem consistent with our long-term economic and environmental aspirations. Working together, it is imperative that we marshal the creativity and will that is necessary to address this far-reaching challenge in an aggressive manner. The United States will be participating in this effort with a view towards negotiating an agreement that is comprehensive, fair and certain. In this way, we hope to outline an agreement that will help prepare our country and the world -- environmentally and economically -- for the next century.

July 10, 1996

6
Approved
Climate Copy
Charlie Munnell

MEMORANDUM

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FROM: Steve Seidel, Special Coordinator for Climate Change, CEQ

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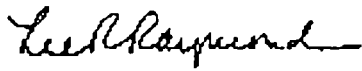
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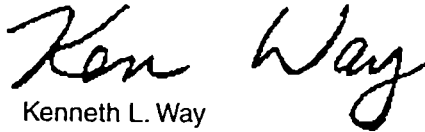
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JUL 8 1996

Sincerely,



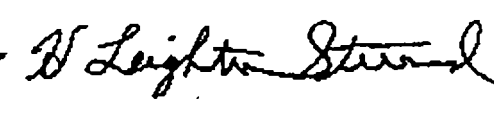
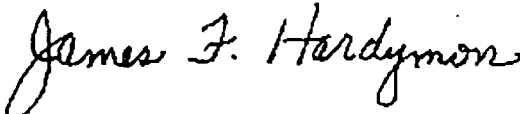
Lee R. Raymond
Chief Executive Officer
Exxon Corporation



Kenneth L. Way
Chairman & CEO
Lear Corporation

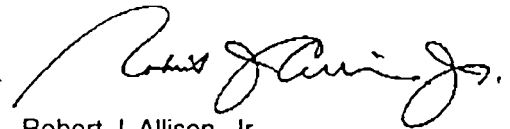


Dr. Ray Irani
Chairman, President & CEO
Occidental Petroleum Corp.

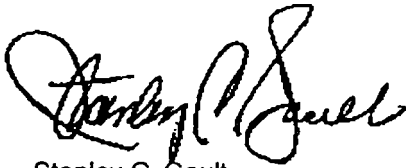


James F. Hardyman
Chairman & CEO
Textron, Inc.

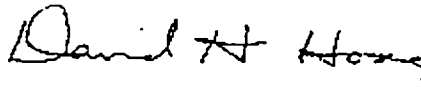
H. Leighton Steward
CEO & Chairman of the Board
Louisiana Land & Exploration Co.



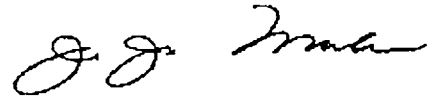
Robert J. Allison, Jr.
President, Chairman & CEO
Anadarko Petroleum Corporation



Stanley C. Gault
Chairman
Goodyear Tire & Rubber Company



David H. Hoag
Chairman & Chief Executive Officer
LTV Corporation



J.J. Mulva
President
Phillips Petroleum Company



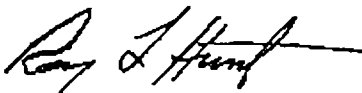
Hans W. Becherer
Chief Executive Officer
Deere and Co.



Victor G. Beghini
President
Marathon Oil Company



Barry J. Galt
Chairman & CEO
Seagull Energy Corporation



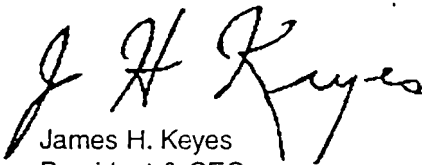
Ray L. Hunt
Chairman & CEO
Hunt Oil Company



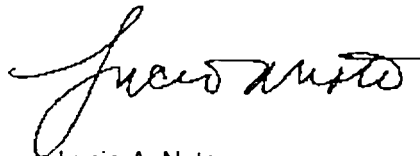
Lee M. Gardner
President & Chief Operating Officer
Mascotech, Inc.



Philip J. Carroll
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Shell Oil Company



James H. Keyes
President & CEO
Johnson Controls, Inc.



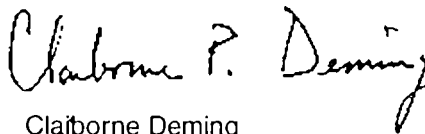
Lucio A. Noto
President, Chairman & CEO
Mobil Corporation



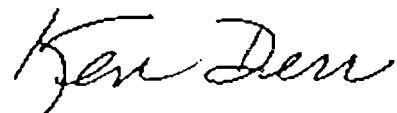
James E. Declusin
Chief Operating Officer
California Steel Industries



John R. Hall
Chairman of the Board & CEO
Ashland, Inc.



Claiborne Deming
President & CEO
Murphy Oil Corporation



Ken Derr
Chairman & CEO
Chevron

B.E. Cooper
Chief Executive Officer
Kennecott Corporation

Thomas V. Falkie
President
Berwind Natural Resources
Corporation

M. Thomas Moore
Chairman and CEO
Cleveland-Cliffs Inc.

Robert M. Smith
Chief Executive Officer
Barrick Gold Corporation

Joseph C. Farrell
Chairman, President & CEO
The Pittston Company

Stephen D. Bennett
President and CEO
Acme Metals Incorporated

Collis P. Chandler, Jr.
Chief Executive
The Chandler Company

B.R. Brown
Chief Executive
Consol, Inc.

R.D. Krebs
President and CEO
Burlington Northern Santa Fe Corporation

Edwin A. Lupberger
Chairman and President
Entergy Corporation

David R. Goode
Chairman, President & CEO
Norfolk Southern Corporation

John C. Grisham
Chief Executive Officer
Buckeye Industrial Mining Co.

Peter J. Green
Vice President, Technology
SMC Electrical Products, Inc.

Paul M. Tellier
President and CEO
Canadian National

Andrew Aloe
Chairman and CEO
Shenango Inc.

R. Gene Dewey
Chief Executive Officer
Molycorp, Inc.

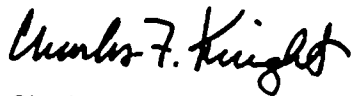
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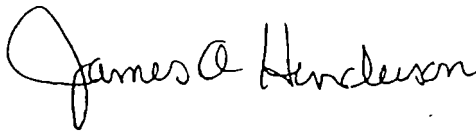
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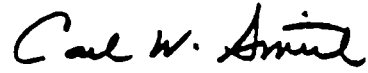
R. Thomas Green, Jr.
President, Chairman & CEO
Oglebay Norton Company



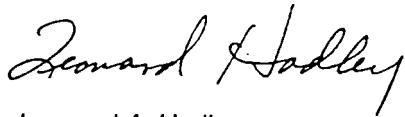
Charles F. Knight
Chairman, President & CEO
Emerson Electric Co.



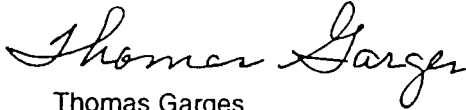
James A. Henderson
Chairman & CEO
Cummins Engine Company, Inc.



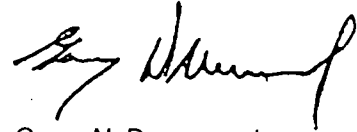
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Thomas Garges
President & CEO
Rochester & Pittsburgh Coal Co.



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President & CEO
Drummond Company, Inc.



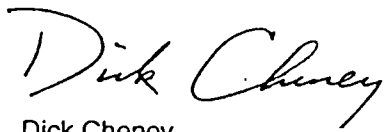
William Carr
President & Chief Operating Officer
Jim Walter Resources, Inc.



Arthur Brown
President & CEO
Hecla Mining Company



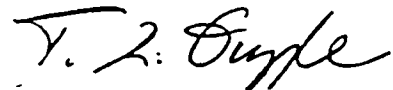
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Halliburton Company



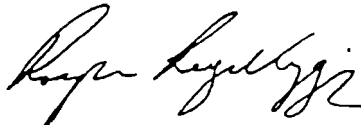
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Chairman & CEO
Homestake Mining Company



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GS Industries, Inc.

cc:

Honorable Albert Gore, Jr.,
Vice President of the United States

Honorable Warren Christopher,
Secretary of State

Honorable Mickey Kantor,
Secretary of Commerce

Honorable Hazel O'Leary,
Secretary of Energy

Honorable Carol Browner,
*Administrator, Environmental
Protection Agency*

Honorable Laura D'Andrea Tyson,
Chair, National Economic Council

U.S. Senate

U.S. House of Representatives

MEMORANDUM

COUNCIL OF ECONOMIC ADVISERS

June 24, 1996

F
Environ.
Climate
chg)

TO: ALICIA MUNNELL

FROM: RAY PRINCE *RP*

SUBJECT: LIST OF POSSIBLE ISSUES AT THE JUNE 24TH PRINCIPALS MEETING
ON CLIMATE CHANGE

The purpose of the meeting is to give some guidance to the U.S. negotiating team at next month's Conference of Parties (COP-2). COP-2 and COP-3 (Fall 1997) are looking at possible amendments to greenhouse gas abatement goals under the Framework Convention on Climate Change (FCCC). Nations are having difficulty meeting those goals plus no goals past 2000 have been established. The main goal under the current FCCC is that Annex I countries (OECD) reduce their greenhouse gas emissions to 1990 levels by the year 2000. Wirth is the head of the delegation.

1. **Role of Annex II (non-OECD) countries** - There may be strong Congressional resistance to ratifying a treaty which does not include commitments from Asian and OPEC countries. It is likely that some set of carrots and sticks would be used to get these nations to sign on. One definite carrot is their inclusion in the U.S. Joint Implementation program (JI or USJI) which aids in the introduction of environmentally benign technology (solar, more efficient coal combustion, etc.) abroad. Another possible carrot is a cap and trade system in which countries signing a treaty will be allocated a certain number of allowances which they can sell of foreign exchange. A possible stick which has been raised (but so far not advocated by anyone) is the use of trade sanctions against countries that do not sign the treaty. Presumably the treaty would exempt participants from sanctions for causing pollution that may result in damages in the U.S.
2. **U.S. response to other nations' proposals for reducing greenhouse gas emissions past 2000** - The most severe is the one by the Alliance of Small Independent States (AOSIS) which calls for a 20% reduction below 1990 levels by 2005. The U.S. does not have a well-define position so it probably can do no more than stall.
3. **Emissions trading** - There is a great deal of interest in this proposal but everyone agrees further study is needed. The possibility of having banking and borrowing of allowances has also been brought up as a way of capturing inter-temporal efficiencies.
4. **Three-fourths versus consensus vote on statements at COP2** - In the past, the U.S. has supported a consensus, effectively giving each participant a veto.

OTHER ISSUE

The House Commerce Subcommittee on Energy and Power held hearings last week on the Climate Change Treaty. EPA's Dave Gardiner, DOE's Marc Chupka, Commerce's Jeff Hunker, and State's Rafe Pommerance testified. The hearing was not very long since there were not many questions from

the Committee. Dingle (ranking Minority member of the Commerce Committee) described the Administration's approach to climate talks as "fat, dumb and happy" citing the lack of analysis on which to base a negotiating position (see attached). This criticism is basically correct since there is still a lot of disagreement on the assumptions underlying economic models. The point that could be made here is that we need to be prepared for the inevitable criticism about the economic and environmental implications of any U.S. action on climate change even if it is to stick with the terms of the current treaty.

The Energy Daily

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Thursday, June 20, 1996

ED Volume 24, Number 118

Dingell Derides Administration's 'Fat, Dumb And Happy' Approach To Climate Talks

BY DENNIS WAMSTED

John Dingell is not pleased.

Dingell, ranking Democrat on the House Commerce Committee, lambasted the administration Wednesday, saying it has no strategy for the global climate change negotiations set to begin in Geneva in July. And without a strategy, the United States will be an easy target for better-prepared nations ready to defend their interests, Dingell warned at a Commerce energy and power subcommittee oversight hearing.

"You are going over there fat, dumb and happy," Dingell told the administration's four witnesses—Rafe Pomerance, deputy assistant secretary of State, David Gardiner, assistant administrator at the Environmental Protection Agency, Marc Chupka, acting assistant secretary of Energy, and Jeffrey Hunker, deputy assistant to the secretary of Commerce.

And when one nation is that unprepared, Dingell said, it is bound to lose in any negotiation, particularly one as complex as climate change.

During questioning, Dingell, a major energy policy player on Capitol Hill, repeatedly asked the four how the administration could negotiate agreements—as it did last year during talks to craft the Berlin mandate and is preparing to do next month—without a comprehensive strategy.

Having a strategy means knowing where you want to go, Dingell said. And to have a strategy, to know where you want to go, a complete analysis of the issue is required.

How much of the analysis is complete? Dingell asked. The answer, about 50 percent, did not please the Michigan Democrat.

How can the United States possibly be ready to negotiate commitments for the period after 2000 without a complete analysis of possible reduction targets and

(Continued on page 2)

Schaefer Wins Rules Fight On SPR Sales

The House began consideration yesterday of the fiscal 1997 Interior appropriations legislation, and immediately faced the prospect of having to come up with \$220 million in new funding.

The new funding or cuts in other programs will be required because of a successful appeal by House Commerce energy and power subcommittee Chairman Dan Schaefer (R-Colo.) to strip a provision in the Interior appropriations bill that would have allowed the Energy Department to sell oil from the Strategic Petroleum Reserve to fund its operations next year.

Schaefer protested that language, saying it amounted to legislating through the appropriations process, which is against House rules, and was bad public policy. The House Rules Committee, which sets the rules for floor debate on pending legislation, agreed with Schaefer. This will allow the Coloradan to raise a point of order against the proposal.

A Schaefer spokeswoman told *The Energy Daily* that the House parliamentarian, who decides points of order, will rule in Schaefer's favor. The issue was expected to be brought up for consideration late last night.

In his appeal, Schaefer warned that if the Rules panel "does not protect the authorizing committee under these circumstances we might as well throw away the rule book. The Appropriations Committee should not be allowed to continue to circumvent the authorizing committee to essentially raise its allocations through unauthorized asset sales."

In addition to being against House rules, Schaefer said, "selling oil from the Strategic Petroleum Reserve for budgetary purposes is an ill-considered policy. Not only do we lose money every time we sell oil...but we compromise something even more valuable: our national energy security."

—DENNIS WAMSTED

Scherman Sees State-To-State Differences As Battleground

BY MARY O'DRISCOLL

The energy policy turf battles of the future will not pit federal against state regulators so much as they will involve regulators from different states, a prominent energy lawyer said Wednesday.

That, Bill Scherman told *The Energy Daily's* conference on the Federal Energy Regulatory Commission's open access rules, is because FERC largely accommodated the states' concerns with its extensive deference clauses. So as individual states begin putting together their own restructuring rules to benefit their own

(Continued on page 2)

'Fat, Dumb And Happy' ...

(Continued from page one)

timetables, and their consequences? he asked. And without that analysis, how can the U.S. develop a negotiating strategy?

The U.S. needs to protect its interests in these negotiations, Dingell continued, but the administration is woefully unprepared to do so.

Instead of being prepared for hardball negotiations, the U.S. is about to send "a fine bunch of preschoolers to protect its interests."

Dingell was not alone in his concerns, with subcommittee Chairman Dan Schaefer (R-Colo.) worrying "that the U.S. will agree to further commitments which may be difficult to meet, have serious negative economic consequences for the U.S. and have little global environmental impact...."

"Global climate change is a truly a global problem which will require global solutions," Schaefer continued. "Yet, for all the leadership the U.S. is showing, there seems to be very little followership among developing countries."

Similar concerns were raised by Commerce Committee Chairman Thomas Bliley (R-Va.). "Because of the lack of adequate time for analysis and assessment we are just about a year away from completing negotiations under the Berlin agreement and our analysis is preliminary, our assessment has not begun, and no one, be it business, labor, environmental groups or Congress, has any idea what kind of commitments the U.S. is considering."

"Consequently, no one has the ability to analyze and comment on a U.S. position...."

Binding the U.S. to future reduction commitments "will require the full support and assistance of the American people," Bliley added. "Shouldn't they know what their government is working toward?"

State-State Differences... (From page one)

electricity customers, Scherman said their interests are bound to collide with the interstate nature of the electric power market.

The potential for state-on-state turf battles, added Scherman, a partner at Skadden, Arps, Slate, Meagher & Flom, could delay the consumer benefits of electric power competition.

"We may have to develop new institutions, new mechanisms to resolve these conflicts between the states," he said. "It may be, at the end of the day, we'll need Congress to act on regulatory compacts."

Nevertheless, Scherman added, the state-federal battle is not yet over. FERC may have "bent over backwards" to accommodate the states, giving them deference on making the transmission-distribution facility call and on authorization for local services, but the National Association of Regulatory Utility Commissioners still is not fully satisfied.

"FERC took steps that no other [commission] has taken before, yet there is still tension," he said, pointing to NARUC's comments on the open access rule. For instance, where FERC gave the states deference on the transmission-distribution call, NARUC says it wants FERC to "conclusively rely" on the state determinations.

Pennsylvania Public Utility Commissioner John Hanger, a proponent of retail competition, agreed with Scherman. Hanger, who said he is not itching to fight the federal government over jurisdiction, noted that the "cooperative federalism" that many state commissioners often tout goes both ways. And FERC has taken the first step, he said, with Order 888's deference "olive branches" to the states.

"States cannot expect cooperation from the federal government if they act like protectionists that are intent on impeding the interstate commerce of electricity and robust competition," Hanger said. And the federal government cannot expect the states to cooperate "if it preempts state authority even when states act in a manner that promotes the interstate commerce of electricity and generation competition."

Though many states chafe at the thought of FERC declaring jurisdiction over retail transmission in interstate commerce, federal intervention may prove helpful in several instances, Hanger said.

For example, state officials promoting retail customer choice will need federal regulators to ensure that no company could have market power in regional electric markets. That is playing itself out in the Pennsylvania-New Jersey-Maryland power pool, where two pool members, Baltimore Gas & Electric and Potomac Electric Power Co., are planning to merge.

The deal will increase generation concentration within the pool if it is completed, he said. And though PJM serves more than half of Pennsylvania, neither of the utilities involved in the merger serve retail customers in Pennsylvania.

"I, therefore, have no jurisdiction over the merger," Hanger said. "Yet, the proposed merger will affect the level of generation competition that exists in the PJM pool and the prices of wholesale electricity and the spot electric retail market that will soon exist. Pennsylvania's interests in robust regional generation competition can only be protected by the federal government."

The same holds true for states that plan to implement retail competition, as Hanger predicted Pennsylvania will do—a legislative panel on Wednesday was marking up a bill that would institute retail competition by 1998, and sentiment on the commission is in favor of retail competition, he said.

State actions preventing one state's generators from selling to another state's retail electric buyers raise important constitutional questions, he said. "Policies that amount to electric protectionism and opposition to retail competition may well violate the...Commerce Clause."

But in the context of Order 888, he added, the questions are: Will FERC really defer when the states are being consistent with open access and comparability? Will state officials avoid protectionist policies designed to protect native utilities? And will they give FERC a chance to demonstrate that it means "deference" before they go to court?

The federal interests in these cases, he said, are legitimate—not exclusive, and not preclusive.

MEMORANDUM

COUNCIL OF ECONOMIC ADVISERS

July 2, 1996

Alicia F
Commerce
Climate
Change

TO: ALICIA MUNNELL

FROM: RAY PRINCE

SUBJECT: Economic Modeling Group Meeting on Climate Change

Rafe Pomerance chaired today's meeting. State and Commerce (Jeff Hunker) are concerned that the economic costs of meeting emissions targets are unacceptably high. They argue that improved modeling would show that the costs are lower.

CEQ (Steve Seidel) and EPA (Chris Christopharos) think that the most promising improvement is to design models with endogenously determined rates of diffusion (reflecting the fact that a certain amount of x-inefficiency exists because not everybody adopts new technologies immediately). Policies that increase the rate of diffusion would show lower loss of potential GDP so long as the rate of diffusion increased than policies that do not. The question that arises is whether the market has already exploited all the economically feasible opportunities to increase the rate of diffusion.

A second possibility is to design models to incorporate the benefits of reducing greenhouse gas emissions (mitigation) in the form of adaptation costs avoided. Adaptation costs arise because rising concentrations of greenhouse gases would require capital expenditures on dikes, levees, irrigations systems, etc. in order to avoid more severe damages. It is not certain, however, just how much capital would be diverted to avoidance activities under a no-action scenario through 2010.

A third possibility is to design models to incorporate policy induced changes in technological change at the sectoral level. This is usually done by assuming that the rate of change is dependent on relative prices. A number of individuals at these meetings argue that this approach implies that the overall rate of technological change is fixed (exogenously determined) and that it is possible for policies to raise the overall rate. Their first point is certainly true and the second point may be. However, models with endogenously determined rates of change are very controversial.

Rafe also mentioned that he was meeting with the different agencies involved in the modeling to discuss specific concerns.



EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON, D.C. 20500

SENIOR ECONOMIST

July 5, 1996

MEMORANDUM FOR RAFE POMERANCE, DEPUTY ASSISTANT SECRETARY FOR ENVIRONMENT AND DEVELOPMENT

FROM: RAYMOND PRINCE

SUBJECT: Issues in Estimating the Economic Costs of Reducing Greenhouse Gas Emissions

Several issues have come up in the discussions over the last few weeks about the costs of meeting greenhouse gas (GHG) emissions goals as predicted by various economic models. Increasingly, the debate seems to revolve around what assumptions should be made when running these models rather than which model to use (see Issue #1). We have been able to resolve some of those issues and are working toward resolution of others. This memorandum is meant to cap where I see we are in those discussions.

Issue #1 - Which model is best to use?

There now seems to be general agreement that all three basic types of models--engineering, macroeconomic and computable general equilibrium--have a role to play in estimating the economic costs of meeting targets and that we will end up with a range on numbers for the estimated costs. None of the models qualify as a silver bullet because it is difficult to capture all the implications of greenhouse policies in a single model. The continued use of old technologies represents opportunities to reduce GHG emissions with very little or even negative costs (no-regrets). Engineering (bottoms-up) models are particularly useful for identifying these opportunities. Economic incentives reduce GHG emissions by driving a wedge between the profit and employment opportunities for firms using energy intensive processes and those that rely more on other inputs. The greater the wedge, the greater the likely reduction in GHG emissions but the greater the structural adjustment costs. Macroeconomic models are particularly useful for estimating the more near term of these structural costs. Reducing GHG emissions is, however, a long term policy and computable equilibrium models are specifically designed to estimate the loss of potential GDP over several decades.

Issue #2 - How should we define the costs for meeting any particular GHG emissions target?

There seems to be general agreement that it should be the difference between potential GDP under a no-action scenario (the baseline case) versus different mitigation scenarios.

Issue #3 - Which mitigation scenario should we use to estimate the upper-bound for the costs of reaching any particular GHG emissions target?

As a general rule, the upper-bound cost estimate of meeting any particular emissions target should be based on policy approaches that have actually been tested in the field and are absent the ameliorating effects of other policies. The SO₂ cap-and-trade system seems a likely program on which model an upper-bound estimate.

Issue #4 - What upward biases exist in models to estimate the costs of meeting any particular GHG emissions target?

Three possible sources of upward bias have been mentioned which would seem to warrant further investigation - (1) it may be possible to affect the rate of diffusion (adoption) of existing emissions reducing technology with certain policies; (2) the rate of emissions reducing technological change may be more responsive to changes in relative prices than is normally assumed; (3) differences in the growth of potential GDP under no-action versus mitigation scenarios is biased upward because the impact of diverting capital to adapt to climate change has not been incorporated into GDP estimates. Not all firms adopt a new technology immediately, which is why engineering studies show the opportunity for efficiency gains. Market expectations, for example, might cause both the rate of diffusion and the rate of technological improvement in emissions reduction to be greater than normally assumed if a policy to reduce GHG emissions were implemented in phases. Avoided adaptation costs like construction of levees, irrigation systems and sea walls as a result of mitigation policies would free up scarce capital sources for investment into productive capacity.

Issue #5 - What downward biases exist in models to estimate the costs of meeting any particular GHG emissions target?

Many models underestimate structural adjustment costs due to the differential effect of policies on profit and employment opportunities across sectors.

Issue #6 - Are the costs of meeting GHG emissions targets lower under mitigation scenarios other than a simple SO₂-type program?

Other possibilities that seem worth exploring are various distribution schemes for permits, auctioning of permits and various ways of recycling revenues.

c: A. Munnell
S. Seidel

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
Washington, D.C. 20503-0001

LRM NO: 4929

FILE NO: 603

7/3/96

LEGISLATIVE REFERRAL MEMORANDUM

Total Page(s): 13

TO: Legislative Liaison Officer - See Distribution below:

FROM: Ron PETERSON *Ron Peterson* (for) Assistant Director for Legislative Reference

OMB CONTACT: Robert TUCCILLO 395-5609

SUBJECT: STATE Qs and As on International Negotiations under the Framework
Convention on Climate Change

DEADLINE: 10:00 AM Monday, July 08,1996

In accordance with OMB Circular A-19, OMB requests the views of your agency on the above subject before advising on its relationship to the program of the President.

Please advise us if this item will affect direct spending or receipts for purposes of the "Pay-As-You-Go" provisions of Title XIII of the Omnibus Budget Reconciliation Act of 1990.

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RESPONSE TO
LEGISLATIVE REFERRAL
MEMORANDUM

LRM NO: 4929
FILE NO: 603

If your response to this request for views is short (e.g., concur/no comment), we prefer that you respond by e-mail or by faxing us this response sheet.

If the response is short and you prefer to call, please call the branch-wide line shown below (NOT the analyst's line) to leave a message with a legislative assistant.

You may also respond by:

- (1) calling the analyst/attorney's direct line (you will be connected to voice mail if the analyst does not answer); or
- (2) sending us a memo or letter

Please include the LRM number shown above, and the subject shown below.

TO: Robert TUCCILLO 395-5609
Office of Management and Budget
Fax Number: 395-5836

FROM: 7/3/96 (Date)
RAY RENCE (Name)
CBA (Agency)
395-5012 (Telephone)

SUBJECT: STATE Qs and As on International Negotiations under the Framework
Convention on Climate Change

The following is the response of our agency to your request for views on the above-captioned subject:

☐ Concur
☒ No Objection
☐ No Comment
☐ See proposed edits on pages _____
☐ Other: _____
☐ FAX RETURN of _____ pages, attached to this response sheet

Supplemental Questions and Answers provided by the U.S. Department of State

to U.S. House of Representatives
Committee on Commerce
Subcommittee on Energy and Power
July 2, 1996

DRAFT

QUESTION 2: PLEASE PROVIDE A LIST OF ALL ANALYSIS AND/OR ASSESSMENT PROJECTS UNDERWAY, CONTEMPLATED OR COMPLETED. PLEASE PROVIDE A LIST OF ALL THE CONTRACTORS CONDUCTING THE ANALYSIS AND ASSESSMENT. HAVE ALL OF THE RESULTS OF THESE GROUPS' ANALYSIS BEEN RELEASED YET? IF ANY HAVE NOT YET BEEN RELEASED, PLEASE EXPLAIN WHY. WHAT ADDITIONAL WORK IS UNDERWAY OR CONTEMPLATED?

Answer: The U.S. Government is engaged in a significant number of analysis and assessment activities whose results could impact the development of our climate change policies. These activities are taking place within and between a number of government agencies, including the National Science Foundation, the National Air and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), National Institutes of Health, the Department of Commerce, the Department of Energy, and the Environmental Protection Agency, among others. The U.S. Government is the principle supporter of most research on basic issues in academia as well. These ongoing activities are expected to feed into the policy development process as we engage in the international negotiations process.

There are also a number of studies that the U.S. Government commissioned for the official analysis and assessment phase under the Berlin Mandate. Attached is the agenda from the June 6-7, 1996 Analysis and Assessment workshop, listing the presentations that were made. Of these presentations, the following work by contractors was government funded with the supporting agency identified:

Patz, Johns Hopkins, "Public Health Implications . . ."	EPA
Blaney, ICF, "Cost of Carbon Emission . . ."	EPA
Earley, EIA et al, "Economic Impacts . . ."	DOE
Probyn, DRI, "The DRI Model . . ."	EPA
Mintzer, U of MD, "Uncertainty in the Modeling . . ."	EPA
Walker, Oxford, "Reducing Carbon Emissions . . ."	DOE
Wilcoxin, U of Texas, "The GCUBED Model . . ."	EPA
Edmonds (Richels, Edmonds, Gruenspecht, Wigley), "The Berlin Mandate . . ."	DOE
Hoffman (based on DOE/EIA Service Report, "An Analysis of Carbon Mitigation . . ."	EPA

Page 647-4463
Fax 647-4462

In addition to the analyses presented at the workshop, other activities underway by the Federal Government include a series of meetings with energy intensive industries that took place in June and a series of roundtable discussions with industry and NGOs that was completed in mid-June.

Future work will be defined based, in large part, on a review of the body of work presented at the workshop.

QUESTION 4: PLEASE EXPLAIN WHAT, IF ANY, ANALYSIS BY THE ADMINISTRATION AND ITS CONTRACTORS IS UNDERWAY OR CONTEMPLATED OR HAS BEEN COMPLETED ON THE ECONOMIC IMPACTS ON NON-ANNEX I PARTIES OF ACTIONS TO STRENGTHEN COMMITMENTS OF ANNEX I PARTIES, ON ACTIONS TO ADVANCE THE IMPLEMENTATION OF COMMITMENTS OF NON-ANNEX I PARTIES, AND ON ACTIONS TO STRENGTHEN COMMITMENTS OF ANNEX I PARTIES THROUGH POLICIES AND MEASURES OR QUANTIFIED EMISSIONS LIMITATION AND REDUCTION OBJECTIVES? ALSO, WHAT PARTIES, OTHER THAN THE U.S. OR INTERGOVERNMENTAL ORGANIZATIONS, ARE CONDUCTING OR PLANNING ANY ANALYSIS AND ASSESSMENT OF SUCH MATTERS?

Answer: The potential impact on non-Annex I Parties of actions by Annex I Parties was discussed in several of the papers presented at the workshop that have been supported by Federal agencies (e.g., Walker, Jacoby). Actions to advance the implementation of commitments of non-Annex I Parties was the subject of one of the sessions at the June workshop at which four papers were presented, one of which was by a representative of the U.S. Country Studies Program office. The vast majority of papers presented at the workshop addressed issues related to potential impacts of policies and measures or quantified emissions and reduction limitation objectives (QELROs) of Annex I Parties, in particular, the United States. In particular, many of the papers analyzed the potential and effects of QELROs proposals by the Alliance of Small Island States and Germany, among others. As identified above, a subset of these papers represent analysis that was supported by DOE or EPA.

Besides the United States, there are a number of other intergovernmental organizations and countries that have undertaken analysis and assessment activities. The Organization for Economic Cooperation and Development (OECD), in conjunction with the International Energy Agency (IEA), are embarked on an exercise to look at whether there are policies and measures for which "common action" by Annex I countries makes sense. These analyses have included some consideration of the consequences of "non-participants" from actions by participants. The Intergovernmental Panel on Climate Change (IPCC) recently began working on a study of policies and measures at the request of the

Subsidiary Body on Scientific and Technical Advice. It is anticipated that this study will consider impacts of actions on non-Annex I Parties. In addition, a series of workshops were held on the margins of the last negotiating session in February-March where countries and NGOs were able to present their analysis on policies and measures and on quantified emission limitation and reduction objectives. Furthermore, a roundtable discussion of heads of delegations is scheduled during the Ministerial portion of COP-2. Finally, a number of countries have been doing their own analysis and assessment work and are expected to present their results during the COP-2 meetings. Each of these latter sessions have included or will include consideration of each of the issues related to non-Annex Parties.

QUESTION 5: PLEASE EXPLAIN WHAT, IF ANY, ANALYSIS HAS BEEN UNDERTAKEN OR IS UNDERWAY CONCERNING THE COMPETITIVE IMPACT ON THE U.S. IF A PROTOCOL OR ANOTHER LEGAL INSTRUMENT INCLUDED A EUROPEAN COMMUNITY BUBBLE, TAKING INTO CONSIDERATION EUROPEAN UNION MEMBERSHIP AS OF 1992, 1996, AND AFTER THE YEAR 2000.

Answer: The analysis presented at the June workshop included several studies that compared potential impacts of various control measures on the United States compared to other countries and regions. For example, the presentation by Jacoby (MIT) and by Walker (Oxford) both utilized international models and showed that impacts of modeled limitation scenarios on Japan, Canada, and some European countries could be greater than on the United States. The MIT study looked at the European Union as a whole, while the Oxford study examined individual countries. As the work to date suggests, the ability to compare impacts on different groupings of countries is limited by the specificity contained in the available models. We intend to do additional analysis comparing a broad range of possible schemes that would vary the scope of allowable "bubbles" or trading schemes.

QUESTION 7: THE ADMINISTRATION AND OTHER PARTIES HAVE SUBMITTED COMMENTS AND VIEWS TO THE CONVENTION SECRETARIAT ON NUMEROUS ISSUES PURSUANT TO REQUESTS BY THE SUBSIDIARY BODIES TO THE CONVENTION AND THE SECRETARIAT. PLEASE IDENTIFY ALL SUCH COMMUNICATIONS WITH THE SECRETARIAT SINCE THE SECOND MEETING OF THE AGBM IN OCTOBER 1995 AND PROVIDE COPIES TO US. IF THOSE COMMUNICATIONS HAVE NOT BEEN MADE AVAILABLE TO U.S. NON-GOVERNMENTAL ORGANIZATIONS, PLEASE EXPLAIN WHY. IF THERE IS A STATUTORY OR OTHER LEGAL BASIS FOR NOT PROVIDING THEM TO NGOs AND, OF COURSE, THIS SUBCOMMITTEE, PLEASE IDENTIFY IT.

Answer: U.S. comments and views that have been submitted to the Convention Secretariat have been distributed to Congressional staff and industry and environmental non-governmental organizations on request. Attached is a copy of these documents.

QUESTION 9: AT THE MARCH 1996 MEETING IN GENEVA, THE GROUP OF 77 AND CHINA RELEASED A "POSITION PAPER" ON GUIDELINES AND FORMAT FOR PREPARATION OF INITIAL COMMUNICATIONS FROM DEVELOPING COUNTRIES, INCLUDING CHINA, INDIA, SOUTH KOREA, AND SINGAPORE, ABOUT GREENHOUSE GAS EMISSIONS INVENTORIES AND RELATED MATTERS. THE POSITION PAPER STATES THAT "THE CONVENTION MAKES THE IMPLEMENTATION OF THE CONVENTION BY ANNEX I PARTIES A PRECONDITION FOR THE FULFILLMENT OF THE OBLIGATIONS OF DEVELOPING COUNTRY PARTIES/NON-ANNEX I PARTIES." WHERE IN THE CONVENTION IS THIS PRECONDITION? THAT STATEMENT ALSO APPEARS INCONSISTENT WITH THE PROVISIONS OF THE BERLIN MANDATE DECISION WHERE THE DEVELOPING COUNTRIES REAFFIRMED THEIR COMMITMENTS UNDER ARTICLE 4.1. DO YOU AGREE?

Answer: The statement in the G-77 and China position paper refers to Article 4.7, which states that "The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology . . ." This provision provides a factual recognition that many developing countries do not have the technical or financial resources to meet their obligations under the Convention.

The Berlin Mandate reaffirms commitments of all Parties (including developing country Parties) and calls for Parties to continue to advance the implementation of those commitments. The Administration strongly supports this obligation; we believe that developing countries must continue to advance their commitments if the ultimate objective of the Convention is to be realized, namely, "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

QUESTION 10: THE POSITION PAPER ALSO EXPRESSED "DISAPPOINTMENT THAT THE ANNEX I PARTIES AND OTHER DEVELOPED COUNTRY PARTIES HAVE NOT BEEN ABLE TO FULFILL THEIR COMMITMENTS REGARDING PROVISION OF FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY AS STIPULATED UNDER THE CONVENTION." PLEASE IDENTIFY THE PROVISIONS OF THE CONVENTION THAT STIPULATE EACH SUCH

COMMITMENT AND EXPLAIN WHETHER OR NOT THE U.S. AGREES THAT DEVELOPED COUNTRIES, INCLUDING THE U.S. HAVE FAILED TO MEET THEIR COMMITMENTS UNDER THE CONVENTION. IN RESPONDING, PLEASE EXPLAIN THE NATURE AND EXTENT OF THE COMMITMENTS, THE ACTION TAKEN BY COPI UNDER ARTICLE 12.7, AND EXPLAIN WHAT, IF ANY, DEVELOPING COUNTRY REQUESTS FOR TECHNICAL AND FINANCIAL SUPPORT MADE UNDER ARTICLE 12.7 HAVE NOT BEEN FULFILLED AND WHY.

Answer: This quotation in the G-77 and China position paper refers to Article 4.7, which was described in Question 9 above. Article 12.7 specifically called for Parties, at COP-1, to "arrange for the provision to developing country Parties of technical and financial support, on request, in compiling and communicating information . . ." The degree to which developed countries have met their commitments for "financial and technical support" is a matter of interpretation. Most of the Annex II (OECD countries) countries have been faithful to the "letter" of their commitments to provide financial and technical support, but have not met the "spirit" of these provisions to provide adequate levels of support to enable developing countries to meet their obligations in a meaningful way.

This includes the United States, whose support has been limited to certain areas. For example, the United States has been the most active developed country with respect to "compiling and communicating information." Specifically, the United States created the U.S. Country Studies Program, and its successor, "Support of National Action Plans" (SNAP), to help developing countries prepare their national communications. While the Country Studies Program has been instrumental in helping approximately 60 transition and developing countries meet many of their reporting requirements, especially with regard to national greenhouse gas emissions inventories, the SNAP program has funding adequate to help only approximately 10 developing countries prepare their national action plans.

Similarly, the United States has not met its voluntary commitment to fund the Global Environment Facility (GEF), which was established to provide support for developing countries to meet their commitments to the Framework Convention. For example, in this fiscal year, the U.S. contributed only one-third of its pledge to the GEF. Other countries are having similar difficulties. This is impinging significantly on the ability of developing countries to meet their current commitments.

QUESTION 12: IN VIEW OF THE PRELIMINARY NATURE OF THE U.S. ANALYSIS AND THE LACK OF ANY ASSESSMENT, WHAT IS THE BASIS FOR THE U.S. PARTICIPATING IN NEGOTIATIONS FOR A PROTOCOL OR OTHER LEGAL INSTRUMENT IN JULY OF THIS YEAR? ARE OTHER PARTIES FURTHER ALONG IN THEIR ANALYSIS AND ASSESSMENT

EFFORTS? WHAT HAPPENS IF THE PARTIES ARE UNABLE TO REACH AGREEMENT IN 1997?

Answer: From its own scientific and analytical assessment, the United States concluded that commitments agreed to date under the Framework Convention on Climate Change are not adequate to resolve the anthropogenic greenhouse gas emissions problem. Therefore, next steps are necessary. However, all Parties agree that any next steps must be taken only after careful consideration of the consequences -- of both action and inaction. Thus, as part of the process to develop next steps, the Parties to the Convention agreed to launch an analysis and assessment phase (a component of the process included on the demand of the United States).

As the presentations at the June 6-7 workshop make clear, we are now beginning to see some of the preliminary results from our own analytic efforts. We also expect other countries to present some of the results of their own analysis and assessment at COP-2. Although some countries may allude to what their intentions are with respect to next steps, and indeed some countries (i.e., Germany, AOSIS) have already introduced ideas for a protocol or other legal instrument, we do not expect explicit "next steps" to be negotiated at the July meeting.

At this time, we expect that the process will move forward along a trajectory that will lead to adoption of its results at the third session of the Conference of the Parties in 1997.

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The Berlin Mandate also required an analysis and assessment of potential future commitments be conducted. Your testimony should address what analysis and assessment has been undertaken so far and a description of the results of such analysis. Special emphasis should be given to any analysis done on impacts of increased U.S. commitments to the U.S. economy *vis a vis* other developed and developing nations. Your testimony should also discuss to what extent U.S. analysis and assessment is complete and/or if further information is needed before the U.S. should agree to further commitments. Finally, your testimony should address the role the Climate Change Analysis Workshop will play in developing the U.S. position in the upcoming negotiations.

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The Honorable Warren M. Christopher
June 12, 1996
Page 2

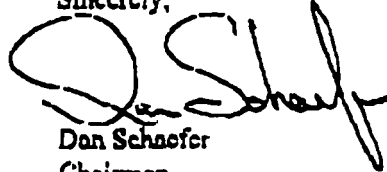
You are requested to submit a written statement which may be of any reasonable length and may contain supplemental materials. Your written statement should be typed, double spaced, and should include a one-page summary touching upon the major points you wish to make. In order to allow sufficient time for Members of the Subcommittee to ask questions, your oral presentation should be limited to 5 minutes. In addition to your written presentation, I would ask that each witness provide written answers, within their area of expertise, to the attached list of questions.

The rules of the Committee require you to provide the Committee with 75 copies of your written statement at least two working days in advance of your appearance. This will allow Members and staff the opportunity to review your testimony and prepare for the hearing. I also request that you provide 30 copies of your curriculum vita or resume. Please send these copies to the attention of Committee's Legislative Clerk, 2125 Rayburn House Office Building. In addition, in order to satisfy the anticipated interest in this hearing, please provide an additional 75 copies of your testimony when you appear before the Subcommittee.

The Committee strongly encourages witnesses to submit testimony in electronic form in addition to providing the required written copies. Attached are guidelines for the submittal of testimony in electronic form. The Committee wishes to make clear that electronic submittal of testimony does not relieve witnesses of the obligation to submit as described in the preceding paragraph.

I appreciate your willingness to participate in this hearing and look forward to seeing you next week. If you have any questions concerning your testimony, please contact Ms. Catherine Van Way of the Commerce Committee staff at (202) 225-2927.

Sincerely,



Dan Schaefer
Chairman
Subcommittee on Energy and Power

Attachment (2)



EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON, D.C. 20500

SENIOR ECONOMIST

June 21, 1996

MEMORANDUM FOR JOEL SCHERAGA AND ANN GRAMBSCH

FROM: RAY PRINCE

RP

SUBJECT: REVIEW OF INFORMATIONAL PACKET FOR UPCOMING CONFERENCE OF
PARTIES ON CLIMATE CHANGE CONVENTION

I have three suggestions:

- The first page indicates a total of 50 different programs in the Climate Change Action Plan, but there only descriptions of 15. The number of descriptions should coincide with the number of programs claimed to exist.
- The Climate Action Report listed the contribution of the various programs to the overall reduction from baseline emissions. It would be useful to include this information in the Packet so that readers could get an idea of the relative importance of these programs.
- (tentative comment pending review of IPCC report) Reference to an increased severity of weather patterns and its effects in the section on **Water Resources** and elsewhere in the "State of the Knowledge" report should be deleted. Whether climate change will increase the severity of weather patterns is still controversial. The Group II report of the IPCC concluded that the data was not conclusive enough to state climate change will lead to more severe weather patterns.

c: A. Munnell

C: Funnell
F
Grambsch
(Climate Change)

MEMORANDUM

COUNCIL OF ECONOMIC ADVISERS

June 19, 1996

TO: ALICIA MUNNELL

FROM: RAY PRINCE

SUBJECT: COMMENTS ON ECONOMIC MODELS OF CLIMATE CHANGE FOR THE
JUNE 24TH PRINCIPALS MEETING

Issue: How models are put together has become a critical policy issue. Attempts to improve welfare have faltered because the supporting analysis was based on models with controversial assumptions. The history of attempts to estimate benefits by measuring marginal willingness to pay through contingent valuation is an example of a basically sound policy which has suffered set backs because of the use of models that were not ready for the public policy arena.

Attempts to address the threat of climate change could suffer the same fate. In fact, policy initiatives have already received bad publicity from the use of engineering models that predicted overly-optimistic results from voluntary programs. More recently, climate models have been attacked for their assumptions about the role of water vapor.

Economic models are critical to determining the best way to deal with climate change. But if the models on which policies rely contain overly-optimistic assumptions, the entire initiative could be discredited. In particular, models that offer a "double-dividend" of increased growth and improved environment are likely to be received negatively.

Specifics:

- None of the models qualify as a silver bullet since it is difficult to capture certain dynamics involved in regulation including development of technology, institutional improvements, and adjustment costs arising changes in employment opportunities and profitability across industries. The best approach is to report representative results from all three basic types of models: engineering (bottoms-up), macro-economic forecasting and computable general equilibrium (tops-down).
- As a standard practice of analysis, results from models should start with a baseline estimate which shows the costs of a particular agenda (e.g., stabilization of emissions by 2000) without the ameliorating effects of other policies (e.g., recycling revenues from the sale of permits).
- The baseline estimate should be drawn from policy alternatives that have a fair amount of field testing. A good candidate for a baseline estimate is a cap and trade system in which a fixed number of allowances are distributed among polluters in a manner which does not alter existing implicit property rights (i.e. the right to emit legally admissible amounts without charge). This alternative has been employed in the SO₂ and other programs.

- One policy alternative that should be examined in detail is a cap and trade system with banking and borrowing. Such a policy offers the opportunity to capture both intra and inter generational efficiencies (address the questions of "when" and "where"). It is, however, also untested and is not now part of the usual regulatory package of policy alternatives.

c: M. Bailly

F
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 C. W. C. K.

I apologize for the tight deadline and appreciate your attention to this matter.



Global Climate Change

U.S. Government Public Information Packet

(COVER OF FOLDER)

The U.S. Climate Change Action Plan

50 programs and 5,000 partners

Residential Sector

- Golden Carrots Market Pull (202)233-9127
- Enhanced Appliance Standards (202)586-7140
- Home Energy Rating Systems and Energy Efficient Mortgages (202)586-9201
- Upgrade Residential Building Standards (202)586-0517
- Energy Value Homes (202)233-9127

Commercial Sector

- Energy Star Buildings and Rebuild America (202)233-9137 or 1-800-363-3732
- Green Lights (202)233-9190 (Hotline) or call (202)233-9659 (Faxline)
- State Revolving Fund for Public Buildings 1-800-363-3732
- Cost Shared Demonstrations for Emerging Technologies (202)586-5253
- Energy Efficiency and Renewable Energy Information & Training, Customer Service 1-800-363-3732

Energy Sector

- Climate Challenge (202)586-2588
- Commercialize High-Efficiency Gas Technologies (301)903-2832
- Promote Integrated Resource Planning (202)586-1491
- Improve Hydroelectric Generation at Existing Dams (202)586-5659
- Accelerate Development of Efficiency Standards for Electric Transformers (202)586-2828
- EPA's Energy Star Transformers (202)233-9002
- Increase Natural Gas Share of Energy Use through Federal Regulatory Reform (202)586-5659
- Promote Seasonal Gas Use for Control of Nitrogen Oxides (NO_x), Office of Policy, Planning and Evaluation, Jim Turner (202)260-2784
- Renewable Energy Commercialization, Office of Utility Technologies, Larry Mansueti (202)586-2588
- Reduce Electric Generation Losses Through Transmission Pricing Reform, Office of Electricity Policy, Paul Carrier (202)586-5659

International, State and Local Programs

- US Initiative on Joint Implementation (202)426-0072
- State and Local Outreach Program (202)260-4314
- "Cool Communities" Program (202)586-9204

Forestry Sector

- Reduce Depletion and Accelerate Tree Planting in Non-Industrial Private Forests (202)205-1376

- Promote Recycling and Pollution Prevention in Ship and Paper Industry (202)205-1565

Industrial Sector

- Climate Wise (202)260-4407 or (202)586-2097
- Accelerate Source Reduction, Pollution Prevention and Recycling (202)260-7019
- NICE 1-800-363-3732
- WasteWise 1-800-EPA-WISE
- Accelerate the Adoption of Energy Efficient Pollution Prevention Technologies for Industry (202)586-2097
- Motor Challenge and Industrial Air Compressors, Pumps, Fans and Drives 1-800-862-2086
- Energy Analysis and Diagnostic Centers (202)586-1298
- Reduce Pesticide Use (202)720-7173

Transportation Sector

- Federal Parking Cash Out (202)260-3761
- Transportation Efficiency Strategy (202)260-3729
- Promote Telecommuting (202)366-4823
- Develop Fuel Economy Labels for Tires

HFC, PFC, and NO_x Emissions

- Create Partnerships to Eliminate HFC-23 Emissions (202)233-9061
- Launch Partnership with Aluminum Producers (202)233-9631
- Improve Efficiency of Fertilizer Nitrogen Use (202)720-4539
- Narrow Use of High GWP Chemicals Using the Clean Air Act and Product Stewardship to Reduce Emissions, Ray Forte (202)233-9134

Methane Reduction and Recovery

- Natural Gas Star (202)233-9044
- Reduce Methane Emissions from Landfills and Expand Landfill Outreach Program (202)233-9631
- Coalbed Methane Outreach Program (202)233-9468
- RD&D for Methane Recovery from Coal Mining 1-800-363-3732
- RD&D for Methane Recovery from Landfills 1-800-363-3732
- AgStar Program (202)233-9041
- Ruminant Livestock Methane Program (202)233-9043

Other Programs

- ENERGY STAR Office Equipment, Linda Latham (202)233-9420
- U.S. Country Studies Program, Ron Benioff (202)426-1635

The U.S. Climate Change Action Plan—
A menu of innovative public-private partnerships to combat
global warming and strengthen the economy.

July
1996

CLIMATE WISE

CLIMATE WISE is helping U.S. industries turn energy efficiency and pollution prevention into a corporate asset. By encouraging comprehensive, cost-effective industrial energy efficiency and pollution prevention actions, CLIMATE WISE is helping companies realize significant environmental and economic benefits. Participating companies expect savings in excess of \$300 million by the year 2000. Companies participate by completing a CLIMATE WISE Action Plan detailing the actions that they will undertake and by reporting the results of their actions through the Voluntary Greenhouse Gas Reporting program. CLIMATE WISE also provides information on the full range of U.S. CLIMATE CHANGE Action Plan programs and encourages company participation in these programs as part of their comprehensive CLIMATE WISE Action Plan.

CLIMATE WISE targets the industrial sector, which accounts for 30 percent of U.S. energy consumption. Companies often face a broad array of emission reduction opportunities that range from process and equipment improvements such as optimizing boiler and air compressor system efficiency to fuel switching, cogeneration, and employee and vehicle fleet trip reductions.

CLIMATE WISE provides technical assistance and public recognition to stimulate the development and implementation of comprehensive emission reduction Action Plans. CLIMATE WISE also hosts regional business-to-business forums to provide CLIMATE WISE partners opportunities to share best management practices, innovative technologies, and assessment techniques that will strengthen their corporate energy efficiency and pollution prevention programs.

Fetzer Vineyards has committed to:

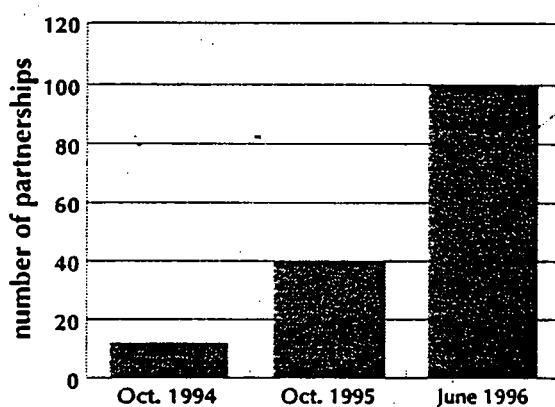
- Reduce power demand 10.5 percent even with projected growth by the year 2000.

- Increase efficiency of insulation, passive cooling, and heating and the environmental control system.
- Convert all service vehicles to alternative fuels such as natural gas, electric and solar by the year 2005.
- Eliminate use of toxic chemicals in all operations and maintenance practices by 2005.
- Improve employee transportation services through electric power vehicles.

General Motors has committed to:

- Launch a supplier outreach program to inform GM suppliers of the benefits of resource conservation and pollution prevention practices and of the CLIMATE WISE program.
- Accelerate a benchmarking project designed to identify the 10 least energy-efficient facilities, audit their operations, and implement identified actions.
- Accelerate powerhouse evaluation studies involving 50 facilities in 1995 and seeking to identify opportunities for shutting down or converting plant boilers to cleaner burning fuels and for providing plant heat through more energy-efficient conversions.
- Work with the DOE National Laboratories to identify additional cost-effective energy efficiency actions.

Climate Wise Partners



Facts and Figures

CLIMATE WISE Partners to date: 100

U.S. industrial energy use represented by current CLIMATE WISE partners: 6 percent

States with pilot state CLIMATE WISE programs: Colorado, Nebraska, New York, North Carolina, Ohio, Oregon, Pennsylvania and Wisconsin.

Cities/Counties with Pilot Industrial Demonstration Programs*: Austin, TX; Berkeley, CA; Dade County, FL; Denver, CO; Portland, OR; Pittsburgh, PA

* A partnership initiative with the State and Local Outreach Program

Climate Change

July
1996

WasteWiSe

WasteWiSe is a voluntary program developed by the U.S. Environmental Protection Agency to assist businesses in taking cost-effective actions to reduce solid waste. WasteWiSe partners make voluntary commitments to achievements in waste prevention, recycling collection and the purchase or manufacture of recycled products.

The principal waste prevention activity undertaken by WasteWiSe partners is reducing or reusing transport packaging. In 1994, nearly 140,000 tons of material was conserved through reductions in transport packaging, and for some companies, this translated into substantial cost savings. For example, Target Stores, a retail chain of 600 stores, save \$4.5 million in annual operating costs by switching to packaging for clothing that requires much less time to unpack and prepare for display.

WasteWiSe partners also reported expanding or improving ongoing company recycling programs by educating employees, performing community outreach and collecting new materials.

The materials recycled in the highest amounts were corrugated containers and boxes, ferrous materials, and aluminum and other non-ferrous metals. Production and consumption of these materials generate substantial greenhouse gas emissions. By reducing, reusing and recycling, WasteWiSe partners are helping to reduce emissions of greenhouse gases.



"What started out as a nice thing for the environment ended up saving an impressive amount of money."

*Jim Oberndorfer, Manager Facilities Operations
Perkin-Elmer Corporation*

"The WasteWiSe program has the most comprehensive information on waste prevention for businesses."

*Nancy Hirschberg, Environmental Coordinator
Stonyfield Farm Yogurt*

Facts and Figures

Current number of WasteWiSe Partners: 440
Current number of WasteWiSe membership-based endorser: 40
Amount reduced and recycled in 1995: 1.8 million tons

Climate Change

July
1996

Rebuild America

Rebuild America is a U.S. Department of Energy (DOE) program that supports the formation of community and regional partnerships to design and carry out commercial and multifamily building renovation programs. By capturing existing energy efficiency opportunities, building owners can reduce their operating costs by hundreds of millions of dollars annually.

DOE provides Rebuild America partnerships with assistance in program administration, staffing, development of technical plans, building audits, evaluation and training.

Facts and Figures

Percentage of U.S. carbon emissions caused by building energy use: 35 percent
Expected cost savings in 2000: \$650 million/year
Number of organizations requesting applications to prepare investment proposals for Rebuild America financial partnerships: 450

Rebuild America is working with more than 40 national community partnerships to improve commercial and multi-family building energy efficiency. Rebuild America partnership commitments made by the year 2000 are expected to save \$650 million each year. 1995 Rebuild America partnerships are expected to leverage non-federal investments in these communities by 70:1 and are creating 3,000 jobs.

Rebuild Colorado Communities, led by the Governor's Office of Energy Conservation, anticipates FY 95 private sector and local government investments of

about \$175 million as a result of DOE's \$200K award to the partnership to renovate 122 million square feet of commercial space and multifamily housing.

Rebuild America partnerships design building renovation programs tailored to the needs of the communities they serve. Partners are conducting four activities:

- **Design Programs.** Partners design specific activities to expand significantly the reach and effectiveness of existing programs for energy retrofits.
- **Form Teams.** Partners obtain commitments from key leaders of local government and industry and form teams to carry out partnership programs.
- **Identify and Leverage Resources.** Partners identify resources available from private and public sources, both federal and non-federal.
- **Implement Retrofits.** Partners carry out retrofit programs that achieve significant energy savings.

"U.S. cities should consider [energy efficiency] options as they work to solve fiscal challenges. Too often, community leaders overlook energy efficiency as a great opportunity to save money."

Victor Ashe
Mayor of Knoxville, Tennessee
President of the U.S. Conference of Mayors

"At a time when all levels of government are being asked to cut back, Rebuild Colorado will help both state and private builders turn energy waste into a new source of capital. By financing project costs through future energy savings, building owners will be able to completely eliminate the high up-front costs often required to save energy."

Linda Smith
Rebuild Colorado Coordinator

Climate Change

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1996

USJI

The U.S. Initiative on Joint Implementation (USJI) is a pilot program encouraging organizations in the United States to implement projects internationally that reduce, avoid or sequester greenhouse gases. Since its launch in 1993 as part of the U.S. Climate Change Action Plan, USJI has become the largest effort worldwide to explore options for countries to jointly reduce greenhouse gases.

The goals of the USJI program are to promote technology cooperation with and sustainable development in developing and transition countries, test and evaluate methods to measure, track and verify emissions reductions costs and benefits; encourage private sector investment and innovation in developing and disseminating technologies to reduce or sequester GHG emissions; and establish an empirical base for the formulation of international criteria for joint implementation.

USJI Program Accomplishments:

The USJI Secretariat has received 51 project proposals from 23 countries. Of these, the USJI Evaluation Panel has approved 15 projects in six countries, including Belize, Costa Rica, the Czech Republic, Honduras, Nicaragua and the Russian Federation. Each proposal has gone through an extensive technical review process conducted by USJI Secretariat staff and other technical experts.

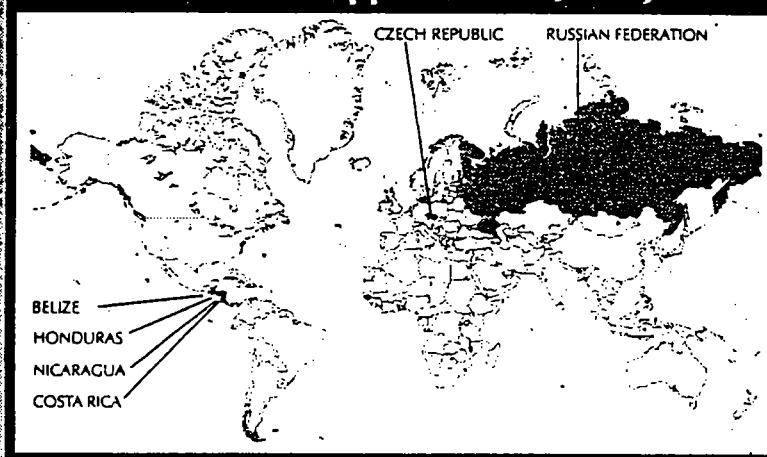
USJI projects include a wide variety of technologies and practices, including wind, solar, hydroelectric and solar energy; coal to natural gas fuel switching; methane

gas capture; and sustainable forest management and preservation.

When fully implemented, investments from the U.S. approved USJI projects are estimated to exceed \$200 million.

To further reduce the transaction costs for participating in USJI, the Secretariat is establishing a Technical Assistance Program to assist approved and in-development project partners in calculating emissions estimates, developing monitoring and verification plans, and identifying sources of project financing.

Countries with Approved USJI Projects



To streamline the application and review process, the USJI has adopted a rolling approval process under which proposals may be submitted to the USJI Secretariat at any time and will be evaluated within 90 days once the proposal is determined to be complete.

The USJI Secretariat has established and maintains an extensive Information Resource Center that includes a library of books, publications and reports on international JI activities; manuals, handbooks and other USJI technical guidance documents; databases of existing and developing JI projects; and information on project financing.

The USJI Secretariat is expanding its public recognition program to recognize more fully the achievements of USJI project partners and host countries and to help partners increase the visibility of their participation in the program.

Facts and Figures

Number of project proposals received: 51
Number of approved projects: 15

July
1996

Climate Change

Renewable Energy Commercialization

Many potential users of renewable energy technologies are unaware of the state of development, economic benefits, high levels of reliability and proper integration of renewables into their overall energy systems. To overcome this barrier, the Department of Energy's renewable energy programs sponsor technical assistance and/or technology demonstrations that help users make informed decisions.

Technical assistance is provided through development and dissemination of specialized reports, development of information and design tools for CD-ROMs and the Internet, sponsorship of workshops and seminars throughout the country, guided technical tours through demonstration projects and in some cases individual consultation with National Laboratory experts. Two programs, Wind and Photovoltaics, support a Design Assistance Center at National Laboratories. These centers provide technical assistance to local governments, other federal agencies, electric utilities, private companies and occasionally other countries. Assistance may include supporting feasibility analyses, structuring Request for Proposals and assisting in development of selection criteria.

Examples of CCAP Renewable Energy Commercialization technical assistance and demonstrations include:

Wind:

To assist with the construction of wind turbine power plants in Wyoming and Iowa, DOE will provide technical assistance through the National Renewable Energy Laboratory. Project planning advice and performance reports will be provided for the next two years.

Photovoltaics:

DOE and its partner, the Utility PV Group (UPVG), fund a six-year 50 MW photovoltaic project to accelerate the commercialization of PV in the United States. DOE also is working with other partners such as state working groups, utilities, trade associations, consumer advocates and universities in gathering, researching and sharing PV cost-effectiveness information with the public.

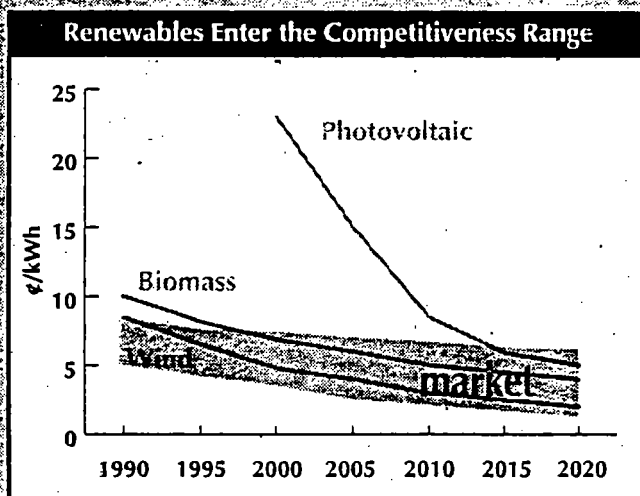
Biomass:

The Vermont Biomass Gasifier Project will provide near-term demonstration of high efficiency biomass gasification/gas turbine systems and will produce 15 megawatts of generating capacity to Burlington Electric's existing 50 megawatt wood-fired McNeil Station. A collaborative DOE/USDA solicitation entitled "Biomass Power for Rural Development" is aimed at demonstrating integrated use of energy crops for power production.

Geothermal:

As part of the "National Earth Comfort Program", DOE is helping the utility industry meet the ambitious goals of achieving Geothermal Heat Pump unit sales of 55,000 to 400,000 annually. DOE is providing collaborative technical assistance by sponsoring a national teleconference

series and by partnering with International Ground Source Heat Pump Association Experts.



Facts and figures:

Still to come from Arlene Anderson at DOE, 586-3818

Climate Change

July
1996

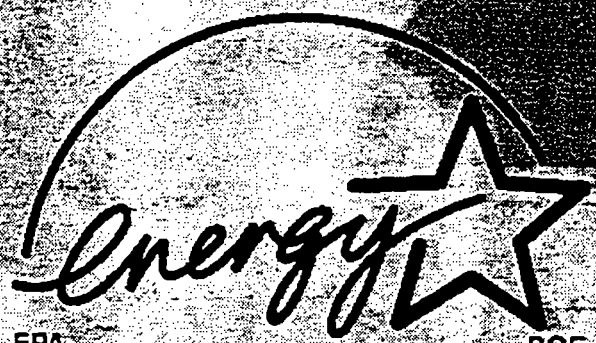
ENERGY STAR Product Labeling

The U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE) are using the ENERGY STAR label to identify products and services that save energy, save money, and help the environment. The goal of the ENERGY STAR labeling programs is to provide consumers with clear information they need about energy-efficient products to improve purchase decisions.

Under this initiative, each agency oversees program activities for a specific set of products. These program activities include partnership relationships with interested equipment manufacturers and builders who agree to produce efficient products, and to display the ENERGY STAR label on models that meet the ENERGY STAR specifications. For those products that are covered by minimum federal efficiency standards, the voluntary ENERGY STAR specifications are designed to exceed the current federal standards.

The ENERGY STAR label was first awarded to energy-efficient computer equipment in 1993, and efforts have since expanded to include office equipment, heating and cooling equipment, appliances, lighting, building envelope technologies, new homes and financing.

Consumer education is an important part of these labeling activities. A national consumer education



EPA

DOE

SAVING THE EARTH. SAVING YOUR MONEY.

campaign is planned for the fall of 1996, and is designed to educate consumers about the important link between energy use and the environment. In addition, each agency will reinforce this general message in targeted outreach activities to promote specific ENERGY STAR labeled products.

In order to reach consumers at the time they actually are purchasing products, both agencies are working with retailers who have agreed to promote ENERGY STAR-labeled products to their customers. In addition, electric and gas utilities are interested in promoting ENERGY STAR products to their customers.

Both agencies also are investigating options for special financing mechanisms that will make the purchase of ENERGY STAR products more affordable for consumers. In response to these efforts, Fannie Mae has agreed to implement a low-interest loan program for equipment manufacturers and retailers. ENERGY STAR loans and mortgages are available from banks and other financiers to assist the purchase of ENERGY STAR equipment and homes.

Facts and Figures:

Current Participation:

- More than 500 manufacturers, offering 13,000 qualifying product models
- More than 20 million ENERGY STAR computers in use
- More than 70 home builders, committed to building 10,000 ENERGY STAR Homes

1996 Benefits:

- 1.5 million metric tons of carbon equivalent avoided
- More than \$300 million in energy savings

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Climate Change Landfill Rule and Landfill Methane Outreach Program

Landfills are the largest source of anthropogenic methane emissions in the United States. Because methane is a fuel, landfills also represent a tremendous energy resource. Through the Landfill Methane Outreach Program (LMOP), launched in December 1994, the U.S. Environmental Protection Agency (EPA) is encouraging landfill operators across the United States to capture and use landfill gas emissions. This voluntary effort works hand-in-hand with EPA's landfill gas New Source Performance Standards (Landfill Rule) to promote cost-effective reductions in methane emissions. Because methane is a potent greenhouse gas, the landfill rule and LMOP combined will provide major greenhouse gas reductions.

The Landfill Rule, promulgated in March 1996, requires large landfills to capture and combust landfill gas emissions. By providing reliable technical and economic information on the opportunities to use landfill gas as a fuel, connecting project partners, creating innovative financing opportunities and demonstrating the many benefits of landfill gas-to-energy, the LMOP is helping landfills affected by the Landfill Rule to achieve the maximum benefit at the lowest cost.

EPA works with state energy and environmental agencies, utilities and industry to lower the barriers to landfill gas-to-energy project development. The LMOP works with its "Allies" to disseminate reliable information, identify project opportunities and create momentum for increasing the economically and environmentally beneficial use of landfill gas.

Through the Landfill Methane Outreach Program, a wide range of technical assistance products has been developed and distributed, including the following:

- Project development handbook;
- Profiles of landfills that are good candidates for energy recovery in 30 states;



LANDFILL METHANE OUTREACH PROGRAM

- Primers outlining key state regulatory and incentive information for several states;
- Software to evaluate the most attractive project options for specific landfills, including estimation of costs and benefits; and
- Fact sheets and issue papers providing guidance on critical issues.

In addition, the Landfill Methane Outreach Program has catalyzed development of several new landfill gas-to-energy projects.

Facts and Figures

Allies include:

- 16 state agencies
- 13 utilities
- 58 industry representatives (project developers, equipment suppliers, financiers, landfill gas end users)

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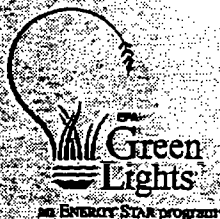
Climate Change

Green Lights & ENERGY STAR Buildings

Investing in a building's energy performance can provide rates of return well above those of most financial instruments. The Green Lights and ENERGY STAR Buildings Programs are voluntary, partnership programs designed to maximize investments in energy-saving and cost-effective pollution prevention measures for commercial buildings. These buildings account for 15 percent of all energy consumption in the United States.

Green Lights

Through the Green Lights program, the U.S. Environmental Protection Agency (EPA) overcomes informational and other barriers to energy efficiency investments in commercial building lighting. Green Lights partners are reducing their energy consumption through cost-effective, energy-efficient technologies. Investments in these technologies cut electricity consumption in half and provide an average rate of return of 45 percent. EPA provides technical support, recognition and environmental motivation to participants who adopt these voluntary and profitable energy efficiency measures. Because lighting accounts for 35 percent of total commercial electricity consumption, Green Lights has a substantial overall impact on energy consumption and greenhouse gas emissions in the United States. Green Lights currently has more than 2,000 participants, including small and large businesses, public schools, hospitals and government agencies. These partners have made commitments to upgrade the lighting in more than 5 billion square feet of floor space (equivalent to 1 out of every 14 U.S. buildings) and have already completed upgrades in more than 1 billion square feet of floor space.



"Green Lights is an excellent example of good partnership between business and government."

By encouraging and helping businesses to upgrade lighting, EPA has shown that improving the environment is sound business."

Flavio Rodrigues

Engineering Manager, PepsiCo, Inc.

ENERGY STAR Buildings

Expanding on the successful Green Lights program, EPA works with individual building owners, developers and others through its ENERGY STAR Buildings program to encourage more comprehensive building upgrades. This program leads a building owner through a five-stage strategy to capitalize on system interactions that maximize energy savings at minimum cost. Green Lights is the first step of this strategy. EPA has successfully completed the ENERGY STAR Showcase Buildings program, in which 24 charter partners demonstrated an average energy bill savings of 30 percent. The full ENERGY STAR Buildings program was launched in 1995, and by the end of 1996 EPA expects that it will have more than 400 partners representing some 1 billion square feet of commercial floor space.



"Our savings from the ENERGY STAR program translate directly into more funds for critical services such as police and community benefits such as longer library hours."

Paul Tseng, Chief of Engineering and Environmental Services
Montgomery County Government

Facts and Figures

Participants: 2,100
Pollution prevented to date: - 2,500,000 tons CO₂,
21,000 tons SO₂, 9,000 tons NO_x
Partner Energy Bill Savings: \$300 million
Net U.S. jobs created, 1995: 6,000

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Climate Change Voluntary Aluminum Industrial Partnership

The EPA Voluntary Aluminum Industrial Partnership (VAIP) encourages primary aluminum producers to reduce emissions of potent greenhouse gases through cost-effective management and technology changes.

The U.S. Environmental Protection Agency (EPA) is partnering with primary aluminum producers to achieve reductions in emissions of carbon tetrafluoride (CF_4) and carbon hexafluoride (C_2F_6), which are emitted as byproducts of the primary aluminum production process. These potent greenhouse gases have global warming potentials of approximately 6,000 and 12,000 times that of CO_2 , respectively, and lifetimes that exceed 10,000 years. Because factors that cause these emissions are a sign of efficiency loss, focus by industry to reduce emissions will result in process enhancements. EPA estimates that emissions of CF_4 and C_2F_6 can be reduced 45 percent industry-wide.

The program has been embraced by the U.S. primary aluminum industry. 12 companies representing 94 percent of U.S. primary production capacity have joined in partnership with EPA.

The program has made great progress in further understanding the emissions of CF_4 and C_2F_6 from U.S. smelters. The program already has developed CF_4 and C_2F_6 gas standards (through the National Institute of Standards and Technology) and initiated fundamental research on the causes of these emissions (through the Massachusetts Institute of Technology).

EPA also has conducted measurements of CF_4 and C_2F_6 at 7 smelters in conjunction with primary aluminum companies. The results of these and other measurements will help companies better understand and predict their emissions, as well as identify the critical actions needed to reduce emissions.

Facts and Figures

VAIP partners include 12 primary aluminum production companies, which operate 22 primary aluminum smelters.



The Voluntary Aluminum Industrial Partnership is "an innovative voluntary environmental improvement program that also provides cost reduction benefits for the primary aluminum industry."

—Alumax, Inc.

VAIP Partners Represent 94% of U.S.
Primary Aluminum Production Capacity

94%

Climate Change

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The State and Local Climate Change Outreach Program

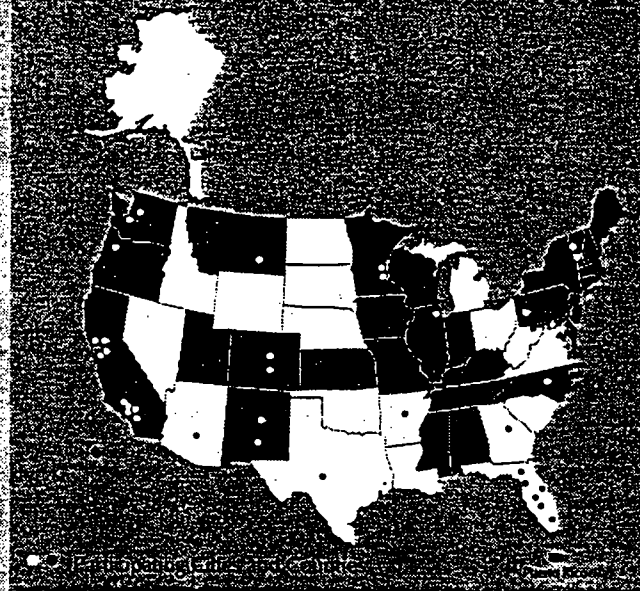
The State and Local Climate Change Outreach Program is a capacity-building program that targets the public sector and, indirectly, the public. State and local governments are targeted because they have regulatory authority over many direct and indirect sources of greenhouse gas (GHG) emissions. For example, local governments define land use, zoning and transportation policy, operate landfills, monitor air quality, pass and enforce building codes, define procurement policies and regulate parking. The Outreach Program staff assists states and localities in analyzing options and determining regional impacts (environmental and economic) of mitigation policies.

The Outreach Program provides outreach assistance that includes offering training workshops and reference manuals, preparing greenhouse gas emissions reports, developing comprehensive GHG reduction plans, testing innovative policies, disseminating results, providing education and outreach materials, and examining regional impacts of mitigation policies. The Outreach Program serves as a catalyst for enabling public sector decision-makers to understand the risks associated with global warming, and to provide leadership in reducing greenhouse gas emissions to constituency groups.

Facts and Figures

States working on greenhouse gas emissions inventories: 29 (including Puerto Rico)
States developing mitigation plans: 14
States that have completed or are completing innovative GHG reduction demonstration projects: 12
Cities in the U.S. participating in the *Cities for Climate Protection Campaign*: 34

U.S. Cities for Climate Protection Participating Cities, June 19-22 workshop



Albuquerque, NM; Atlanta, GA; Austin, TX; Berkeley, CA; Boulder, CO; Broward County, FL; Buriem, WA; Burlington, VT; Chicago, IL; Chittenden County, VT; Chula Vista, CA; Dade County, FL; Denver, CO; Durham, NC; Little Rock, AR; Los Angeles, CA; Minneapolis, MN; Missoula, MT; Mount Rainier, MD; Oakland, CA; Olympia, WA; Orange County, FL; Overland Park, FL; Pittsburgh, PA; Portland, OR; Saint Paul, MN; San Francisco, CA; San Jose, CA; Santa Fe, NM; Santa Monica, CA; Sunnyvale, CA; Tampa, FL; Tucson, AZ; West Hollywood, CA.

Among the strategies identified in the state mitigation plans are: emission cap and trade, energy-efficient mortgages, revised building codes, incentives for fuel efficient vehicle purchase, afforestation and partnership programs.

At the local level, the Outreach Program is working in partnership with the International Council for Local Environmental Initiatives (ICLEI) to assist cities and counties. ICLEI operates two programs, the *Green Fleets* program and the *Cities for Climate Protection Campaign*. *Green Fleets* focuses on transportation energy use and the development of integrated measures to reduce local demand for travel. The *Cities for Climate Protection Campaign* engages municipalities in climate change abatement policy. The campaign strengthens local commitments to reduce GHG emissions, develops and disseminates tools to increase local capacity, and encourages energy efficiency practices.

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Climate Challenge

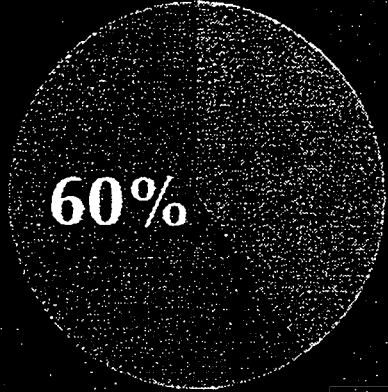
Climate Challenge is a joint initiative of the U.S. Department of Energy (DOE) and the U.S. electric utility industry to obtain voluntary commitments by utilities to undertake actions to reduce, avoid or sequester greenhouse gas emissions. DOE provides technical information and support, and public recognition to utility participants. The Climate Challenge Options Workbook, a joint effort of the utility industry and DOE, describes more than 50 options that utilities can use to meet their commitments, ranging from generating plant efficiency improvements to forest management projects.

Each utility partner provides DOE with an "Individual Participation Accord" that outlines greenhouse gas reduction measures that will be taken. Partners report their greenhouse gas reductions, Climate Challenge actions and achievements to DOE annually.

"In the global warming debate, proactive management, willingness to negotiate and leadership through voluntary initiatives are our strongest trump cards... Through a series of positive actions, we can become participants in positive progress instead of negative rule."

*Mark DeMichele
President and CEO
Arizona Public Service*

U.S. Electricity Generation by Climate Challenge Partners



60%

"This voluntary, flexible initiative is the best way to tap the utility industry's technical skills and problem-solving capabilities, while obviating the need for costly command-and-control requirements."

*E. Linn Draper, Jr.
Chairman
American Electric Power*

"Our Climate Challenge commitment reflects our continuing interest in cost-effective environmental progress. It is good business for us to address both local and global environmental problems that concern our customers. This program is an example of how, if given a chance, significant reductions can be achieved on a voluntary basis."

*Eldon Cotton
Assistant General Manager
Los Angeles Department of Water and Power*

Facts and Figures

Current number of Climate Challenge
participants: 581

Climate Change

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NICE

The National Industrial Competitiveness through Energy, Environment, Economics Program (NICE³) is a cost-shared grant program of the U.S. Department of Energy. The goals of the program are to catalyze cleaner production and manufacturing processes, reduce wastes in industry, conserve energy and energy-intensive feedstocks, and improve industrial cost-competitiveness.

NICE³ is implemented through a competitive solicitation process leading to grant awards through which federal funds are matched with a 55 percent cost share minimum. Industry applicants submit project proposals through a state energy, pollution prevention, or business development office. NICE³ awardees then commercialize the process or technology developed. Already, several of these technologies have been sold internationally as well as domestically.

Select NICE³ program partners include:

- Beta Control Systems, Inc. of Beaverton, Oregon, which plans to develop an on-site hydrochloric acid recovery system for galvanizers and small to medium-sized steel manufacturers. The technology will avoid acid waste transport and disposal costs and associated long-term liability in



addition to saving an estimated \$1 billion Btu's each year.

- Damage Protection Products is substituting pallets used for freight transport (normally produced from 100 percent virgin wood) with postconsumer paper waste with varying amounts of mixed paper wastes. Every ton of postconsumer waste substituted for virgin wood fiber in the paper production process would save 50 percent of the water and 60 percent of the energy used to make the paper.

- Pegasus Technologies has developed a prototype neural network system for improving the thermal efficiency of large, coal-fired utility plants. For less than \$250,000, Pegasus Technologies can install the NeuSIGHT for Heat Rate Improvement system to control combustion of nitrogen oxides, carbon dioxide and sulfur dioxide emissions from pulverized-coal-fired boilers.

"The NICE³ program has acted as a catalyst to bring together a partnership of state governments and industry to work together toward common beneficial goals. The format of NICE³ proposals, in fact, has also helped companies to obtain funding from traditional sources (the private sector)."

David Jones, California Energy Commission, Sacramento, California

- Tri Valley Growers proposes an innovative membrane technology for black olive processing in which all water, chemicals, and olive pomace are recycled into the operation or converted into a useful byproduct. A net energy savings of 14 percent will result, with total energy savings of 21.2 billion Btu's each year.

- DuPont-Merck Pharmaceutical Company proposed an ultrasonic tank cleaning method that uses water as a solvent rather than the volatile organic compound methylene chloride, a toxic solvent currently used to clean tanks. Energy savings of 3.5 billion Btu's per year are estimated.

Facts and Figures:

Number of NICE³ partners: 120
Number of NICE³ projects: 58
Average private sector investment generated by each \$1 of federal funding: \$4.5

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U.S. Country Studies Program

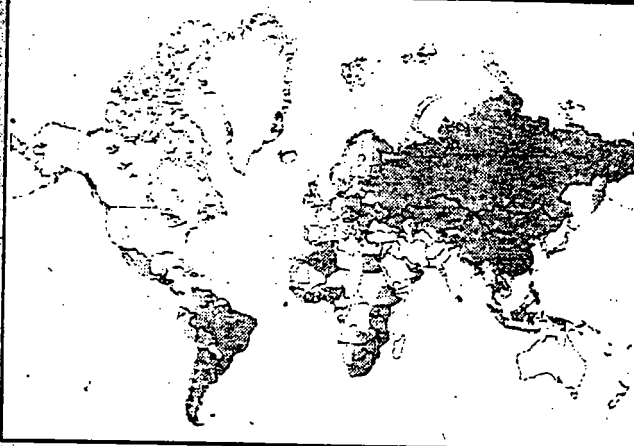
The U.S. Country Studies Program (CSP) provides financial and technical support for climate change studies to 55 developing countries and countries with economies in transition. These studies include greenhouse gas emission inventories, vulnerability and adaptation assessments, and analyses of mitigation options.

At COP-1 the United States launched a next phase of the Country Studies Program to provide support for national action plans (SNAP) that delineate specific response measures (including technology projects) that countries will implement and to lay the foundation for the preparation of national communications as called for under the Climate Convention. The CSP initiated assistance for plan preparation with 9 countries in 1995 and will assist 5 to 10 additional countries in 1996.

Accomplishments of the U.S. Country Studies Program include the following:

- Built human, technical and institutional capacity in 55 developing and transition countries to conduct climate change assessments through training, analytical tools and reference materials provided to more than 1,000 country analysts.
- Catalyzed the establishment and strengthening of intergovernmental climate change committees in the 55 countries and helped these countries identify opportunities to implement climate change responses that will contribute to their sustainable development objectives.
- Disseminated the study results (representing one of the most comprehensive international assessments to date) in more than 20 major synthesis reports and workshop proceedings in

Participating Countries



collaboration with the U.S. Global Change Research Program (USGCRP), the Intergovernmental Panel on Climate Change (IPCC) and others.

- Created a technical assistance program that is often cited as a model of effective cooperation between OECD and developing and transition countries and helped guide the design of GEF support for enabling activities.
- The 9 countries currently receiving CSP support for the preparation of their plans have already identified specific mitigation and adaptation measures (including technology projects) they wish to implement. Where appropriate, the CSP and the U.S. Agency for International Development are assisting countries with the development of these measures and their integration with other sustainable development plans and programs.
- More than 30 additional countries have expressed interest in preparing climate change action plans that will provide the basis for their national communications.

Facts and Figures

Number of participating countries: 55
Number of countries currently participating in the SNAP program: 9

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1996

Natural Gas STAR

Through the Natural Gas STAR Program, the U.S. Environmental Protection Agency (EPA) encourages natural gas companies to overcome barriers and adopt cost-effective technologies and practices that reduce emissions of methane, a potent greenhouse gas.

The Natural Gas STAR Program was launched in March 1995 with transmission and distribution companies. In 1995, the program was expanded to include the production sector. EPA provides guidance on cost-effective best management practices for companies to employ to reduce methane emissions. In addition, EPA provides partners with public recognition and works to remove regulatory barriers to STAR program practices. Companies submit an implementation plan and annual progress reports to EPA after becoming a program partner.

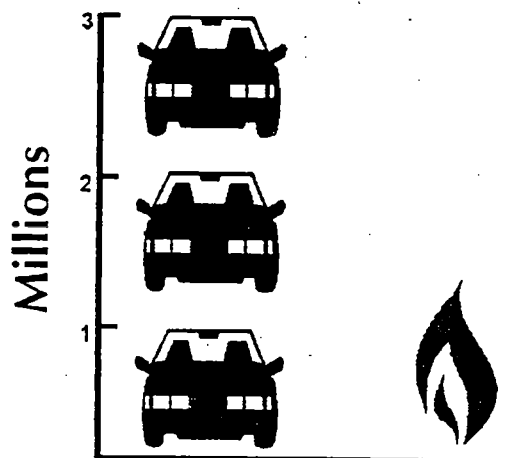
The American Gas Association, the National Association of Regulatory Utility Commissioners, The Natural Gas Supply Association, and the Southern Gas Association have endorsed the Natural Gas STAR Program. In addition, the Gas Research Institute endorsed the Natural Gas STAR Program in April 1994, pledging \$4 million of its annual budget to projects that reduce methane emissions.

"Involvement in Natural Gas STAR inspires new cost-effective methane reducing ideas. These ideas translate into lower system operating costs and help preserve our environment. Natural Gas STAR is a win-win program. We can cost-effectively prevent losses of methane to the environment and increase system efficiency."

Deanna Haines
Environmental Engineer
Southern California Gas Company

Facts and Figures

Transmission Pipeline Miles Covered: 65 percent
Distribution Pipeline Miles Covered: 35 percent
Production Covered: 25 percent
Annual Methane Savings: 4.3 trillion BTU's



More than 35 billion cubic feet of methane can be reduced industry-wide when this action is fully underway — the carbon equivalent of removing about 3 million cars from the road.



Climate Change

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Motor Challenge

Motor Challenge is a voluntary partnership program between the U.S. Department of Energy (DOE) and U.S. industry to increase the use of energy-efficient electric motor systems. U.S. industry spends more than \$30 billion annually on energy for motor systems. Electric motors and motor-driven equipment such as fans, pumps, blowers and compressors account for more than 70 percent of all electricity consumed by industrial facilities. By working with industry, Motor Challenge can help companies identify opportunities for motor system improvements.

DOE's implementation of Motor Challenge involves five program elements:

- Showcase Demonstrations prove the cost-effectiveness of high-efficiency electric motors in various industrial applications. Lockheed-Martin's flagship showcase demonstration has been a success. Adjustable speed drive units were installed in the ventilation system in the company's Burlington Vermont plant, where initial costs of \$98,000 will yield savings of \$68,000 per year in energy costs.
- The Information Clearinghouse serves as a one-stop shop to provide access to a toll-free hot line for technical assistance, an electronic bulletin board, decision tools, training materials, and information about upcoming conferences.
- The Allied Partner Program provides non-end-users, working with the Motor Challenge Program to promote energy-efficient motor systems, with value-added products they can provide to their customers.

"Motor Challenge private teamwork to accomplish shared goals in the energy and environmental arenas"

*David Buzzell
VP and Corporate Director Environmental
Health and Safety and Public Affairs
Dow Chemical*

- The Excellence Partner Program provides national recognition to end-user organizations committed to continuous motor system improvement.
- The Industry Partnerships program provides partners with materials such as instructional videos and decision software tools.

By deploying a team to survey their facilities, 3M Corporation has already identified opportunities to save \$315,000 annually through motor system upgrades. Ultimately, 3M expects to save at least \$8 million per year by increasing the efficiency of their motor systems corporate-wide.

Graphic Box:
Logo available electronically from Arlene
Anderson at DOE. 586-3818

Facts and Figures

Number of Motor Challenge partners: 1,337

State of Knowledge

The Earth's climate has started to change because human activities are altering the chemical composition of the atmosphere. The buildup of greenhouse gases - primarily carbon dioxide, methane, nitrous oxide and chlorofluorocarbons - is changing the radiation balance of the planet. The basic heat-trapping property of these greenhouse gases is essentially undisputed. Although there is considerable scientific uncertainty about exactly how and when the Earth's climate will respond to enhanced greenhouse gases in the future, observations indicate that detectable changes are underway. The direct effects of climate change will include changes in temperature, precipitation, soil moisture, and sea level. Such changes are predicted to have adverse effects on ecological systems, human health, and socio-economic sectors.

Human-induced climate change is a complex problem, which can impact the economy and the quality of life for this and future generations. The lag time between emission of the gases and their impact is on the order of decades to centuries; so too is the time needed to reverse any effects. Thus, policy decisions in the near term will have long-term consequences.

the Climate System

A natural greenhouse effect keeps the Earth about 33°C warmer than it otherwise would be. Without this, life as we know it would not be possible. Water vapor, carbon dioxide, and other trace gases trap heat as it is re-radiated from the Earth back to space. However, since pre-industrial times, human activities have added to the natural greenhouse effect by releasing additional greenhouse gases to the atmosphere. The burning of fossil fuels (coal, oil, and gas) for energy is the primary source of emissions; changing land-use patterns through agriculture and deforestation also contribute a significant share. Current global emissions of carbon dioxide from energy use are approximately 6 gigatons of carbon (GtC) per year.

Future greenhouse gas emissions are sensitive to changes in demographic, economic, technological, policy, and institutional developments. By the year 2025, world emissions could range from 8 to 15 GtC per year. In the year 2100, world emissions are projected to range from 5 to 36 GtC per year, depending on energy use, populations, technologies, and other factors. The U.S. and the rest of the OECD countries currently contribute about 40 percent of global carbon dioxide emissions. Future growth in emissions from OECD countries is predicted to be significantly smaller than growth in developing countries and countries with economies in transition.

Since the pre-industrial era, atmospheric concentrations of carbon dioxide have increased by nearly 30 percent, methane concentrations have doubled, and nitrous oxide concentrations have risen by 15 percent. These increases result in a radiative forcing or heat-trapping of energy equivalent to about 2.8 watts per square meter (Wm^{-2}). About half of the radiative forcing may

have been masked by increased levels of traditional air pollutants—sulfates and carbonaceous aerosols, particularly in the Northern Hemisphere—which reflect incoming solar radiation and alter the reflective properties of clouds. Aerosols are short-lived and vary regionally, hence they should not be regarded as a simple offset to greenhouse gas forcing. In addition, due to their health effects, build up will be limited. Calculations suggest that the projected increases in atmospheric concentrations of greenhouse gases alone will result in an additional radiative forcing of about 3 – 8 Wm⁻² by 2100. For a given concentration of greenhouse gases, the resulting increase in radiation can be predicted with precision; but the resulting impact on climate is more uncertain.

Model calculations, based on plausible ranges of future emissions and climate sensitivities, suggest that the global surface temperature could increase an average of 0.9 – 3.5°C by 2100, with significant variation by region. This estimate accounts for the offset from aerosols which has lowered earlier estimates somewhat. Global-average temperature changes of this magnitude would be greater than recent natural fluctuations and would occur at a rate significantly faster than any observed changes in the last 10,000 years. The U.S. and high latitudes are projected to warm more than the global average, especially as sulfate aerosol loading is decreased.

Model calculations also suggest that the rate of evaporation will increase as the climate warms, leading to an increase in average global precipitation. While precipitation at high latitudes is expected to increase, much of the precipitation increase may fall over the oceans. The models also suggest that the frequency of intense rainfall will increase and there will be a marked decrease in soil moisture over some mid-latitude continental regions during the summer.

Sea level is projected to increase by 15 to 95 centimeters by the end of the next century, due primarily to the thermal expansion of the oceans and the melting of glaciers.

Calculations of climate change at the regional scale are significantly less reliable than average global values, and it is unclear whether climate will become more variable. The frequency and intensity of extreme weather events of critical importance to ecological systems (droughts, floods, frosts, cloudiness, the frequency of hot or cold spells, and the intensity of associated fire and pest outbreaks) could increase.

Global mean surface temperatures have increased between 0.3 and 0.6°C since the late 19th Century, despite marked regional, seasonal and diurnal differences, raising the decadal global temperatures to the highest level in this century.

There is consistency between the observed global average temperature trend over this period and model simulations of the warming due to greenhouse gases if allowance is made for the increasing evidence of a cooling effect due to anthropogenic aerosols and stratospheric ozone depletion. Analyses of the geographical and vertical patterns of change suggest that they are likely to be due to human influences and are unlikely to be due to natural influences. The IPCC has concluded that the balance of evidence suggests a discernible human influence on global climate.

The warming is also continuing. The nine warmest years this century have all occurred since

1980. 1995 was the warmest year on record, suggesting the atmosphere has rebounded from the transient cooling of 0.5°C caused by Mt. Pinatubo and simulated by the models.

Several ancillary pieces of evidence are consistent with global warming. These include a decrease in Northern Hemisphere snow cover, a simultaneous decrease in Arctic sea ice, continued melting of alpine glaciers, and a rise of sea level. The frequency of extreme rainfall events has also increased throughout much of the country, suggestive of an intensification of the hydrologic cycle.

Carbon cycle models imply that limiting atmospheric concentrations of carbon dioxide to any level below 750 parts per million by volume (ppmv), about three times the pre-industrial level, would require emissions worldwide to eventually drop below 1990 levels. The longer emissions continue to increase, the greater reductions would eventually have to be made to stabilize concentrations at a given level.

While much is already known about the greenhouse effect, substantial reduction of key uncertainties (detailed quantification of the timing, magnitude and regional patterns of climate change) may require a decade or more. Accurate predictions are limited by our knowledge of the future emissions and atmospheric concentrations of carbon dioxide, aerosols and other greenhouse gases, the role of clouds and water vapor, and the role of the oceans.

Projected Impacts of Climate Change on the United States

Climate change poses threats to resources both domestically and internationally. These threats could have significant, but uncertain, socioeconomic consequences. Changes in temperature, precipitation and sea level driven by climate change can add to existing stresses on resources caused by other influences such as population growth, land-use changes, and pollution. Developing countries are more vulnerable than developed countries to climate change because of their socio-economic conditions.

Overall, various strategies for coping with climate change can be identified for "intensively managed" systems (such as agriculture, water resources, and developed coastlines). For these systems, technological and management options exist to some extent today, although they may be costly to implement. By comparison, fewer options can be identified for natural systems (such as wetlands and wilderness areas).

Temperature changes of the magnitude expected from the enhanced greenhouse effect have occurred in the past, but the previous changes took place over centuries or millennia instead of decades. Rates of natural migration and adaptation of species and communities appear to be much slower than the predicted rate of climate change. As a result, populations of many species and inhabited ranges could change as the climate to which they are adapted effectively shifts northward or to higher elevations.

One of the consequences of global climate change may be increases in the frequency of extreme weather events, particularly droughts and floods. These events, when they do occur, can be costly. For example:

Since 1992, 15 weather-related disasters in the U.S. have cost \$70 billion in damages and several hundred deaths from floods, heat waves, hurricanes, blizzards, and hail storms.

Damages from the Mississippi River flooding in 1993 are estimated to range from \$10 billion to \$20 billion.

Almost \$4 billion in federal payments went to farmers suffering crop losses during the 1988 drought.

Examples of the kinds of effects that may result from climate change include:

Health

Human health will be adversely affected through an increase in the rate of heat-related mortality and in the potential for the spread of vector-borne diseases such as malaria, dengue, yellow fever, and encephalitis and non-vector borne-diseases such as cholera and salmonellosis. There will likely be increased risk of malaria and dengue in the United States. Changing temperatures and precipitation patterns may produce new breeding sites for pests and pathogens.

Climate change may increase heat-stress mortality, particularly in the very young and very old.

Water Resources

Water resources will be increasingly stressed, leading to substantial economic, social, and environmental costs, especially in regions that are already water-limited and where there is strong competition among users.

Changes in precipitation and increased evaporation from higher temperatures can affect water supplies and water quality, posing threats to hydropower, irrigation, fisheries, and drinking water.

Floods are more likely because the frequency of intense rainfall is predicted to increase.

Droughts are likely to be more severe because warmer temperatures increase evaporation rates and thereby lead to drier soils during periods of little or no rain.

Climate change would be likely to add to the stress in several U.S. river basins such as the Great Basin, California, Missouri, Arkansas, Texas Gulf, Rio Grande, and Lower Colorado.

Water scarcity in Middle Eastern and African countries is also likely to be exacerbated by climate change.

Coastal Resources

A 50 cm rise in sea level by the year 2100, which is within the range projected by the IPCC, could inundate more than 5,000 square miles of dryland and an additional 4000 square miles of wetlands in the U.S. if no protective actions are taken.

Areas at highest risk from sea level rise are areas currently experiencing high erosion rates and those with very low elevations, such as parts of the U.S. Atlantic and Gulf coasts.

Internationally, many low-lying areas such as parts of the Maldives, Egypt, and Bangladesh would be completely inundated and uninhabitable by a similar sea level rise.

Agriculture

Large areas of the eastern and central United States face moderate to severe drying. Drought could become more frequent, particularly in the Great Plains.

Changes in management practices and technological advances might reduce or eliminate many of the potentially negative impacts of climate change in the agricultural sector.

Agriculture production in developing countries is likely to be more vulnerable to climate change given that they have relatively fewer economic resources.

Food scarcity is threatened in some regions of the world, especially in the tropics and subtropics,

where many of the world's poorest people live, even though the effects of climate change on total global food production may be small to moderate in comparison to the effects of population growth and increasing nutrition demands.

Forests

Natural ecosystems will be degraded because the composition, geographic distribution, and productivity of many ecosystems, such as forests, will shift as individual species respond to changes in climate. This will likely lead to reductions in biological diversity and in the goods and services ecosystems can provide for society.

Climate change over the next several decades might shift the ideal range for some Norrtttttttttttttttttttttth American forest species by as much as 300 miles to the north, exceeding the ability of forests and other ecological communities to migrate.

Forest damage from fire and diebacks driven by drought, insects and disease could increase.

The most vulnerable forest resources are those in regions subject to increased moisture stress, as in the dry continental interiors.

Energy and Transportation

Warmer temperatures will increase cooling demand but decrease heating requirements.

Changes in water availability may affect reliability of hydropower output.

Warming should lead to fewer disruptions of winter transportation, but increased droughts and floods may interfere with water transport.

Key Findings of the Second Assessment Report of the Intergovernmental Panel on Climate Change

The USG finds the IPCC Second Assessment Report to be an extremely useful document. It has achieved the goals of being scientifically credible and policy relevant, without being policy prescriptive.

In our opinion the key findings of the IPCC can be simply summarized:

Regional and global climate and on sea level

- * Human activities are increasing the atmospheric concentrations of carbon dioxide and other greenhouse gases that tend to warm the atmosphere and, in some regions, of aerosols that tend to cool the atmosphere.
- * The Earth's climate is changing. The surface temperature this century is as warm or warmer than any other century since at least 1400 AD; the temperature has increased by 0.3 to 0.6°C (about 0.5 to 1°F) over the last century; the last few decades have been the warmest this century; sea level has risen 10 to 25 cm (about 4 to 10 inches); and mountain glaciers have retreated world-wide this century.
- * Models that account for the observed increases in the atmospheric concentrations of greenhouse gases and sulfate aerosols are simulating the recent history of observed changes in surface temperature and its vertical distribution with increasing realism.
- * The balance of evidence suggests that there is a discernible human influence on global climate.
- * Without specific policies that reduce the growth of greenhouse gas emissions, the Earth's average surface temperature is projected to increase by about 1 to 3.5°C (about 2 to 6.5°F) by 2100, a rate faster than anything observed over the last 10,000 years.
- * The reliability of regional-scale predictions is still low, and the degree to which climate variability may change is uncertain.
- * Sea level is projected to rise by 15-95 cm (6-38 inches) by 2100.
- * The long atmospheric lifetime of many greenhouse gases, coupled with the thermal inertia of the oceans, means that the warming effect of anthropogenic emissions will be long-lived.
- * Even with a stabilization of greenhouse gas concentrations in the year 2100, temperatures would continue to increase for several decades, and sea level would continue to rise for centuries.

Potential health and environmental consequences of climate change

- * Human-induced regional and global changes in temperature, precipitation, soil moisture, and sea level add important new stresses on ecological and socio-economic systems that are already affected by pollution, increasing resource extraction, and non-sustainable management practices.
- * Most systems are sensitive to both the magnitude and rate of climate change.
- * The projected changes in climate include potentially disruptive effects that will affect the economy and the quality of life for this and future generations:

- Human Health will be adversely affected through an increase in the rate of heat-related mortality and in the potential for the spread of vector-borne diseases such as malaria, dengue, yellow fever, and encephalitis and non-vector-borne diseases such as cholera and salmonellosis.
- Food Security will be threatened in some regions of the world, especially in the tropics and subtropics, where many of the world's poorest people live, even though the effects of climate change on total global food production may be small to moderate in comparison to the effects of population change and increasing nutrition demands.
- Water Resources will be increasingly stressed, leading to substantial economic, social, and environmental costs, especially in regions that are already water-limited and where there is strong competition among users.
- Human Habitat Loss will occur in regions where small islands and coastal plain and river areas are particularly vulnerable to sea level rise.
- Natural Ecosystems will be degraded because the composition, geographic distribution, and productivity of many ecosystems, such as forests, will shift as individual species respond to changes in climate. This will likely lead to reductions in biological diversity and in the goods and services ecosystems can provide for society.
- * Developing countries are more vulnerable than developed countries to climate change because of their socio-economic conditions.
- * Impacts will be hard to quantify with certainty because of uncertainties in regional climate projections, the complicating effects of multiple stresses, and a lack of understanding of some key processes.

Approaches to mitigate or adapt to climate change

- * Adaptation, which involves adjustments in practices, processes, or structures of systems, can be helpful either in reducing adverse impacts or in preparing to take advantage of potential beneficial changes in climate.
- * Options such as migration corridors to assist adaptation of natural ecosystems to new climate conditions are limited and their effectiveness is generally unproven.
- * Successful adaptation will depend upon technological advances, institutional arrangements, availability of financing, technology transfer, information exchange, and incorporation of climate change concerns into resource-use and development decisions. Potential adaptation options for many developing countries are extremely limited due to the limited availability of technological and economic capabilities.
- * Stabilization of the atmospheric concentrations of carbon dioxide at three times the pre-industrial concentration or less will eventually require global emissions to be cut well below today's levels.
- * Gains in energy efficiency of 10-30% above present levels are feasible at little or no cost in many parts of the world through conservation measures, development of new energy supply technologies, and improved land management practices over the next 2 to 3 decades.
- * Significant reductions in net greenhouse gas emissions can be achieved utilizing an extensive array of technologies, and policy measures that accelerate technology development, diffusion, and transfer in all sectors.
- * Flexible, cost-effective policies relying on economic incentives and instruments, as well as

internationally coordinated instruments, can considerably reduce mitigation and adaptation costs.

- International and intergenerational equity issues are critical for policy formulation.
- There is justification for going beyond a no-regrets strategy.

Implications for Policymakers

In our opinion the IPCC has clearly demonstrated that the current non-binding measures for Annex I countries alone are inadequate. They have shown that there are many cost-effective approaches to reduce net emissions in all parts of the world, which if implemented would provide significant environmental benefits. In non-Annex I countries, many of these options will improve prospects for sustainable development and management of resources. While we are clearly not technology limited in making some initial progress in reducing projected greenhouse gas emissions, deep long-term cost-effective reductions will require an intensive R&D program into energy, industrial and crop technologies. Therefore, it is clear that we collectively must redouble our efforts in identifying the most cost-effective global approaches to reduce emissions in both the near- and long-term utilizing a broad portfolio of actions. Further, we must enhance support for cooperative national and international efforts to understand the socio-economic consequences of climate change, regional variations, and the efficacy of adaptation and mitigation options.

Post-It® Fax Note 7671		Date 6/5	# of pages 1
To ALICIA	From MIKE		
Co./Dept. MUNNELL	Co. TOMAN		
Phone #	Phone #		
Fax #	Fax #		



JUNE 5, 1996

Handwritten notes:
 Prince
 Climate
 Change

MEMORANDUM FOR: RAY PRINCE, CEA

FROM: MIKE TOMAN *MT*

SUBJECT: GOSSIP ABOUT THE ADMINISTRATION'S CLIMATE CHANGE ANALYSIS

I have had a couple of occasions at recent meetings to talk with some pretty well-connected people outside the government who have some knowledge about the Administration's interagency analysis of the economic impacts of long-term GHG emissions constraints. Since I am not close to the process myself at this point, I have no way to independently judge the veracity of their assertions. However, I know these people to be competent analysts and generally well enough connected to be believable. Their comments suggest that there are some real potential problems with the Administration's analysis, flaws that (again, if these guys are right) could be identified by sharp analysts hostile to the Administration's climate program. There thus seems to be sufficient risk of embarrassment that it might be worth following up on these concerns, assuming that CEA has not been shut out of the process entirely.

The gossip I was privy to did not provide a detailed road map of the potential analytical problems. However, the following points seem to be at issue:

- (1) Why is the Administration relying mostly if not entirely on variants of the long-term DRI model? The essence of the EMF12 process was that models differed considerably in their results, and that the differences were not just the result of parameter values. A macro forecasting model like DRI's will inherently show different responses to GHG control policies and different adjustment costs, especially in the short term (the adjustment costs would likely be higher, it seems to me, than with a GE model that emphasizes changes in resource allocation over spending levels).
- (2) Is the version of the model the Administration is using reliable? There seem to be concerns about the specification of energy demand in the model, but I did not get any details. There also seems to be some real concern about how the costs of carbon taxes in the model are recycled. I know that in earlier studies of the macro effects of energy prices using these models, the economy always could be made to boom with cuts in corporate taxes. I always thought these results were pretty bogus, so if the Administration's analysis is using carbon tax revenues to lower capital taxes, they may be understating the cost of the GHG constraints.

Again, I wish I could be more precise about the concerns; I hope this is helpful.



CONFIRMATION NOTICE

This is to confirm that you are registered to attend the Climate Change Analysis Workshop being held on June 6 and 7 at the Springfield Hilton in Springfield, Virginia.

Handwritten signature/initials

PRELIMINARY AGENDA FOR THE WORKSHOP

Wednesday, June 5

3:00-7:00 pm Pre-registration at the Springfield Hilton

Thursday, June 6

7:30-8:30 Registration/Coffee

8:30-11:30 Morning plenary

11:30-1:00 Lunch (on your own)

Breakout Session #1

1:00-2:45 Modeling U.S. Economic Impacts of Emissions Limits

2:45-3:15 Break

3:15-5:30 Economic Modeling Issues

5:30-6:30 Reception (cash bar)

Breakout Session #2

Policies & Measures: Reviews of Options

Policies & Measures: Approaches

Friday, June 7

8:30-10:00 Modeling International Economic Impacts Policies & Measures: Transportation

10:00-10:30 Break

10:30-12:15 Views on Structuring an Agreement Policies & Measures: Roles for Other Entities

12:15-1:15 Lunch (on your own)

1:15-3:00 Structuring an Agreement *continued* Policies & Measures: Energy Efficiency

3:00-3:30 Break

3:30-5:00 Article 4.1 & Non-Annex I Parties Policies & Measures: Renewables and Forests

HOTEL INFORMATION



The Springfield Hilton
6550 Loisdale Road
Springfield, Virginia 22150
703-971-8900

Location: Located at junction of I-95 at Franconia Road. Exit 169A (one mile south of the Capital Beltway).

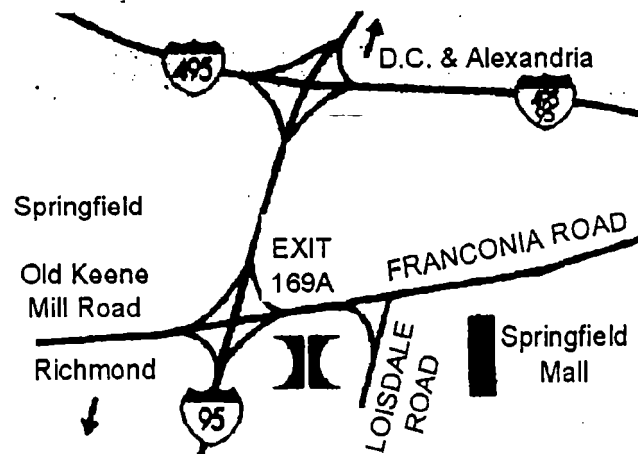
Hotel Reservations should be made directly with the Springfield Hilton. To obtain the government rate of \$124.00 (single or double occupancy), reference the **Climate Change Analysis Workshop**. Call either 1-800-HILTON (445-8667) or 703-971-8900. Reservations must be made by **May 22** to obtain the rate. *Space is limited.*

DIRECTIONS:

From the North: I-95 South to Capital Beltway I-495 (South to Alexandria). Follow to southern side of Beltway. Exit to I-95 South to Richmond. Immediately exit 169A Franconia Road 644E. Take first right at stoplight onto Loisdale Road. Turn right into hotel.

Via Metro: Take Blue line to Van Dorn Street. Morning shuttle bus service available 7:00 to 8:00 a.m. only (approximately every 20 minutes). Cabs will be available (approximately 5 miles).

For additional information, contact the Workshop Information Line at 703-934-3870.



Preliminary Agenda

Wednesday, June 5

3:00-7:00 pm Pre-registration at the Springfield Hilton

Thursday, June 6

7:30-8:30 Registration
8:30-11:30 Morning plenary
11:30-1:00 Lunch (on your own)

Breakout Session #1

✓ 1:00-2:45 Modeling U.S. Economic Impacts

2:45-3:15 Break

✓ 3:15-5:30 Economic Modeling Issues

5:30-6:30 Reception (cash bar)

Friday, June 7

✓ 8:30-10:00 Modeling International Economic Impacts

10:00-10:30 Break

10:30-12:15 Views on Structuring an Agreement

12:15-1:15 Lunch (on your own)

1:15-3:00 Structuring an Agreement, continued

3:00-3:30 Break

3:30-5:00 Article 4.1 & Non-Annex I Parties

Breakout Session #2

Policies & Measures:
Reviews of Options

Policies & Measures:
Approaches

Policies & Measures:
Transportation

Policies & Measures: Roles
for Other Entities

Policies & Measures: Energy
Efficiency

Policies & Measures:
Renewables and Forests

Agenda

DAY ONE

8:30-8:50	Gardiner	Welcome
8:50-9:10	Claussen	Status of Int'l Negotiations
9:10-9:30	??	Climate Change Impacts on our economy
9:30-10:00	Watson	Overview of IPCC (working group I and II)
10:00-10:30	Scheraga/Patz	Benefits of taking action
10:30-11:00		Break
11:00-11:30	Chupka	Overview of Government Analysis
11:30-1:00		Lunch

1:00-2:45	Modeling: Domestic (4)	P&M: Cross-Cutting Reviews (5)
2:45-3:15	Break	Break
3:15-5:30	Modeling: Issues (6)	P&M: Approaches (6)

DAY TWO

8:30-10:00	Modeling: International (4)	P&M: Transportation (4)
10:00-10:30	Break	Break
10:30-12:15	Structuring an Agreement I (4)	P&M: Roles for Other Entities (4)
12:15-1:15	Lunch	
1:15-3:00	Structuring an Agreement II (4)	P&M: Efficiency (5)
3:00-3:30	Break	Break
3:30-5:00	Article 4.1 (4)	P&M: Renewables/Forests (4)

Breakouts

Number	Author	Organization	Topic
Government Analysis Overview			
50	Chupka	DOE	USG analyses
Benefits			
2	Scheraga	OPPE	Ancillary environmental benefits of GHG reductions
56	Patz	John Hopkins Univ.	Health impacts of climate change
Modeling: Domestic			
5	Probyn	DRI	DRI modeling framework; USG analysis – macro-, regional & sectoral costs
9	Laitner	Economic Research Assoc.	EPAct's 30% energy efficiency target: GDP, jobs, wage, and carbon impacts.
43	Earley et al	EIA	IDEAS & DRI
48		ICF Kaiser	Electricity sector based on DRI electricity demand forecast
Modeling: Issues			
10	DeCanio	UCSB	Modeling the rate of technical progress
12	Cook, Miller	WRI, UMD	Lessons from other policy commitments (e.g., ozone)
18	Mintzer	UMD	Uncertainty in the modeling of technological progress
28	Weyant	Stanford	Overview of EMF 14 design & preliminary results
33	Montgomery	Charles River Assoc	Descriptive: How to do climate analysis; surveys other studies
	Kopp		
Modeling: International			
4	Wilcoxon	U. Texas	Trade impacts of carbon controls, regional costs, investment flows
24	Jacoby, Prinn	MIT	Analysis of targets & timetable proposals & adjustment mechanisms (leakage, trade, climate)
30	Richels	EPRI	MERGE analysis of various targets and paths to get there
42	Walker		Oxford model for 2 target levels (international)
Structuring an Agreement I			
13	Hoffman	OAR	GHG reductions thru institutional and organizational change
17	Buckner	UMWA	Carbon emission projections from EIA data; multi-stage targets 20-60 yrs; 1990 by 2005-2010
36	Dudek	EDF	structure of a limit; carbon budgets
45	Edmonds		Cost-effective strategies: where & when flexibility
Structuring an Agreement II			
1	Ramakrishna, Deutz	Woods Hole Research Ctr	Ecologically-driven targets
6	Capoor, Deutz	EDF, Woods Hole	Broad scope, including Annex I commitments and considerations for developing countries
47	Fay et al.	Int'l Climate Change Partshp.	Impacts on corporate investment strategy of long-term targets & timetables
	Sandoor		Trading
Article 4.1			
7	Keegan	Int'l Inst for Energy Cons.	Case studies of energy efficiency/renewable projects, developing countries
16	Leffert	Resource Mgmt Intl	Asia least-cost GHG abatement project, development of National Mitigation Plans
29	Benioff	Country Studies	Country Studies preliminary results

Speakers listed in
numerical order -
no decisions on
been made on
speaking order.

Breakouts

51	Novak	EEI	The role of Joint Implementation
P&M: Efficiency			
3	Koomey	LBL	Energy efficiency potential to reduce GHG emissions, buildings sector
22	Heydaneck	DOW	Energy efficiency improvements, enhanced competitiveness (non-Annex I applications)
23	Menzer	AC & Refrigeration Inst.	Energy efficiency products are best way to reduce GHG emissions
25	Long	PIMA	Insulation, thermal bldg standards; developing country potential
32	Spurr	IDEA	cogen, district energy benefits
P&M: Transportation			
8	DeCicco	ACEEE	Analysis of Transport sector policies and options
11	Lashoff	NRDC	Aviation fuel taxes, modifying Int'l Civil Aviation Org
21	Alson	OMS	Empirical analysis of transp. demand models of GHG emissions
49	Difiglio	DOE	Car Talk analysis
P&M: Renewables/Forests			
35	Sklar	Solar Energy Industries Ass.	Solar & biomass (link to developing countries jobs & security, reduced GHG)
38	Baldwin	NREL	Renewables
53	Evans	USDA	Benefits of agriculture and forestry management systems
54	Fox-Penner	DOE	Biomass
P&M: Cross-cutting reviews			
26	Topping	Climate Institute	Green Energy Partnerships (R&D, financing, market dev't, public policy "will")
34	Tennis	UCS	Decision tree approach -- costs, economic performance, carbon impacts
41	Bernow	Tellus	using NEMS to model electric sector carbon
55	Rubin	Carnegie-Mellon	NAS study findings, energy efficiency
57	Zimmerman	DOE	Review of policy options
P&M: Approaches			
14	Hezir	EOP	Voluntary industry programs -- steps to assess their effectiveness & role post-2000
15	Marvin	BCSEF	technology responses today -- market mechanisms and market pull
31	Goettle (Jorgenson)	Jorgenson Assoc.	Internalizing energy use externalities thru U.S. tax system changes
39	Krause	IPSEP	mandatory vs. voluntary efficiency stds
44	Muller	Ctr for Global Change	Carbon tax strategies: policy design and development
52	Shelby	OPPE	U.S. subsidies
P&M: Roles for Other Entities			
27	Blomberg, Hausauer	Vermont	State policy options
37	Mills	LBL	Insurance industry's role in promoting energy efficiency
46	Jessup	Cities for Climate Protection	Sustainable transport and demand-side efficiency in municipalities
	Helms	Center for Clean Air	Wisconsin
No Presentation (speaker limited to one presentation)			
20	Alson	OMS	Fuel economy trends
40	Krause	IPSEP	Analysis of IPCC WG3 studies for economic bias

80 registered as of 5/20

(not including sponsors + EPA/DOE/White House)

5/20/96

Name	Title	Organization	Address	Telephone	Facsimile	Date	Invite Sent	Registration Received	Signature
1 Richard K. Kader	Managing Director, Environmental Affairs	Air Transport Association	1301 Pennsylvania Avenue, NW, Suite 1100	Washington DC 20004	202-626-4155	202-626-4139		14-May 1:05	
2 Nihil Davel	Senior Associate	ICF Resources	8300 Lee Highway	Fairfax VA 22031	703-834-3602	703-881-3348	6-May 14-May	14-May 1:05	
3 Scott Sklar	Executive Director	Solar Energy Industries Association	122 C Street, NW, 4th Floor	Washington DC 20001	202-363-2611	202-363-2670		14-May 1:05	x
4 Eric O. Stark	Principal	ES&A	1104 N. Potomac Street	Arlington VA 22205	703-241-5417	703-241-5417	14-May	14-May 1:26	
5 John M. DeCicco	Senior Associate	ACEREE	1001 Connecticut Avenue, NW	Washington DC 20036	202-428-8873	202-428-2248		14-May 1:34	x
6 Gwyn Rowles	Director, Environmental Affairs	Aerospace Industries Association	1250 Eye Street, NW	Washington DC 20005	202-371-8401	202-371-8470	1-May 14-May	14-May 2:21	
7 Bob Klugewicz	Management, Environmental Affairs	Aerospace Industries Association of America	1250 Eye Street, NW	Washington DC 20005	202-371-8461	202-371-8470	26-Apr 14-May	14-May 2:51	
8 Rick Brown	Senior Manager	American Petroleum Institute	1220 I Street, NW, 9th Floor	Washington DC 20005	202-682-6444	202-682-6304		14-May 2:59	
9 Lois Johnson	Manager, International Relations	Texaco, Inc.	2000 Westchester Avenue	White Plains New York 10650	914-908-2798	203-545-4017		14-May 3:03	
10 Anthony J. Fiorentino	Executive Coordinator	Pratt & Whitney	400 Main Street, Mailing 163-16	East Hartford CT 06108	203-685-2798	203-685-4017		14-May 3:09	
11 Roger C. Fairchild	Attorney	Shuster & Low	14500 Arden Parkway, Suite 300	Chantilly VA 22021	703-818-1320	703-818-8813	6-May 14-May	14-May 3:32	
12 Daniel A. Mashof	Senior Scientist	NRDC	1360 New York Avenue, NW, Suite 300	Washington DC 20005	202-783-7800	202-783-6817		14-May 3:35	X
13 Thomas M. Kohn	Public Affairs	American Petroleum Institute	1220 I Street, NW	Washington DC 20005	202-682-6076	202-682-6071		14-May 3:38	
14 Robert P. Gehl	Principal Research Specialist	Southern Company Services	P.O. Box 2625	Birmingham AL 35202	205-676-6323	205-677-7294		14-May 3:41	
15 Paul H. Cicio	Manager of Government Relations, Hydrocarbons & Energy	The Dow Chemical Company	1776 Eye Street, NW, Suite 5757	Washington DC 20006	202-429-3411	202-429-3467		14-May 4:18	
16 Howard C. Arlenworth	Director, Atmospheres & Civil Aviation	Aerospace Industries Association	1250 I Street, NW	Washington DC 20005	202-371-8456	202-371-8470	26-Apr 14-May	14-May 4:18	
17 Alan F. Eisenberg	Economic Analyst	Ford Motor Company	514 World Headquarters, The American Road	Dearborn MI 48121	313-322-4120	313-390-6648	16-May	14-May 4:20	
18 Joe Lencowski	Manager	Virginia Power	5000 Dominion Boulevard	Glen Allen VA 23060	804-273-2977	804-273-2964	24-Apr 14-May	14-May 4:57	
19 David Banks	Principal	American Petroleum Institute	1220 I Street, NW	Washington DC 20005	202-682-6110	202-682-6116		14-May 5:58	
20 John A. "Skip" Lahrner	Principal	Economic Research Associates	1205 Collingwood Road, Suite 1100	Alexandria VA 22304	703-780-6407	703-780-6411		14-May 8:05	x
21 Richard H. Moss	Leader	IPCC WG-II Technical Support Unit	300 D Street, SW, Suite 840	Washington DC 20024	202-651-6280	202-654-8858		14-May 10:30	
22 Arlene F. Anderson	Environmental Manager	US DOE EE-70	1000 Independence Avenue, SW	Washington DC 20585	202-618-3618	202-686-2176		14-May 10:33	
23 Brian E. Card	Director Applied Analysis	US DOE EE-71	1000 Independence Avenue, SW	Washington DC 20585	202-618-3618	202-686-2176		14-May 10:33	
24 Eric C. Petersen	Director Applied Analysis	US DOE EE-71	1000 Independence Avenue, SW	Washington DC 20585	202-618-3618	202-686-2176		14-May 10:40	
25 Ami Bando	Vice President	Resource Management International	1130 Connecticut Avenue, NW, Suite 350	Washington DC 20036	202-429-8815	202-658-2928		14-May 10:40	x
26 Deborah A. Lofert	Analyst	Resource Management International	1130 Connecticut Avenue, NW, Suite 350	Washington DC 20036	202-429-8815	202-658-2928		14-May 10:40	x
27 Darryl M. Henden	Director, Issues Management	The Dow Chemical Company	2920 Dow Center	Midland MI 48674	517-636-3364	517-636-8918		14-May 10:40	X
28 Harry D. Jacoby	Professor of Management	Massachusetts Institute of Technology	77 Massachusetts Institute of Technology	Cambridge MA 02142	617-253-6808	617-253-6845		14-May 10:40	X
29 Frank Muller	Director of Policy Research	Center for Global Change	4801 43rd Place, NW	Washington DC 220018	202-244-2245	301-503-1165	26-Apr 14-May	14-May 10:47	x
30 Peter J. Wilcoxon	Department of Economics	University of Texas	Austin TX 78712	512-475-8531	512-471-3510			14-May 10:59	X
31 David Montgomery	Vice President	Charles River Associates	1001 Pennsylvania Avenue, NW, Suite 700 North	Washington DC 20004	202-682-3640	202-682-3610	26-Apr 14-May	14-May 11:00	x
32 Eric Holdsworth	Associate Director	Global Climate Coalition	1331 Pennsylvania Avenue, NW, Suite 1500 North Tower	Washington DC 20004	202-637-3158	202-638-1043	1-May 14-May	14-May 12:42	
33 John B. Shiesee	Executive Director	Global Climate Coalition	1331 Pennsylvania Avenue, NW, Suite 1500 North Tower	Washington DC 20004	202-637-3158	202-638-1043	1-May 14-May	14-May 12:42	
34 Mark A. Oram	Administrative Director	Global Climate Coalition	1331 Pennsylvania Avenue, NW, Suite 1500 North Tower	Washington DC 20004	202-637-3158	202-638-1043	1-May 14-May	14-May 12:42	
35 John J. Beath	Director	Northwest Airlines	5101 Northwest Drive C1125	St. Paul MN 55111	612-726-7280	612-727-4845		15-May 1:05	
36 Stephen J. DeCanto	Professor	University of California	Department of Economics University of California	Santa Barbara CA 93106	805-893-3130	805-893-8830		15-May 1:17	X
37 Dr. John F. Montgomerie	Manager Environmental	American Airlines	412 Teaswood Drive	Ft. Worth TX 76038	817-947-1099	817-957-8352		15-May 2:21	

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5-20-96 11:21:10PM

SENT BY: JCF Resources Inc.

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3/29/96

Name	Title	Organization	Address	City	State	Zip	Telephone	Facsimile	Hotel	Called	Invite Sent	Registration Received		
												Date	Time	Speaker
38 Susan M. Gaff	Senior Administrator	American Airlines	208 Tenback Circle	Capehart	TX	75019	817-947-4032	817-947-4032				15-May	2:21	
39 Thomas E. Werhane	Director, Regulatory Affairs	BF Alschers	2000 Market Street	Philadelphia	PA	19103	215-419-7861	215-419-7067				15-May	3:11	
40 Rae E. Connerly	Environmental Counsel	NRECA	4301 Wilson Boulevard, EP11-256	Arlington	VA	22203	703-907-6791	703-907-6617				15-May	3:30	
41 LeeAnn Kosak	Principal Research Specialist	Southern Company Services	P.O. Box 2825	Birmingham	AL	35202	205-870-4322	205-877-7836				15-May	3:41	
42 Eric R. Hidenour	Director	Chrysler Corporation Environmental & Energy Planning	800 Chrysler Drive East GMS 482-00-71	Auburn Hills	MI	48326	810-578-8078	810-578-7826				15-May	3:52	
43 Marie E. Takemoto	Senior Planning Specialist	Chrysler Corporation Environmental & Energy Planning	800 Chrysler Drive East GMS 482-00-71	Auburn Hills	MI	48326	810-578-5482	810-578-7826				15-May	3:52	
44 Florentine Krause	Director	IFSEF	7827 Lewiston Avenue	El Cerrito	CA	94530	510-625-7530	510-625-4444				15-May	4:46	X
45 Bill McGee	Assistant Director	General Accounting Office	P.O. Box 28165, 310 New Bern Avenue	Raleigh	NC	27611	919-829-3600	919-829-6618				15-May	4:47	
46 Jonathan H. Temple	Comptroller Officer	British Embassy	3100 Massachusetts Avenue, NW	Washington	DC	20008	202-698-6312	202-698-4406				15-May	4:50	
47 Jeffery A. Crockett	Manager, Federal Regulatory Affairs	American Electric Power	801 Pennsylvania Avenue, NW, Suite 214	Washington	DC	20004	202-428-1645	202-428-4276		22-Apr	14-May	15-May	7:15	
48 Jane L. Robinson	Manager, Environmental Resources	Wingate Power Company	500 South 27th Street	Decatur	IL	62525	217-424-8834	217-423-0119				15-May	7:58	
49 Larry D. Myers	Vice President	Allegheny Power	800 Cash Hill Drive	Greensburg	PA	15801	412-838-6806	412-838-6868				15-May	8:16	
50 Thomas E. Wallace	Vice President	Allegheny Power	800 Cash Hill Drive	Greensburg	PA	15801	412-838-6781	412-838-6868				15-May	8:16	
51 LeRoy Wadkins	Director, Public Policy	ARI	4301 North Fairfax Drive, Suite 425	Arlington	VA	22203	703-524-8800	703-528-3818				15-May	8:22	
52 Mark Menzies	Vice President, Engineering & Research	ARI	4301 North Fairfax Drive, Suite 425	Arlington	VA	22203	703-524-8800	703-528-3818				15-May	8:22	X
53 Phil Squier	Director, Legislative & Regulatory Affairs	ARI	4301 North Fairfax Drive, Suite 425	Arlington	VA	22203	703-524-8800	703-528-3818				15-May	8:22	
54 Renee Hancher	Director, International	ARI	4301 North Fairfax Drive, Suite 425	Arlington	VA	22203	703-524-8800	703-528-3818				15-May	8:22	
55 Tad W. Leland	Vice President, Government Affairs	ARI	4301 North Fairfax Drive, Suite 425	Arlington	VA	22203	703-524-8800	703-528-3818				15-May	8:22	
56 Gary R. Evans	Special Assistant/Globel Change	USDA	300 12th Street, SW, Room 2M08	Washington	DC	20250	202-401-1273	202-401-3812				15-May	8:57	X
57 Richard W. Schneider	Manager, Environmental Compliance	Delta Air Lines	3044 West Grand Boulevard, Metrolife 482-112-201	Detroit	MI	48084	313-554-7783	313-554-8003				15-May	9:08	
58 Terry Johnson	Manager, Environmental Compliance	Delta Air Lines	P.O. Box 20708 Department 885	Atlanta	GA	30320-6901	404-714-1168	404-714-3310				15-May	9:16	
59 Charles R. Sharp	Manager	AAMA	1401 H Street, NW	Washington	DC	20005	202-326-5642	202-326-6028				15-May	9:18	
60 Robert H. McFadden	Senior Vice President, Policy	AAMA	1401 H Street, NW	Washington	DC	20005	202-326-5623	202-326-6028				15-May	9:18	
61 Constance D. Holmes	Director, Statistical Services	National Mining Association	1130 17th Street, NW	Washington	DC	20036	202-463-2664	202-633-8638				15-May	10:36	
62 Leslie Coleman	Gr. Vice President	National Mining Association	1130 17th Street, NW	Washington	DC	20036	202-463-9780	202-633-8638				15-May	10:36	
63 Peter J. Shuck	Director, Government Relations	Allegheny Power System Inc.	800 Cash Hill Drive	Greensburg	PA	15801	412-838-6215	412-830-5400			14-May	15-May	11:02	
64 Mary J. Brooks	Senior Energy Analyst	GreenCool	P.O. Box 2666	Washington	DC	20013	703-843-2378	703-880-4397				15-May	11:25	X
65 Michael W. Tarrille	Head (Acting), Center for Building Science	Union of Concerned Scientists	Two Brattle Square	Cambridge	MA	02238-8106	617-447-6682	617-864-8405				15-May	11:33	X
66 Even Mills	Project Manager	Energy & Environment Division Lawrence Berkeley National Laboratory	One Cyclotron Road, MS-80 3068	Berkeley	CA	94720	510-486-8784	510-486-6394				15-May	12:57	
67 Mary Rita Koenig	Director, Environmental Policy and Projects	Center for Clean Air Policy	444 N. Capitol Street, Suite 602	Washington	DC	20001	202-624-6181	202-608-3829		6-May	14-May	15-May	1:03	
68 Pamela F. Faugert	Director, Environmental Policy and Projects	Virginia Power	5000 Dominion Boulevard	Glen Allen	VA	23060	804-273-3467	804-273-2984				16-May	1:03	
69 Jim Smithson	Senior Economist	Illinois Power Company	500 South 27th Street Decatur, IL 62525	Decatur	IL	62525	703-834-3065	703-881-3348		6-May	14-May	16-May	1:05	
70 David N. Friedman	Vice President	Assochels of American Railroads	50 F Street, NW	Washington	DC	20001	202-639-2184	202-639-2362				16-May	1:30	
71 James S. Poff	Associate Director, COSEUP	Potomac Electric Power	1800 Pennsylvania Avenue, NW	Washington	DC	20004	202-872-2274	202-331-8181			1-May	14-May	2:48	
72 Deborah D. Sline	Senior Associate	National Academy of Sciences	2101 Constitution Avenue, NW	Washington	DC	20007	202-334-3238	202-334-1967				16-May	2:54	
73 Elizabeth Cook	Director, Climate, Energy & Pollution	World Resources Institute	1709 New York Avenue	Washington	DC	20006	202-662-3488	202-636-0036				16-May	3:06	
74 Roger C. Dower	Senior Policy Analyst	World Resources Institute	1709 New York Avenue	Washington	DC	20006	202-662-2361	202-636-0036				16-May	3:06	
75 Russell O. Jones	US EPA	American Petroleum Institute	1220 L Street, NW	Washington	DC	20005	202-682-6546	202-682-8404			24-Apr	14-May	3:16	
76 Jeff Alton	US EPA	US EPA	2565 Plymouth Road	Ann Arbor	MI	48105	813-468-4298	313-688-4573				16-May	3:40	X
77 John Gertgen	US EPA	US EPA	2565 Plymouth Road	Ann Arbor	MI	48105	813-468-4298	313-688-4573				16-May	3:40	

Name	Title	Organization	Address	Telephone	Facsimile	Hotel	Called	Invited	Date	Registration Received		
										Date	Time	Speaker
78	Lucien Duckstein	Visiting Scholar	CEWRC-NWA-P	7701 Telegraph Road Casey Building	Alexandria VA	223150-3698	703-428-6370	703-428-6124		16-May	4:57	
79	Eugene Z. Stahiv	Chief, Policy and Special Studies Division	Institute for Water Resources	CEWRC-NWA-P, 7701 Telegraph Road Casey Building	Alexandria VA	223150-3698	703-428-6370	703-428-6124		16-May	4:57	
80	Abraham E. Hespel	Acting Deputy Assistant Secretary, Office of Policy	Department of Energy	1000 Independence Avenue, SW	Washington DC	20586	202-586-6316	202-586-3047		16-May	5:23	
81	David W. South	Vice President	Energy Resources International, Inc.	1015 18th Street, NW, Suite 650	Washington DC	20036	202-785-8833	202-785-8834	26-Apr	14-May	16-May	5:25
82	Daniel Dudek	Senior Economist	Environmental Defense Fund	257 Park Avenue South	New York NY	10010	212-606-2100	212-606-2375		16-May	16-May	6:37
83	Bob Wurster	Senior Economist	General Accounting Office	441 G Street, NW, Room 2237	Washington DC	20548	202-612-2983	202-612-9825		16-May	16-May	7:17
84	James A. Bott	Policy Advisor	Mobil Corporation	3925 Odorous Road, Room 30013	Fairfax VA	22037	703-846-4179	703-846-4129		16-May	16-May	8:45
85	James A. Edmonds	Senior Scientist	Pacific Northwest National Laboratory	901 D Street, SW, Suite 900	Washington DC	20024	202-646-6200	808-646-6233		16-May	10:15	
86	Ron D. Benoit	Acting Director	U.S. Country Studies Program	1000 Independence Avenue, SW PO-63	Washington DC	20585	202-426-1636	202-426-1540		16-May	10:57	X
87	Chuck Barnell	Assistant Director	General Accounting Office	441 G Street, NW	Washington DC	20548	202-612-6286	202-612-9926		16-May	12:54	
88	Kelly Macdon Stynes	Science Policy Director	Quone Action	1821 Connecticut Avenue, NW	Washington DC	20009	202-355-6738	202-966-9041		17-May	1:04	
89	Bridget C. Tushill	Energy Analyst	Energy and Environmental Analysis, Inc.	1855 N. Fort Myer Drive, Suite 800	Arlington VA	22209	703-628-1900	703-628-6108		17-May	2:16	
90	John P. Weyant	Professor	Stanford University	Department of Engineering Economic Systems and Operations Research	Stanford CA	94305-4025	415-723-3506	415-723-4107	28-Apr	14-May	17-May	2:33
91	C.V. Mehral	Principal Scientist	Arizona Public Service	P.O. Box 33998, M/S 0901	Phoenix AZ	85072	602-250-3589	602-250-3813		17-May	3:08	
92	Mark L. Kammer	Senior Washington Representative	General Motors Corporation	1680 L Street, NW, Suite 401	Washington DC	20001	202-775-6066	202-775-6077		17-May	3:10	X
93	Richard G. Richels	Director, Global Climate Change Register	EPA	2412 Hillview Avenue	Palo Alto CA	94303	415-855-2802	415-855-2960	28-Apr	14-May	17-May	3:28
94	Kurt D. Zwief	USIA Secretary	1000 Independence Avenue, NW PO 63	Washington DC	20585	202-426-1628	202-426-1561			17-May	3:36	
95	Donald M. Goldberg	Senior Attorney	Center for Int'l Env't Law	1821 Connecticut Avenue, NW	Washington DC	20009	202-332-4840	202-332-4886	18-May	17-May	3:40	
96	Bruce A. Steiner	Vice President - Environment & Energy	American Iron & Steel Institute	1101 17th Street, NW, Suite 1300	Washington DC	20036	202-452-7112	202-463-6573		17-May	3:46	
97	Sally M. Kane	Senior Economist	NOAA	1100 Wayne Avenue, Suite 1210	Silver Spring MD	20910	301-427-2098 x518	301-427-2073		17-May	3:48	
98	Dallas Buttrick	Fellow	Resources for the Future	1816 P Street, NW	Washington DC	20036	202-328-6087	202-939-3480		17-May	5:24	
99	Victoria L. Lennay	Administrative Assistant	Potomac Electric Power Company	1900 Pennsylvania Avenue, NW	Washington DC	20046	202-331-6513	202-351-6181		17-May	7:14	
100	Daniel L. Farshaw	Executive Assistant to Commissioner	Public Utilities Commission of Ohio	180 East Broad Street	Columbus OH	43215-3783	614-466-3805	614-466-7365		17-May	9:42	
101	Stephen S. Banzov	Vice President	Telus Institute	11 Arlington Street	Boston MA	2116	617-268-5400	617-268-8303		17-May	11:00	X
102	Mark Spurr	Legislative Director	International District Energy Association	1200 19th Street, NW, Suite 300	Washington DC	20036	612-227-8452	612-292-0014		17-May	11:36	
103	Roy E. Harvans	Environmental Issues Manager	Duke Power Co	13308 Hagers Ferry Road	Huntersville NC	28078	704-875-6836	704-875-6483	15-May	16-May	20-May	7:01
104	Peter L. Levin	White House Fellow	OMB	Washington DC	20503	202-395-4732	202-395-4639			20-May	7:50	
105	John Palmisano	Director, Regulatory Affairs	Enron Europe, Ltd.	Ferri Millbank	London England	SW1P 3ET	44-171-316-6733	44-171-316-6381		20-May	7:56	
106	Stephen D. Jenkins	Director, Issues Management	TECO Energy, Inc.	P.O. Box 111	Tampa FL	33601	813-228-1846	813-228-6200		20-May	8:01	
107	Eli Amich	Senior Vice President	American Honda Motor Company, Inc.	966 L'Enfant Plaza, Suite 6300	Washington DC	20004	202-564-4850	202-486-3642		20-May	9:15	
108	Klaus Lamberck	Energy Specialist	Public Utilities Commission of Ohio	180 East Broad Street	Columbus OH	43215-3783	614-644-8244	614-782-8363		20-May	9:25	
109	Margo Thorming	Chief Economist	American Council for Capital Formation	1750 K Street, NW, Suite 400	Washington DC	20006	202-293-6811	202-785-6165	15-May	15-May	20-May	10:01
110	Rosina M. Blumbaum	Acting Director for Environment	OETP	445 Old Executive Office Building, 17th & Pennsylvania Ave., NW	Washington DC	20502	202-466-6202	202-466-6025		14-May	20-May	10:06
111	Joanne Allen	Air Conditioning & Refrigeration Institute	American Trucking Association	Alexandria, VA			703-624-6836 x 352	703-625-3818	28-Apr	14-May		
112	Karen Medlin	ARCOS	Chrysler				202-878-8224	202-878-8286		16-May		
113	Darlene Ward	Chrysler					810-676-5882	810-676-7928		16-May		
114	Maurie Takemoto	Cimela Institute					202-647-0104	202-647-0111	28-Apr	14-May		
115	John Bond											

Name	Title	Organization	Address	Telephone	Facsimile	Hotel	Called	Invited	Date	Registration Received		
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116 Derek Winstanley		Department of Commerce/NOAA	Herbert C. Hoover Building Room 5224, 14th & Constitution Avenues, NW, Washington, DC 20529	202-482-1437	202-482-6231		6-May	14-May				
117 Roy Wood		Eastman Kodak Company		716-585-7638	716-722-3883			14-May				
118 Sam Baldwin		EMER NRBL	408 12th Street, SW Suite 710 Washington, DC 20024-2125	202-651-7642	202-651-7502		28-Apr	14-May				
119 Joe Hezr		EDP Group		202-833-8940			29-Apr	14-May				
120 Bob Hevenroch		EPA	Anne Harbor	313-688-4346	313-688-4212		25-Apr	14-May				
121 Brian Flannery		Exxon		908-730-2540	908-730-3301			17-May				
122 Lynn B. Russo	Washington Representative	Exxon Corporation	2001 Pennsylvania Avenue, NW, Suite 300 Washington, DC	202-482-0220	202-482-0287			14-May				
123 Chris Donaldson		Forthelm & Hammonds	Washington, DC	202-835-7483	202-296-6727		6-May	14-May				
124 George Kleinfeld		Forthelm & Hammonds	Washington, DC	202-835-7468	202-296-6727			14-May				
125 James E. Pesak	Manager Fuel Efficiency	General Motors	3044 West Grand Boulevard, Melrose 482-112-201 Detroit MI 48064	313-566-7712	313-566-9000							
126 Dale Jorgensen		Harsco		817-491-4069	817-688-2708		28-Apr	14-May				
127 Tammy TeraMaga		Honda North America, Incorporated	955 L'Enfant Plaza, SW Suite 6300, Washington, DC 20004	202-684-1650	202-488-3542		6-May	14-May				
128 Jim Wolf		Honeywell			202-657-8856			16-May				
129 Craig Eberl		ICF Kaiser		202-682-1130	202-682-1144			14-May				
130 Michael Gibbs		ICF Kaiser		818-609-3188	818-609-3137			14-May				
131 Daniel E. Nash	Senior Consultant	ICF Resources Incorporated & Twenty First Strategies	8000 Lee Highway Fairfax, Virginia 22031	703-684-3085	703-691-3348		6-May	14-May				
132 Philip Jessup		Int'l Council for Local Environmental Initiatives		416-382-1480			1-May	14-May				
133 Tere Solomon		Mitsubishi		202-223-6736	202-294-9211			16-May				
134 Michelle Martens		Northern States Power		612-330-7975	612-330-6367			14-May				
135 Dorothea Stewart		PUDCO		614-486-8081	614-752-8363		15-May	16-May				
136 Karen F. Suhr	Vice President	Spaerli & Associates	1318 F Street, NW, Suite 301 Washington, DC	202-383-3240	202-383-4385							
137 Ron Westin		US Coast Guard	Washington, DC	202-267-6001	202-267-4656		24-Apr	14-May				
138 Nadine Kennedy		US Council for International Business		212-364-4868	212-876-0327			17-May				
139 Les Blumberg		Vermont Department of Public Service	Vermont	802-828-4052	802-828-2342		24-Apr	14-May				
140 Bob Towers		Virginia Power	Richmond, VA	804-273-2976	804-273-3410		16-May	15-May				
141 Robert Combs		Washington Int'l Energy Group		804-273-2976	804-273-3410		28-Apr	14-May				
142 Tom Chuman				202-833-7141	202-331-8864			16-May				
143 Christine Kohn				703-312-8506	703-627-5477			14-May				
144 Fred Brannaman				415-781-1181	415-781-1186			16-May				
145 James Behrman			P.O. Box 6551 Albuquerque NM 87187		505-898-7331			17-May				
146 Karen Fernickler			1319 F Street, NW Washington DC 20004	202-383-3240	202-383-4385		6-May	14-May				
147 Kathy Yarbrough				202-383-0240	202-637-3580		1-May	14-May				

June 5, 1996

MEMORANDUM TO DISTRIBUTION

FROM: Marc Chupka
Department of Energy

SUBJECT: Final Draft Conference Presentation

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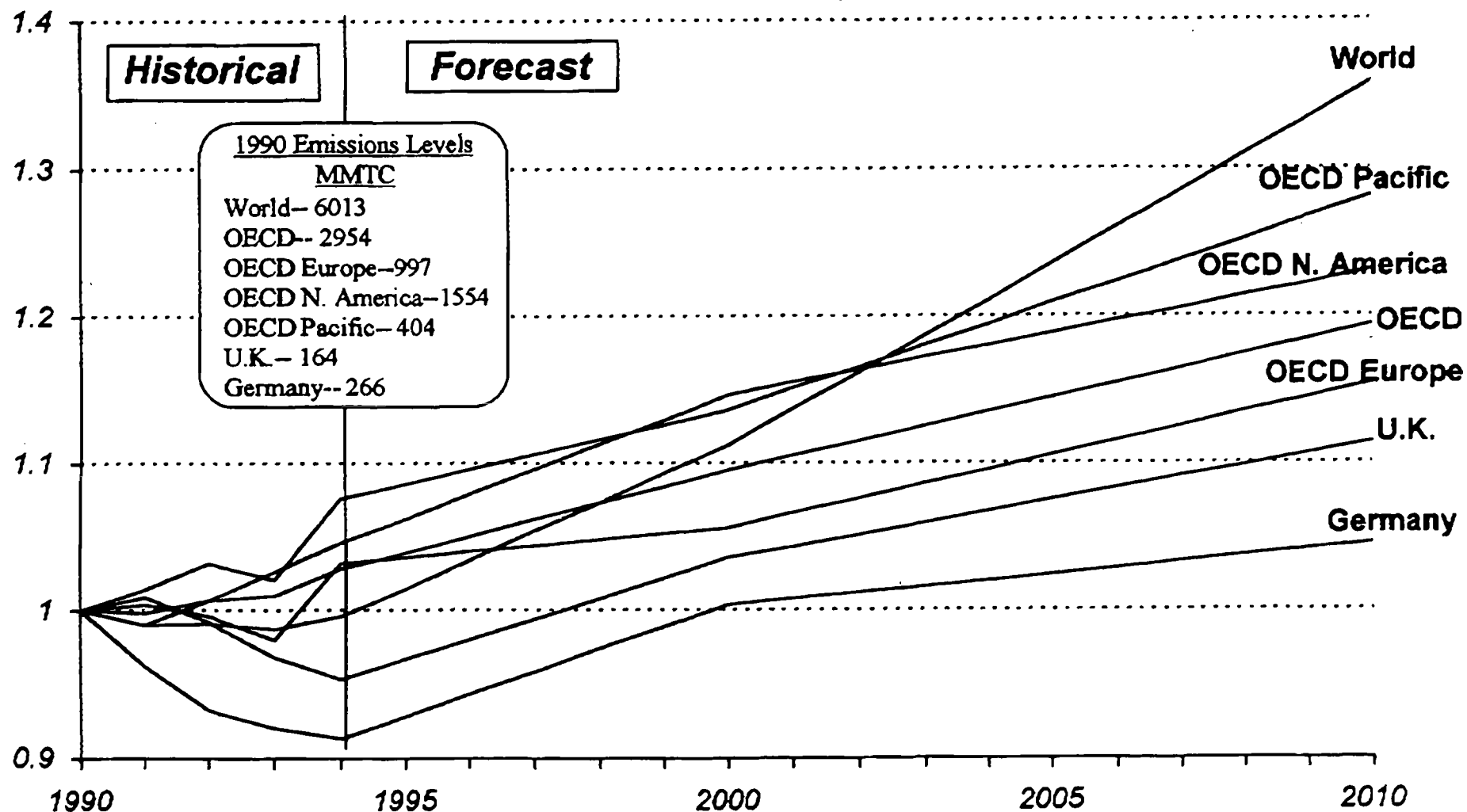
Attached is a final draft of the Climate Change Analysis Workshop presentation for June 6. All comments must be delivered to Eileen Claussen at State Department by 11:00 am today (Phone: 647-1554, fax 647-0217). Figures will be faxed separately this morning.

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DOE: Dirk Forrister 586-9987
EPA: Mary Nichols 260-5155
David Gardiner 260-0275
OVP: Pete Jordan 456-9500
NSC: David Sandalow 456-2710

FIGURE 1

Energy-Related Carbon Emissions Forecasts: Indices for OECD Groupings (1990=1)



Note: Developing countries increase to about double their 1990 emissions by 2010. The former Soviet Union and other East Bloc countries, whose emissions have fallen sharply since 1990, reach only 90% of their 1990 level by 2010.

Source: The historical data is from BP Statistical Review of World Energy. The forecasts are an average of DRI, WEO, and IEO scenarios. Individual country forecasts are based on DRI estimates.

FIGURE 2

Cumulative Global Anthropogenic Carbon Emissions 1850-2100

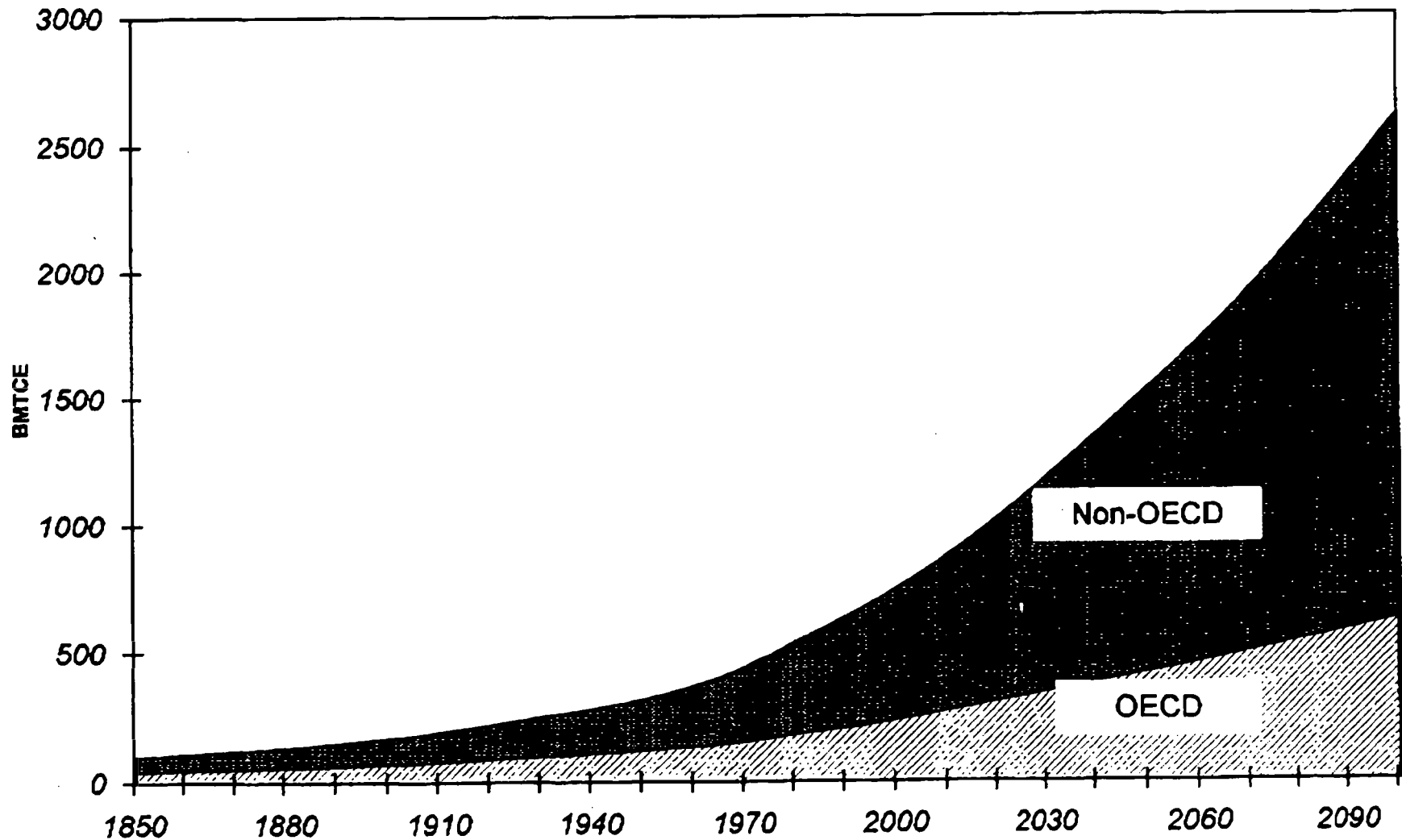


FIGURE 3

U.S. GHG Emissions: 1990-1995 **with Baseline Projections through 2010**

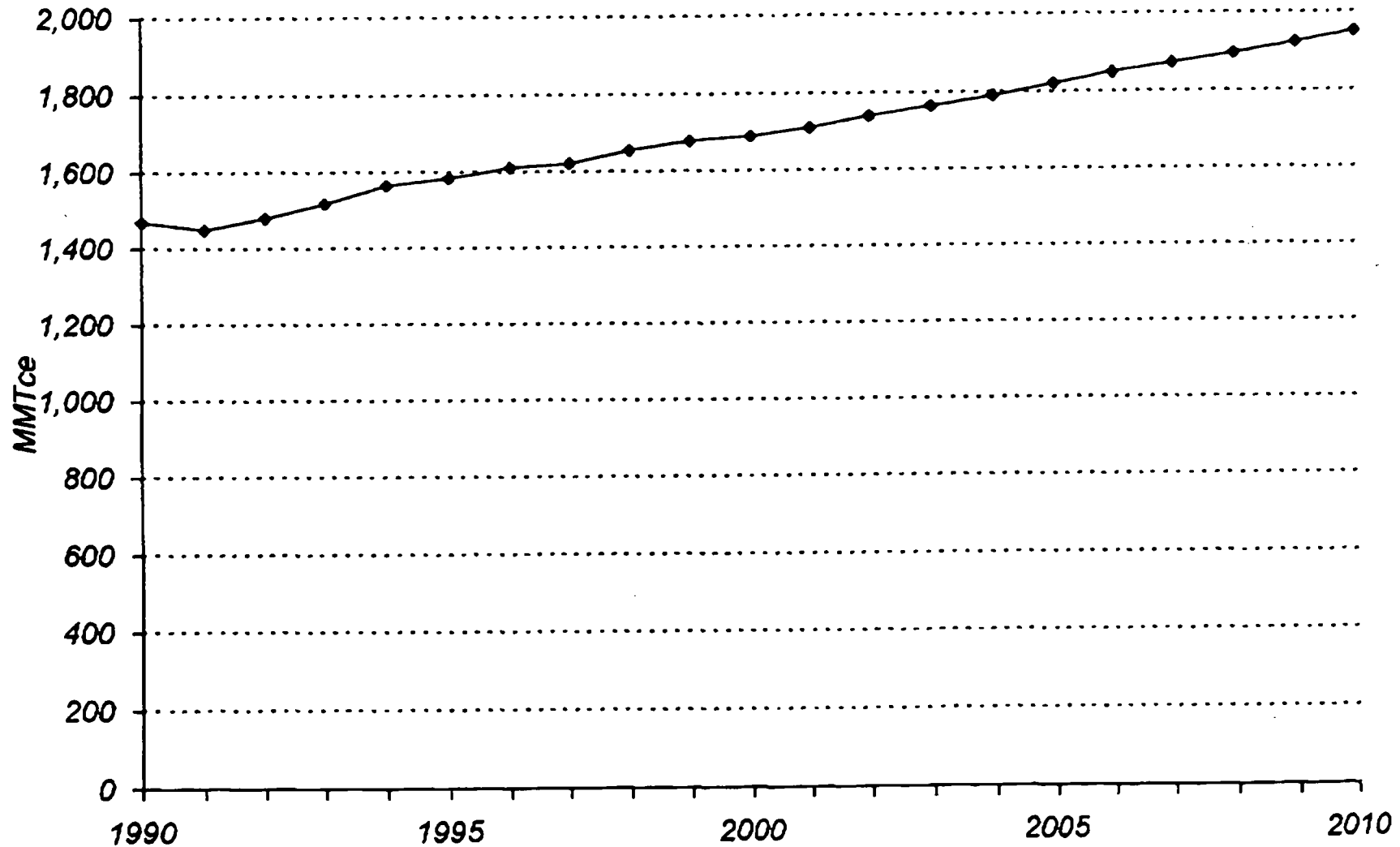
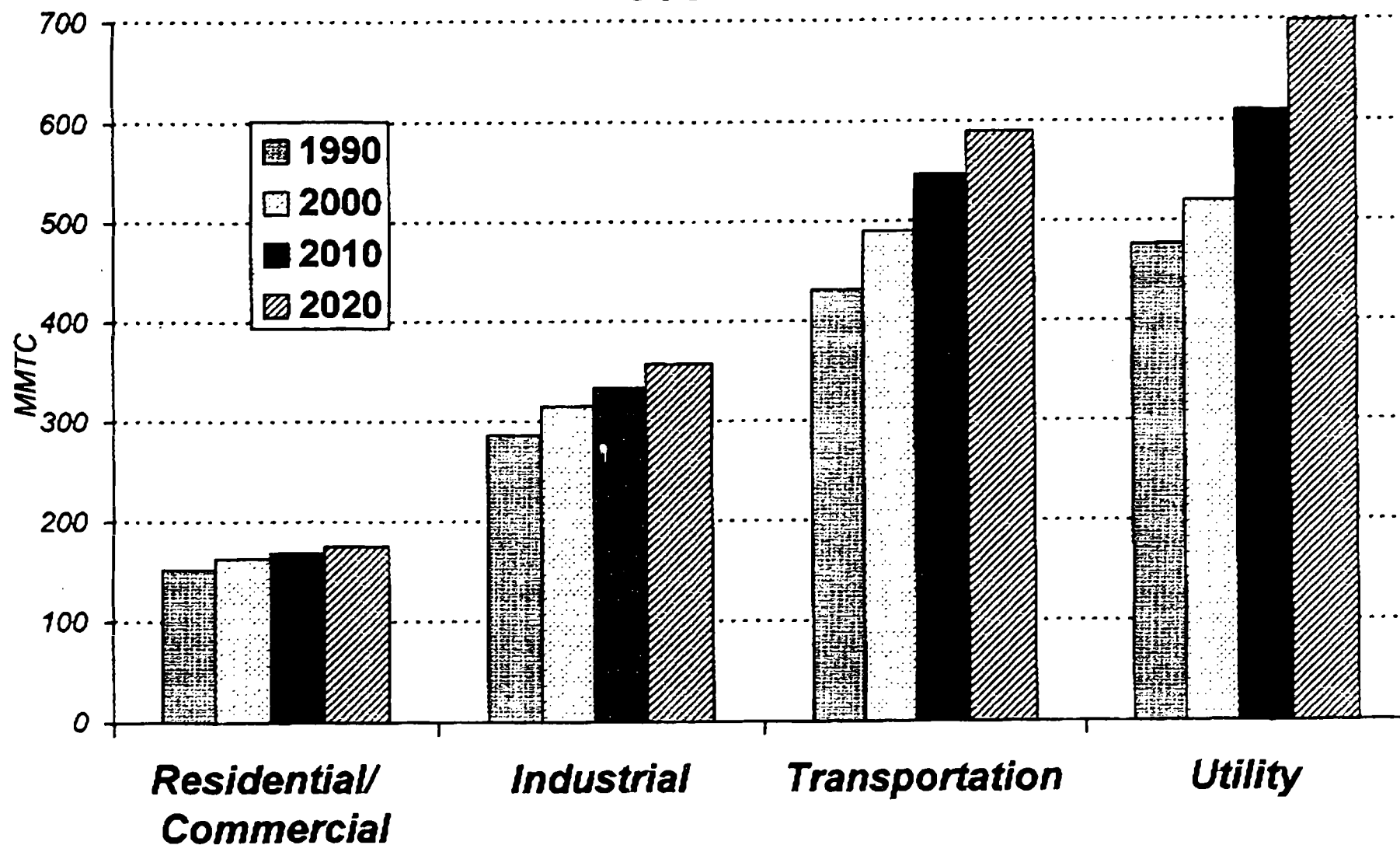


FIGURE 4

Sectoral Energy-Related Carbon Emissions 1990-2020



Note: The Residential/Commercial share of total electricity use increases from 65% in 1990 to 68% in 2020. The Industrial sector accounts for virtually all other electricity use.

FIGURE 5

Technology Potential for Emission Reduction

OTA (1991) and NAS (1991)

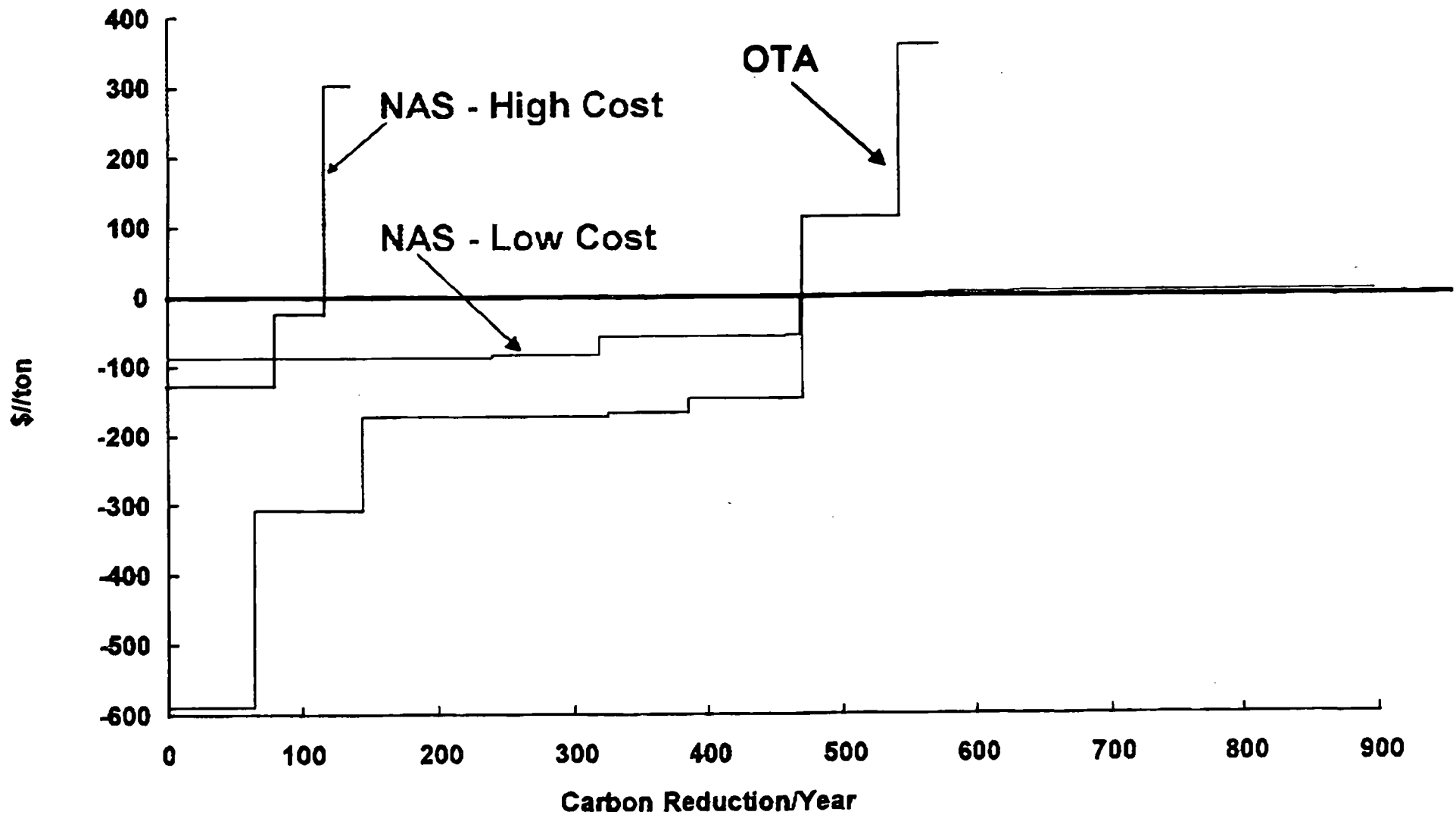
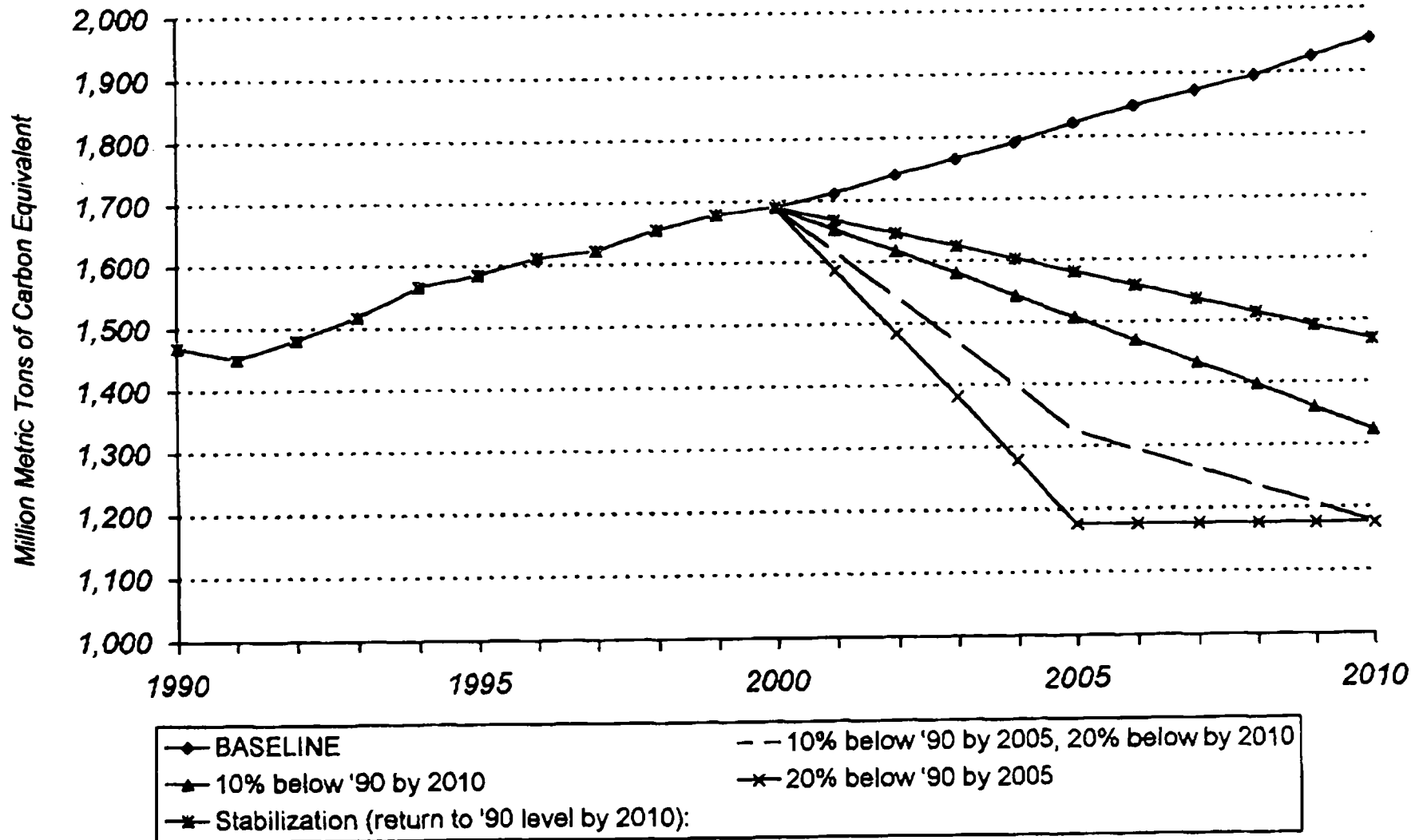


FIGURE 6

Impact of Different Emission Reduction Proposals on U.S. Emissions



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FIGURE 7A
GDP Impact of Different Emission Targets
(Permit Auction, Consumer/Business Recycling)

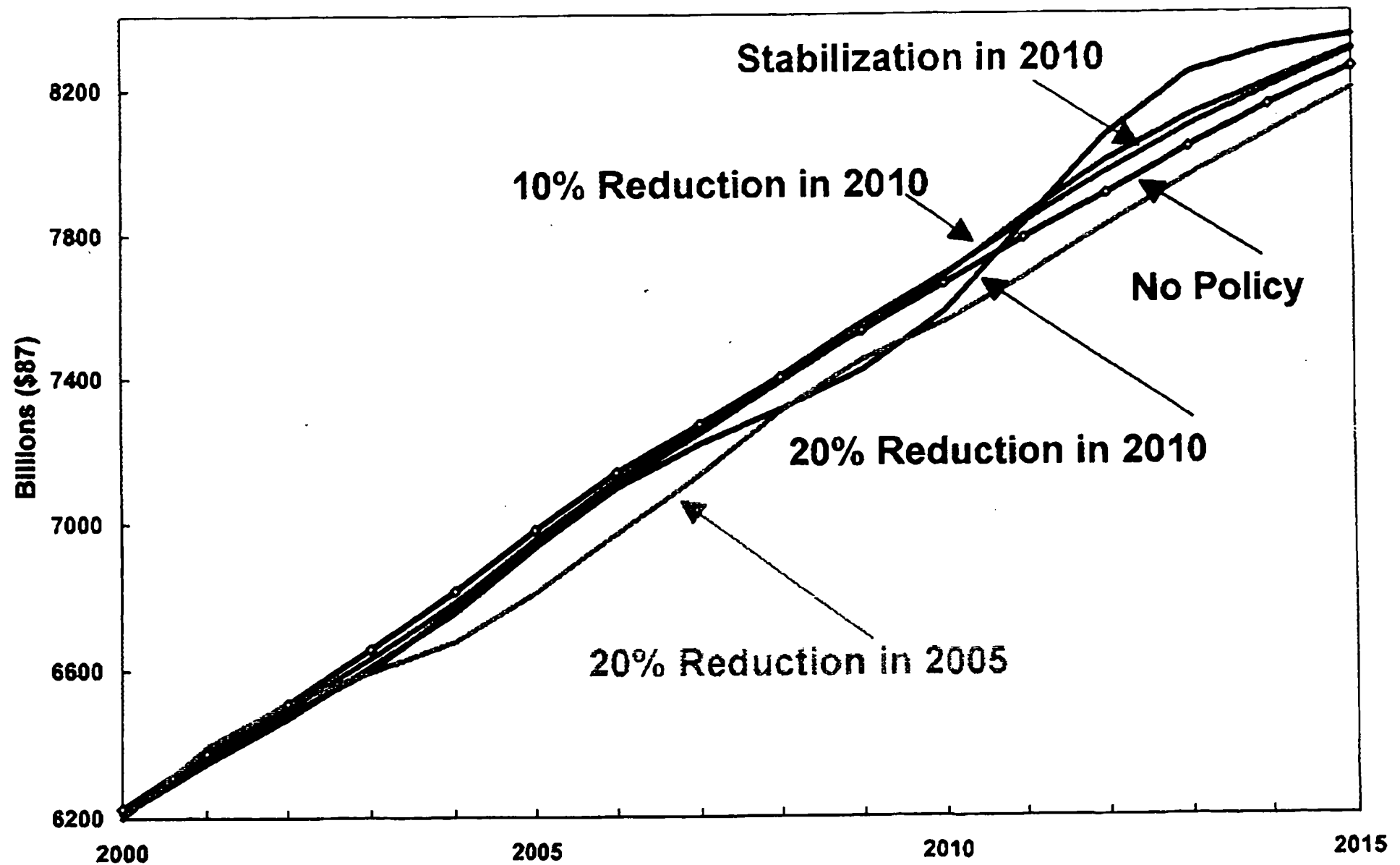


FIGURE 7B

GDP Impact of Different Emission Targets (Permit Auction, Consumer/Business Recycling)

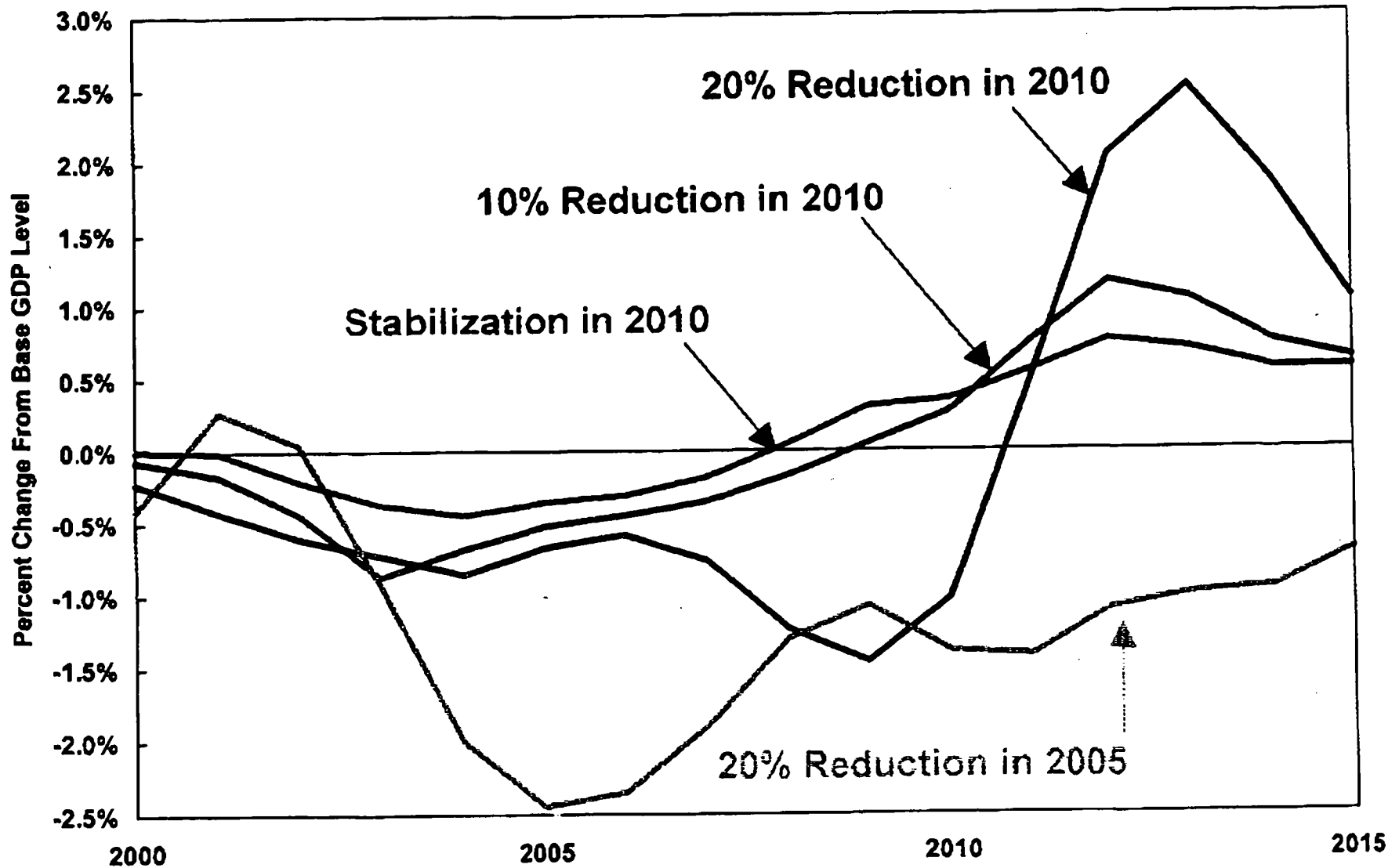
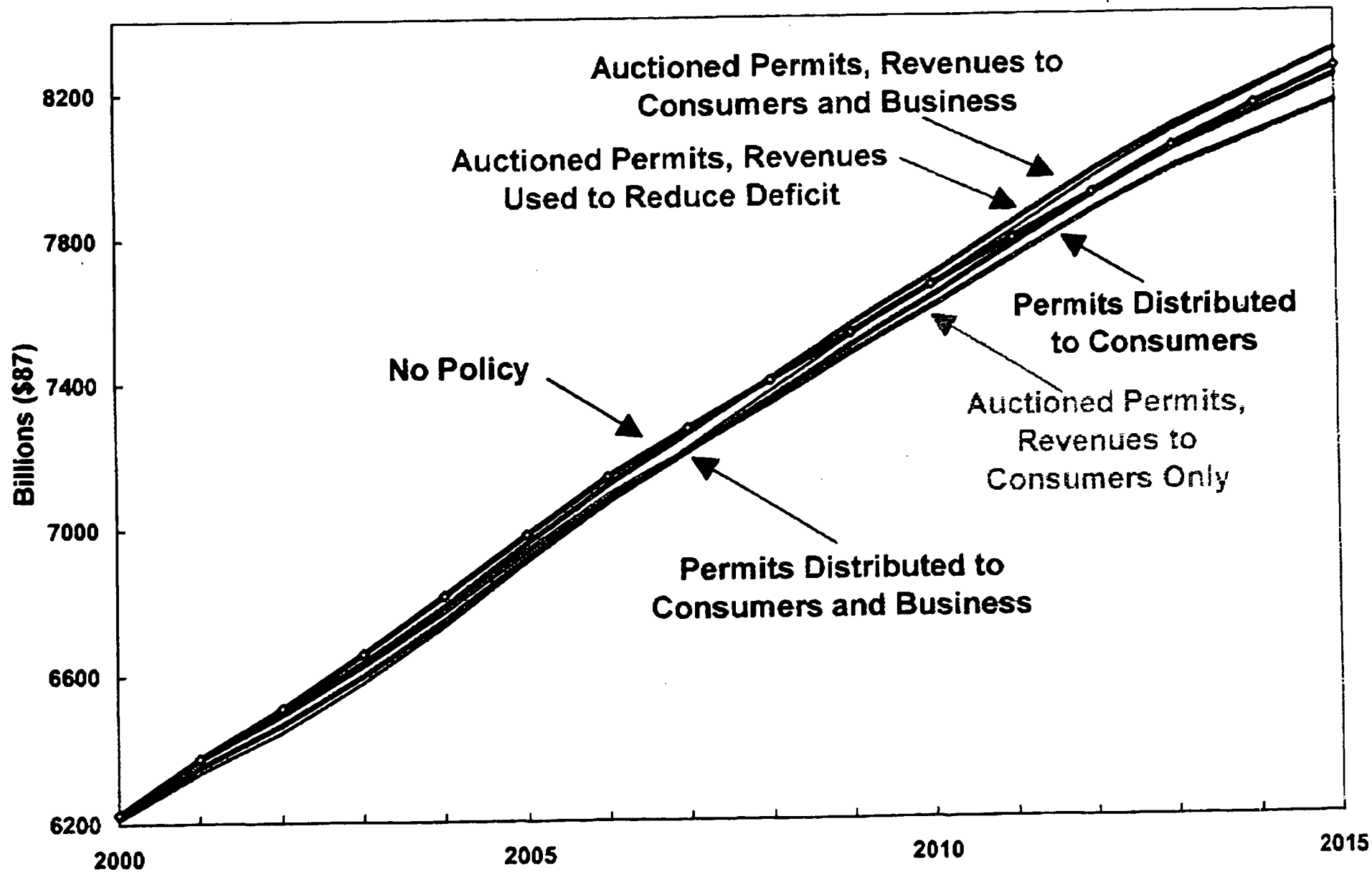


FIGURE 8A
GDP Impact of Stabilization in 2010
Five Different Implementation Policies



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FIGURE 8B

GDP Impact of Stabilization in 2010 Five Different Implementation Policies

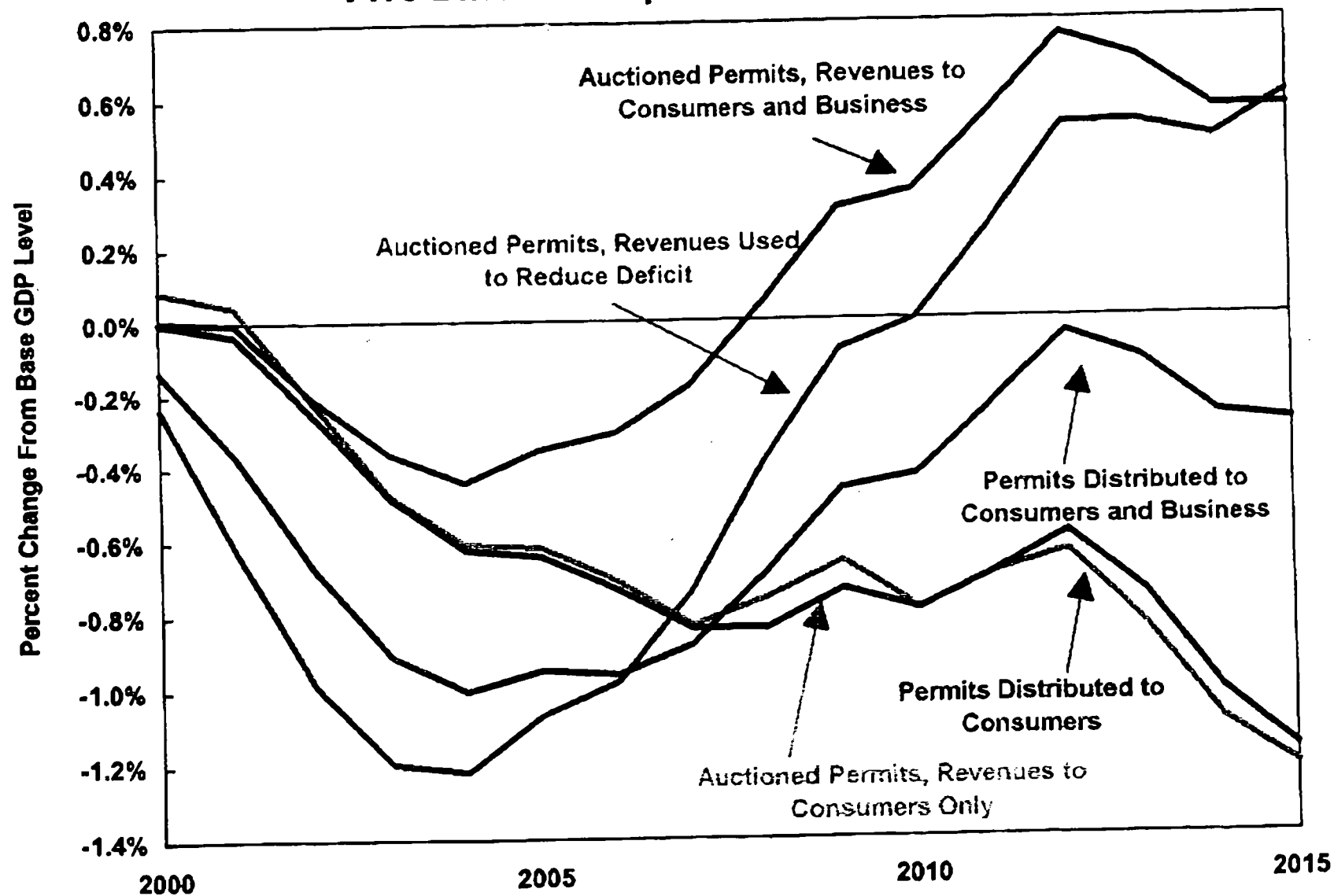
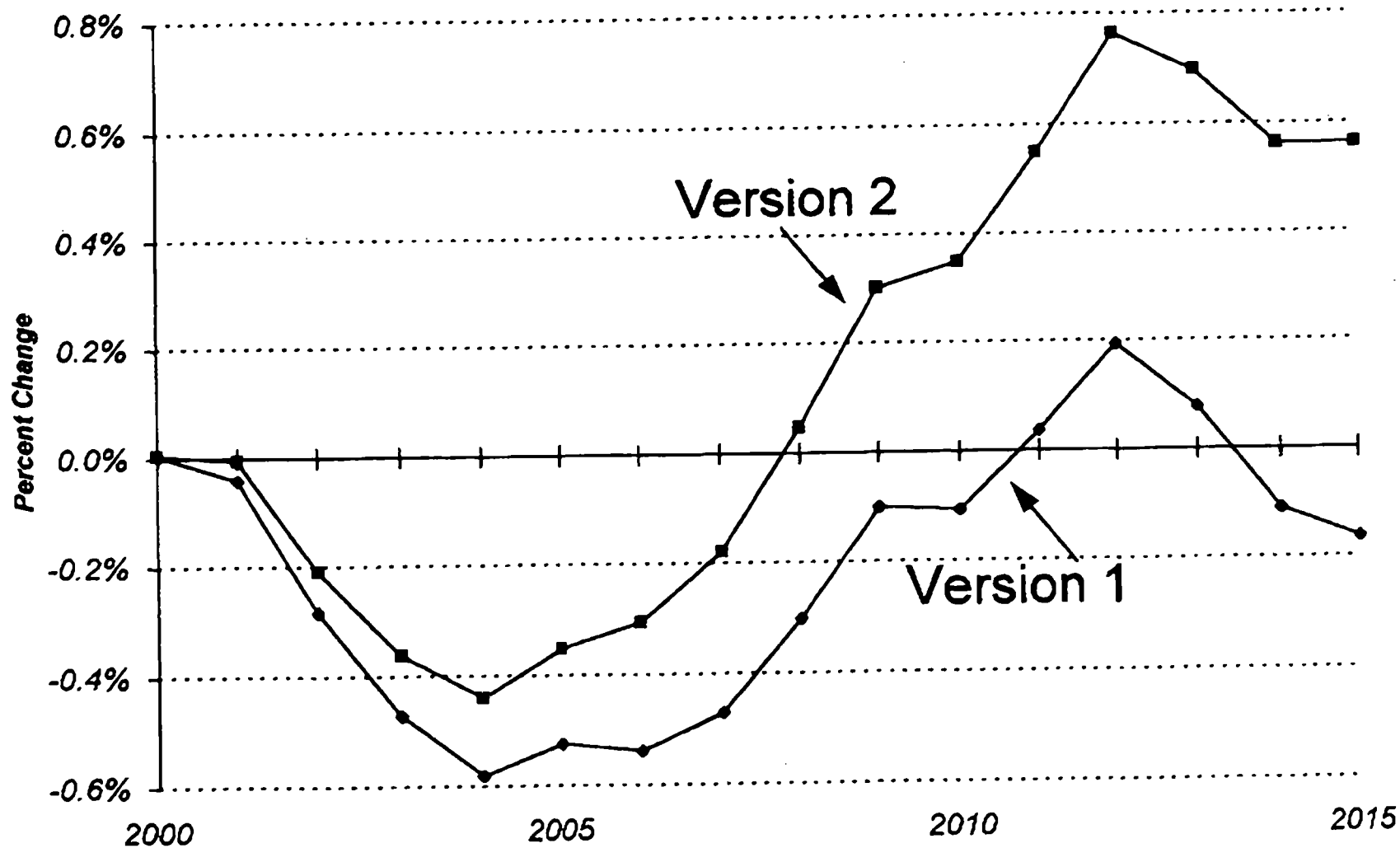


FIGURE 9

GDP Impacts of GHG Stabilization in 2010

Different Model Versions with Permit Auction, 60/40 Split





Department of Energy
Washington, DC 20585

June 5, 1996

MEMORANDUM TO DISTRIBUTION

FROM: Marc Chupka
Department of Energy

SUBJECT: Final Draft Conference Presentation

Attached is a final draft of the Climate Change Analysis Workshop presentation for June 6. All comments must be delivered to Eileen Claussen at State Department by 11:00 am today (Phone: 647-1554, fax 647-0217). Figures will be faxed separately this morning.

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USTR: Jennifer Havercamp 395-4579
DOE: Dirk Forrister 586-9987
EPA: Mary Nichols 260-5155
David Gardiner 260-0275
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INTERAGENCY ANALYSES OF CLIMATE CHANGE PROPOSALS

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1. INTRODUCTION

International negotiations to address the risk of climate change have been underway for more than seven years. At the Earth Summit in Rio de Janeiro in 1992 -- formally known as the U.N. Conference on Environment and Development -- over 150 nations signed the Framework Convention on Climate Change (FCCC). Article Two of the FCCC states its ultimate objective: "to stabilize atmospheric concentrations of greenhouse gases at a level that would prevent dangerous anthropogenic interference with the climate system."

The FCCC obligates the United States and other industrialized nations -- known in FCCC parlance as "Annex 1" nations -- to aim to return greenhouse gas emissions to 1990 levels by the year 2000. In 1993, President Clinton unveiled the Climate Change Action Plan (CCAP), which included over 50 actions intended to bring the U.S. to the emissions level called for by the FCCC. Although the CCAP programs have in fact cost-effectively reduced emissions over the past three years, it now seems likely that the U.S. will fall significantly short of the goal, due to substantial funding cuts by Congress, stronger than expected economic growth, and lower energy prices. A review of the CCAP is being completed for release in fall, 1996, and will include an update of baseline trends, a review of the effectiveness of current actions, and recommendations for additional actions.

At the first Conference of the Parties to the FCCC in Berlin in March 1995, the Parties decided that current commitments under the FCCC were not adequate to address the Convention's ultimate objective. Recognizing that current commitments are an important first step, the Parties noted that they fail to address emissions after the year 2000.

Accordingly, the Parties decided to launch a process to define actions to be taken by the industrialized Annex 1 nations in the post-2000 period, and to promote implementation of commitments by all nations. This decision, known as the "Berlin Mandate", initiated international negotiations to develop a new legal instrument for adoption in 1997. The U.S. successfully urged the Parties to include in the Berlin Mandate a call for an initial phase of analysis and assessment to inform the negotiation of post-2000 obligations.

Three formal negotiating sessions have been held since the Berlin Mandate was issued at the First Conference of the Parties. The Berlin Mandate calls for Parties to strengthen the commitments of developed countries by setting "quantified emissions limitations and reduction objectives" (called QELRO's or emission targets) for the post-2000 period and through "the elaboration of policies and measures". While the Mandate specifically precludes the introduction of new commitments for developing countries, it calls for the Parties to "continue to advance the implementation of existing commitments". These three elements are the focus of current negotiations and analytic efforts to support the negotiations.

A number of countries, as well as groups of countries, have offered proposals containing targets and timetables for Annex I countries. In addition, some countries have also proposed mandatory, internationally coordinated "policies and measures".

The United States Government has to date proposed **neither** a QELRO for reducing greenhouse gas emissions, **nor** a specific set of policies and measures. Instead, the U.S. Government is analyzing and assessing the proposals offered by other countries, under a variety of implementation schemes, to provide a sound foundation for its own development of a policy and negotiating position. Analysis and assessment is helping to guide the way toward an appropriate level of commitment and, equally or more important, toward a structure of commitments and domestic implementation approaches that will cost-effectively meet our environmental goals.

Analysis and assessment together constitute an evolutionary process that informs policy development. Together, these two functions account for the costs and benefits -- both economic and environmental -- associated with alternative policy strategies. Analysis provides a neutral picture of the range of possible outcomes that would result from implementation of alternative domestic and international policies. Assessment, by contrast, weighs the range of analytic results and identifies those that are most plausible. Policy development then formulates positions based on the conclusions of the assessment process.

The U.S. Government is presently focused on analysis -- gathering the set of policy-relevant results from analysts inside and outside of the Government. The Analytic Workshop on June 6-7, 1996 will provide the U.S. Government an opportunity to hear more than 50 diverse presentations from a wide range of sources. Over time, the balance of U.S. Government activities will shift to a greater emphasis on assessment, i.e., the consideration of which analytical results are most plausible and which should receive the most consideration in the policy development phase.

The U.S. Government's Interagency Analytic Team (IAT), which is responsible for most of the analysis underlying this paper, includes staff analysts from many of the U.S. government agencies that have a role in developing climate change policy, including the Environmental Protection Agency, the Department of Energy, the Department of Agriculture, the Department of Commerce, Department of Transportation, Department of the Treasury, and the White House Council of Economic Advisors. The IAT has adopted a diversity of perspectives and approaches -- from detailed technology assessments to highly aggregated domestic and international macroeconomic modeling exercises -- in making progress toward a balanced assessment of the impacts of climate change mitigation policy alternatives.

This paper presents partial and interim findings from the IAT analyses to date of proposals advanced by other countries, with some reference to analyses by other stakeholders. These findings are being presented on a preliminary basis at the U.S. Government's Analytic Workshop on Climate Change, as a starting point in order to facilitate maximum feedback by experts and stakeholders.

Among their other limitations, the partial scope of the analyses discussed in this paper should be acknowledged up front. Atmospheric greenhouse gas concentrations are a function both of emissions from a variety of sectors and activities and of available sinks. The U.S. Government continues to maintain that international commitments should be comprehensive, addressing all sources and sinks of all greenhouse gases. However, much of the analyses described in this paper focuses on energy-related emissions of carbon dioxide. This focus reflects the availability of modeling tools that can be used to assess the relationships linking energy use and economic performance, as well as the fact that energy-related emissions account for over 86 percent of total U.S. greenhouse gas emissions and 70 percent of global greenhouse gas emissions.

It bears emphasis that this paper marks the beginning, not the end, of a process of analysis, assessment and development of climate change response strategies. Beyond the June 6-7 Analytic Workshop, we would invite the public to comment on IAT analysis and to submit additional analyses for consideration.

2. PRELIMINARY LESSONS LEARNED FROM ANALYSES

The balance of this paper will discuss the strengths, weaknesses and preliminary findings of alternative models that have been enlisted to analyze the economic effects of implementing other countries' climate change proposals. It should be noted that non-practitioners of economic modeling tend to attribute more significance to the absolute values of numerical results than do modelers themselves. Modelers tend to focus instead on qualitative lessons for policy formulation, derived from cases where a particular policy design or strategy shows consistently superior results under a variety of modeling frameworks and assumptions. Accordingly, this section distills key lessons that the U.S. Government has derived on a preliminary basis from its initial analytic work. The lessons follow:

- Modest emissions reductions can be achieved with macroeconomic impacts ranging from mildly negative to slightly positive. The range of analytic results depends on the modeling framework used as well as the type of policy intervention simulated.
- All else held equal, more stringent emission reduction targets will impose higher costs.
- Lower costs are associated with policies that are broad-based, flexible and phased. Such policies can help avoid disruptions such as premature retirement of capital and allow for rational planning by businesses and consumers.
- Technological development and dissemination is critical to addressing climate change. In the short run, we need to understand and overcome the institutional barriers that slow the deployment of cost effective energy-saving technologies. In the longer term, we need to encourage the development and dissemination of new energy-saving and low-carbon technologies.

- Addressing the climate change problem will require unprecedented international cooperation. Cost-effective global solutions will require flexibility in the timing and location of greenhouse gas reductions, as well as institutions able to accommodate and promote such flexibility.
- A balanced assessment of emissions reduction policies should account for the benefits that they would deliver in terms of averting or reducing the economic dislocations projected to occur in a rapidly changing climate. Significant progress needs to be made in estimating impacts and monetizing the range of damages so that the costs of action can be more appropriately compared to the costs of inaction.
- In the past, regulatory compliance costs have often been overestimated because of reliance on analytic tools that fail to account for dynamic technological, institutional and organizational innovations. Such responses have greatly reduced compliance costs from original estimates for some regulations, and future analysis needs to consider how to take this potential bias into account.
- Rigorous assessment of the impacts of greenhouse gas mitigation requires a variety of analytic approaches since no single model is capable of capturing all relevant aspects of the economy. Each approach has its own strengths and weaknesses. Therefore, it is imperative to understand and reconcile insights gained from a diversity of analytic approaches in arriving at an informed and balanced assessment.

3. BENEFITS OF REDUCING GREENHOUSE GAS EMISSIONS AND THE COSTS OF INACTION

Drawing on the work of 2,500 scientists from around the world, the Intergovernmental Panel on Climate Change issued its Second Assessment Report last December that concluded "The balance of evidence suggests that there is a discernible human influence on global climate." For the first time, this diverse group of scientists stated their belief that human beings have already begun to disrupt the climate system, a statement that is based on a multiplicity of peer-reviewed studies of empirical observations, statistical models, and advanced climate models. This finding has reinforced the urgency that Parties attach to additional actions under the Berlin Mandate.

Global greenhouse gas emissions are projected increase up to six-fold over current levels by 2100 under the set of possible "business as usual" futures considered in the recent report of the Intergovernmental Panel on Climate Change (IPCC). Under any of the IPCC emission scenarios, the scientists asserted that the rate of warming due to human emissions "will probably greater than any seen in the last 10,000 years."

None of the economic models discussed in the remaining sections of this paper measure the economic benefits of mitigating greenhouse gas emissions in terms of reduced climate change and other environmental impacts. Since the models do not attempt to balance costs with benefits,

the estimated costs of achieving emission reductions under various policies could be outweighed by the benefits of reduced or avoided climate change impacts. Reducing greenhouse gas emissions can lessen or avoid some of these impacts, but it should also be noted that since most greenhouse gases are long-lived in the atmosphere, past emissions have already committed us to experience some climate change impacts. Unfortunately, the tools available to estimate the magnitude of specific impacts and convert them to monetized damages are limited at this time, hampering the ability to undertake a more comprehensive cost-benefit assessment of climate change policies. Nevertheless, some impact analyses have indicated substantial possible costs associated with inaction, providing an important context for considering the economic costs associated with policies to reduce greenhouse gas emissions.

4. GREENHOUSE GAS EMISSION TRENDS

Global Trends: During the first half of the 1990s, greenhouse gas emissions grew in the U.S. and most of the rest of the world. However, due to the restructuring of the former Soviet Union and Eastern Europe, global emissions have been roughly stable. Nearly all of the countries of the Organization for Economic Cooperation and Development (OECD) are experiencing rising greenhouse gas emissions. The important exceptions are the U.K., where energy sector deregulation is resulting in shifts away from coal and toward natural gas; and Germany, whose emissions have fallen due to dramatic emissions reductions in the former East Germany. Projected U.S. emissions growth is expected to be slightly higher than the OECD average. Emissions are expected to grow somewhat more slowly in OECD-Europe, somewhat faster in OECD-Asia, when compared to the U.S.

Over the next century, the bulk of emissions growth will occur in the non-OECD developing countries. While OECD carbon emissions are expected to grow by about 26% over the next twenty years, developing country carbon emissions are expected to double (Energy Information Administration, 1996). This observation underscores why addressing the climate change problem will require both international cooperation and developed country leadership.

Figure 1: Relative growth within OECD

Figure 2: Long-term emissions trends

U.S. Emissions Trends: Total US emissions of greenhouse gases were 1,595 million metric tons of carbon equivalent (MMTCE) in 1990, of which 1,336 MMTCE (roughly 84%) resulted from fossil fuel combustion. By 1994, the U.S. was emitting 1,666 MMTCE of greenhouse gases

(EPA, 1995). Of this total, 85% were carbon dioxide emissions, about 11% were methane (CH_4), 2% were nitrous oxide (N_2O), and 2% from other gases including HFC, PFC, and SF_6 . The transportation and industrial sectors of the U.S. economy were responsible for most of the CO_2 emissions. Landfills and agricultural production were the greatest sources of CH_4 emissions, and the agricultural sector was the largest emitter of N_2O . Automotive air conditioning was largely responsible for the remaining emissions from HFC-134a.

Without additional policy intervention, U.S. greenhouse gas emissions are expected to rise by at least 20 percent by 2010. Seventy five percent of the emissions growth will be in the energy sector, mainly in electricity generation and transportation. Emissions of HFCs – substitutes for chemicals being phased out under the Montreal Protocol – are expected to increase substantially.

Figure 3: US Greenhouse Gas Emissions 1990-1995. With baseline projections through 2020

Figure 4: Sectoral Energy-Related U.S. Carbon Emissions 1990-2020

5. DOMESTIC ANALYSES

The IAT has taken a number of different approaches to examining domestic options for reducing greenhouse gas emissions and is attempting to integrate and synthesize the diverse results. A review of these results is presented in the following sections.

Technology Costing Studies: Previous studies show that there exist large potential emissions reductions through economical investments and changes in energy use. This conclusion rests in part upon previous work from the National Academy of Sciences (NAS) report, *Policy Implications of Greenhouse Warming* (NAS 1991) and *Changing by Degrees, Steps to Reduce Greenhouse Gases*, by the U.S. Office of Technology Assessment (OTA 1991). These studies have documented an enormous technical potential to reduce emissions from today's levels at *net economic savings*. The NAS study found that 100 to 480 million metric tons of greenhouse gas emissions could be reduced at negative or no cost, assuming sufficient time for capital stock turnover. The OTA study identified a greenhouse gas emissions reduction potential of up to 472 million metric tons at negative cost or net benefit (Figure 5). A recent review of the technical potential for emission reductions performed by EPA shows results consistent with these two studies.

Figure 5

The strength of the technology costing approach is that it demonstrates the extent of technological opportunities available to save energy and reduce greenhouse gas emissions. The primary limitation of this approach is that it does not incorporate the reasons why businesses and consumers do not take full advantage of these opportunities.

For example, comprehensive retrofit measures that replace existing equipment in commercial buildings could significantly reduce carbon dioxide emissions while also reducing long term costs. In theory, investments in more efficient lighting and ventilation systems in existing buildings demonstrate tremendous potential to reduce greenhouse gas emissions at a net savings. In practice, the number of actual retrofit investments has been limited, primarily because of institutional and financing barriers. Institutional impediments include transaction costs, ill-defined property rights, and lack of information about technologies. Barriers to financing include high up-front costs and risks of investing in new technologies. In addition, consumers may have high discount rates and therefore underinvest in energy saving technologies. Finally, energy efficiency is only one of many features that consumers consider in making purchases. For all of these reasons, it appears that different signals than the market currently provides are needed to induce consumers and businesses to change their behavior and reduce energy use.

To help provide additional insights into individual policies and measures that might be used to reduce emissions, DOE is now completing an update of its 1989 report *A Compendium of Options for Government Policy to Encourage Private Sector Response to Potential Climate Change*. This update summarizes, on a sector-by-sector basis, the results regarding individual policies and measures to mitigate emissions reported in the literature since issuance of the original report. The report considers the extent to which each of the factors affecting the end-user adoption of relevant technologies are incorporated in the analysis and which appear to be most relevant for successful introduction of measures in each specific sector.

Energy Sector and Macroeconomic Analyses: Large-scale macroeconomic models can simulate broad-based policies that reduce emissions, and estimate the economy-wide economic impacts of emissions reduction policies. The IAT used a set of such modeling systems to analyze the macroeconomic impact of a number of proposals advanced by other nations in the negotiating process, and examined the impacts of using different domestic implementation schemes to achieve the proposed targets.

The IAT analysis used two distinct energy models linked to the DRI/McGraw Hill Macroeconomic Model of the U.S. Economy. These models were used to estimate the potential economic impacts for a range of policy scenarios, including impacts on gross domestic product (GDP), consumption, investment, employment, and inflation; as well as regional, industrial, and energy market impacts. Linked macroeconomic and energy models are needed to take advantage of the comprehensiveness of the former and the energy detail of the latter. Macroeconomic models have the advantage of representing economy-wide adjustments and responses to policies, particularly business cycle responses. Their weakness is that they do not provide detailed representation of specific markets and specific technologies.

To address this weakness, energy price increases have been estimated using the DRI/McGraw Hill Energy Market Model and the IDEAS model. Energy sector models constrain greenhouse gas emissions either by limiting the supply of fossil fuels or by directly increasing their price. Given these constraints, energy sector models forecast changes in fossil fuel energy prices and consumption, and related changes in behavior. The two models used incorporate different assumptions about the price responsiveness in energy demand and different characterizations of energy technologies. These assumptions yield different estimates of the magnitude of price changes needed to achieve a given target in the energy sector.

Four Emissions Reduction Scenarios: The U.S. Government's domestic macroeconomic analysis has focused almost exclusively on proposals that have already been advanced by other nations in the international negotiating process. The emission reduction targets of the following four proposals are depicted in Figure 6:

- (1) **Stabilization Proposal:** Annex I Parties stabilize emissions at 1990 levels in 2010 (Originally proposed by the European Union and the focus of much analysis to date);
- (2) **United Kingdom Proposal:** Annex I Parties reduce emissions 10 percent below their 1990 levels by 2010;
- (3) **German Proposal:** Annex I Parties reduce emissions 10 percent below 1990 levels by 2005; 20 percent below 1990 levels by 2010;
- (4) **Alliance of Small Island States (AOSIS) Proposal:** Annex I Parties reduce emissions 20 percent below 1990 levels by 2005.

At this time, the U.S. Government does not endorse any of these proposals, but is analyzing their economic consequences for the U.S. and for the rest of the world.

Figure 6

In order to analyze these proposals, assumptions had to be made regarding implementation. The IAT chose to analyze the proposals using marketable permit systems as the implementation mechanism because they readily lend themselves to analysis in the available large-scale economic models such as the DRI model. However, the analysis of marketable permit systems should not imply an endorsement by the U.S. Government; in fact, the U.S. Government continues to examine a variety of options to achieve climate goals.

The marketable permit analysis assumes that policies are phased in after 2000. Energy prices gradually increase throughout the period, and emissions generally decline to the target by the end of the phase-in period (2005 in the AOSIS proposal, 2010 for other proposals). The other analytical choice is in the type of permit system modeled, i.e. whether they are given away to consumers and/or producers or distributed by auction. As discussed in the next section, these

choices can have significant impacts on results.

Figures 7A and 7B shows the GDP impacts from 2000 through 2015 of the different levels of GHG emissions abatement associated with the different target scenarios, assuming that the permits are auctioned and that corresponding reductions in corporate income tax rates and increased personal income tax exemptions are used to distribute the revenue back to the private sector. This implementation option has the greatest potential to enhance the long term growth of the economy under carbon reduction policies, as discussed in the next section.

Figure 7A. GDP Impacts of Different Emission Targets: Permit Auction with 60/40 split

Figure 7B. Deviations from Baseline to accentuate policy differences

[THIS SECTION IS TENTATIVE, DEPENDS ON FINAL GRAPHS]

Under these assumptions, the initial effect of the carbon constraint is to raise fossil fuel prices, generating a rise in the general price level and reducing demand. In response to inflation, the Federal Reserve's Open Market Committee restricts the money supply to offset the inflationary impacts of the policy, further slowing the economy from the baseline growth path. In the cases of stabilization at 1990 levels by 2010 and the British proposal to achieve a 10% reduction by 2010, the slight negative impact on baseline GDP growth lasts through the early years of the decade, but GDP growth would eventually become higher than baseline projections in the 2010 through 2015 period. This occurs as a result of the increased business investment associated with reducing marginal corporate income tax rates, an implementation policy that returns 60 percent of the permit auction revenues back to the corporate sector.

Under the more stringent targets (the German and AOSIS proposals), changes in GDP from baseline levels follow the same general pattern, but these shifts display quite different magnitudes and are timed differently through the period. The German proposal to achieve a 10% reduction in 2005 and a 20% reduction in 2010 would reduce baseline GDP growth by slightly more than the cases described above between 2000 and 2005, and then fall again between 2005 and 2010. However, the magnitude of the permit prices increases necessary to attain the 2010 target yield substantially more revenues to reduce corporate income tax rates, amplifying the investment response that pushes GDP significantly higher above baseline between 2010 and 2015. Under the AOSIS proposal that achieves a 20% emission reduction by 2005, however, the investment response is not strong enough to offset the larger impact of higher energy prices, and GDP growth remains below the projected trend during the 2005 through 2015 period.

Alternative Permit Allocation Policies: The IAT examined five very different schemes for allocating the permits to analyze their economic and distributional impacts. The fundamental insight from the analysis is that the economic impacts of mitigation depend to a very great extent on how the permits -- and thus the costs and likely economic responses -- are allocated across different sectors of the economy. The five scenarios that were evaluated are:

1) Permits Distributed to Consumers: all permits are allocated to individual

households, who in turn sell their permits to primary fossil fuel producers;

2) Permits Distributed to Consumers and Business: permits are allocated to both consumer and businesses, based on their historical energy use;

3) Auctioned Permits, Revenues to Consumers Only: distributing revenue to consumers by increasing the personal income tax exemption;

4) Auctioned Permits, Revenues Used to Reduce Deficit: using the revenue to reduce the Federal budget deficit and retire Federal debt;

5) Auctioned Permits, Revenues to Consumers and Business: sharing revenue between consumers and producers by increasing the personal income tax exemption and reducing corporate marginal income tax rates.

Figures 8A and 8B. GDP Impact of GHG Stabilization in 2010: Five Different Implementation Policies: Actual Values and Percent Deviations from Baseline

Figures 8A and 8B depict the GDP impact of alternative methods of distributing or auctioning marketable permits and recycling any revenues, using the objective of stabilizing emissions at 1990 levels in 2010 as an illustrative example. It is clear that the design of the permit system can significantly influence the GDP impacts of a given target. Every approach causes near term GDP losses from the baseline as the economy adjusts to higher energy prices. However, the long term impacts depend critically on the permit distribution and revenue recycling system assumed. When the revenues from selling permits are distributed to consumers and businesses based upon historical patterns of spending on energy - i.e., 40% to consumers and 60% to producers - higher investment actually raises economic activity above what it would have been without any policy in later years. Alternatively, when the permits (or the revenues from selling permits) are distributed only to households, the economy's aggregate savings are lower. With fewer savings available for investment, GDP is lower even in the later years of the forecast.

These results highlight not only the importance of the permit system design, but the importance of the distribution of the permits or the disbursement of revenues from permit auctions. All implementation approaches pose complex issues of policy design. The above examples illustrate that well designed policies can help mitigate economic impacts from greenhouse gas emission reductions.

Effects of Alternative Specifications of Potential GDP: As efforts progressed to model the impact of carbon reduction policies on the economy, a key conceptual issue arose regarding the effect of restricted energy use on the productive capacity of the economy, or "potential GDP.". The IAT was using two alternative versions of the DRI model that represent the impact of changes in energy consumption and production on potential GDP differently. In Version 1, potential GDP is a function of capital, labor, and *energy consumption*. In Version 2, potential GDP is a function of capital, labor, and *domestic oil and gas production*. The results presented thus far were generated with Version 2. However, the difference in the way energy is represented in the potential GDP equation can have a significant effect on the analytic results. In Version 1, a

decrease in energy consumption has a negative effect on potential GDP. In Version 2, only a decrease in domestic oil and gas production has a negative impact on potential GDP.

When the model is used a macroeconomic forecasting tool of business cycles, the difference between these two specifications is insignificant. However, when it is used to perform policy analysis of carbon abatement programs, the results are significantly different. Figure 9 illustrates the difference between these alternative model specifications under a carbon stabilization scenario. Although both models display a similar pattern of GDP impacts, the GDP is slightly lower under Version 1 than in Version 2, a difference that grows from about 0.4% in 2010 to nearly 0.7% in 2015.

Figure 9

Further research is currently underway to attempt to understand the appropriate specification of potential GDP for these type of policy analyses. Options include: retaining the current specifications; revising the contribution of energy to the potential GDP equation; or including energy indirectly, for example by adjusting capital stock depreciation under certain policy cases that raise energy prices and potentially lower the economic productivity of existing capital. Unfortunately, this analysis will not be available for this conference. However, it does provide us with an interesting area of discussion for some of the detailed presentation that will follow during the next two days.

Sensitivity Analysis of Energy Price Elasticities: A significant source of uncertainty lies in the energy sector response to a marketable permit system. The key consequence of the permit system is to raise energy prices by limiting fossil fuel use. How consumers and businesses respond to these price changes is one of the critical determinants of any policy's costs. If consumers and businesses respond very strongly to price signals, then relatively small price increases -- and thus relatively low permit prices -- will be necessary to achieve a given emissions target. On the other hand, if consumers and businesses are not very responsive to price signals -- if they have low energy demand price elasticities -- then it will take large price hikes to achieve the same target.

Various academic studies have demonstrated a wide range on energy price elasticities. Some of these studies suggest that energy users are more responsive to changes in energy prices - they have higher demand elasticities - than is suggested by the DRI Energy Market Model. As a sensitivity analysis, we replaced DRI's own long-run energy elasticities with average estimates from recent literature reviews. This change cut permit prices in half, with a corresponding reduction in macroeconomic effects. Other modeling approaches that incorporate less rigid economic structure will also tend to result in lower energy prices and yield lower macroeconomic impacts to achieve a given target. For example, the DRI model's permit prices fall towards the high end of the range reported in the Stanford Energy Modeling Forum (EMF12), suggesting that alternative modeling approaches would yield less macroeconomic impact than from the cases analyzed by the IAT. The IAT will continue to assess this issue in order to improve forecasts of energy sector impacts from alternative greenhouse gas policies.

Comparison With Other Analyses: The results presented in this paper are generally more favorable than those presented in other studies using comparable modeling tools. For example, DRI examined carbon emissions reduction scenarios in a study sponsored by the Electric Power Research Institute, using a version of the model similar to "Version 1" described above. That study estimated the GDP loss in 2010 for carbon taxes that held emissions in 2010 at approximately 5 percent above the 1990 level (\$100 tax) or 5 percent below the 1990 level (\$200 tax), at -2.3% and -4.3% respectively. For a target of carbon stabilization, these results imply a GDP loss of roughly 3 percent of GDP in 2010, substantially larger than the most negative results from the IAT analysis of stabilization targets.

Why are the IAT's current results so different from the earlier DRI results? The IAT's initial review suggests several possible reasons, including differences in model versions, the length of time over which the policy is implemented, the distribution of costs among consumers and businesses, and assumptions regarding the response of the Federal Reserve Open Market Committee to the economic effects of the policy.

Summary of Energy Sector and Macroeconomic Analyses: Taking account of the above factors, the U.S. Government's preliminary macroeconomic results show a wide range of impacts on the economy, but clearly suggest smaller adverse impacts on the U.S. economy than the results obtained in some earlier studies. Moreover, the impacts depend fundamentally on what kind of policy is implemented; intelligent policy design can significantly improve economic outcomes.

The IAT's analyses indicate that the U.S. economy will continue to grow at a healthy pace through the first decades of the next century under all of the options examined. The IAT is still synthesizing the results of these studies and exploring the how, timing, implementation, and the size of the emissions reductions – as well as the modeling methodologies – may explain the range of outcomes.

6. INTERNATIONAL ANALYSES

The IAT is also pursuing a variety of analyses using a diverse set of models of the international economy, including the Oxford and G-Cubed models that are being discussed in separate papers prepared for the June 6-7 Analytic Workshop. A wide range of results has been obtained, with review and synthesis still pending. It is possible, however, to reflect on some of the themes that consistently emerge in international analysis.

Different GDP Impacts Across Countries: There may be significant differences across OECD countries in the costs of meeting any specific target. Some countries, such as Germany and the United Kingdom, enjoy special circumstances that will make it relatively inexpensive to reduce emissions during the next decade. Countries expected to grow relatively rapidly, such as Japan, will find it more difficult to meet particular targets. Low-carbon economies such as France, which rely on nuclear power for much of their electricity, will have fewer cost-effective opportunities to reduce emissions.

Carbon Emission Reduction "Leakage": Some analysts argue that if the developed nations constrain the use of fossil fuels in order to reduce greenhouse gas emissions, two effects could

lead to an offsetting increase in developing country fuel use and greenhouse gas emissions. First, reduced demand could cause world oil prices to decline, thereby potentially spurring increased oil demand in the developing world. Second, over the longer term, energy-intensive industries facing higher energy prices in developed countries might migrate to developing countries that are not controlling emissions. Taken together, these two influences are called the "leakage effect."

Preliminary modeling results indicate that several factors influence the magnitude of the leakage effect. These include the size of the short-term macroeconomic impacts of policies on OECD countries and on their demand for imports from developing countries; the extent to which the price of globally traded fossil energy falls; and the long-run mobility of energy-intensive industries. The actual movement of energy intensive industries depends on the relative cost of energy between countries, the support of peripheral industries in the developing countries, adequate supply of skilled labor, and the capital market. Preliminary results suggest that the leakage effect is likely to be modest, but current models may not fully capture all of the potential factors. Recognizing the complexity of the issue, the IAT is still examining its implications and gathering more detailed analysis.

"Where" and "When" Flexibility: Some of the preliminary international results illustrate how both the level, design and timing of commitments for Annex 1 could affect the costs of greenhouse gas mitigation. One recent study used four different models to evaluate the extent to which flexibility in the international location and timing of emission reductions should reduce costs. The results suggested that costs of achieving the same cumulative emissions reductions over the next fifty years could be significantly reduced by allowing reductions anywhere in the world and by allowing a slower pace of early emission reductions which are then "made up" with more extensive reductions later. According to this analysis, the cost reduction for locational flexibility alone could be roughly 70 percent, timing flexibility alone 40 percent, and both types of flexibility together 85 percent. The cost reductions from timing flexibility are significantly reduced as the time horizon over which higher initial emissions must be "made up" is shortened.

These model results depend on a number of important assumptions. For example, the models do not consider the potential for technological developments in response to control regimes and they assume perfect foresight regarding the path of technology development. Finally, the analysis assumes that the institutional infrastructure need to undertake emissions trades internationally can be implemented without cost, negotiated effectively, and remains enforceable. Relaxing these assumptions could reduce the gains from "where and when" flexibility.

8. TECHNOLOGY CHANGE: LESSONS FROM PREVIOUS POLICIES

The modelling approaches described above do not estimate the technological innovation response to the policies analyzed, but rather assume a relatively fixed path of technological change. Policies that limit energy use will tend to stimulate research investments that will

produce technologies that cannot be predicted in advance but which are likely to reduce the costs of meeting greenhouse gas emission reduction goals.

This potential bias has affected some previous analyses of the costs of pursuing environmental policies where the private sector demonstrated an ability to respond to market-based policy signals with technological innovation that reduced the costs of meeting environmental goals. Lessons may be drawn from two successful and innovative environmental policies: the acid rain control program and the Montreal Protocol, designed to limit the release of ozone-depleting chemicals into the atmosphere. Experiences with the phase-out of ozone-depleting CFCs and with implementation of the 1990 Clean Air Act Amendments demonstrate that when the government sends a clear signal concerning its environmental goals and preserves operational flexibility for businesses, innovative technologies tend to emerge and costs tend to fall well below early projections.

Sulfur Dioxide Allowance Trading: The price of sulfur dioxide emissions permits under the Acid Rain market trading mechanism has plummeted far below initial estimates, demonstrating that the projected costs of meeting the goal had been exaggerated. In 1989, industry projected that they would have to pay \$1,500 for the right to emit one ton of sulfur dioxide. Due to such factors as improved methods of blending coal types to meet emission limits and innovations in smokestack scrubber technology, the actual price of a one-ton permit on the Chicago Board of Trade in 1996 is just \$66.

CFC Phase-out: Similarly, initial industry cost estimates for car air conditioning retrofits of CFC substitutes were between \$800 and \$1,500. These retrofits are now available at a cost of \$200-800. Moreover, the price of substitutes for CFC themselves are far less than initial estimates; in some cases no estimates existed because government and industry analysts did not know if substitutes for some CFCs would even emerge.

A change in greenhouse gas policy would also likely stimulate private sector efforts to develop low-carbon energy technologies. Analyses of proposed climate policies tend to underestimate these types of dynamic responses because they are difficult to quantify and may be impossible to forecast. However, care must be taken in modeling presumed increases in energy sector research investment. For example, increased energy sector research and development investments could come at the expense of reducing innovation in other sectors of the economy unless the market and government policies support higher levels of overall R&D investment. Differences between the climate change problem and either acid rain or stratospheric ozone depletion may also limit the transferability of lessons from those cases. Unlike some environmental technologies, Federal expenditures in energy efficiency and renewable technologies have totalled \$17 billion since 1978 (1994 dollars), and private sector technology research and development has been stimulated by tax credits and regulatory requirements.

Beyond the insights that can be gained from looking back at previous regulatory analysis and the costs actually experienced in the market, comprehensive evaluation of the role of innovation and

technical change are needed to provide a more accurate estimate of the potential long-term impacts of climate change policies and any potential bias in current modeling results.

9. NEXT STEPS: FURTHER REFINEMENT OF ANALYSIS

While a significant amount of analysis has been conducted to date, much remains to be done. Among the remaining questions to be addressed over the next several months are:

- How can the results of many models be synthesized into a clear understanding of economic impacts in order to inform the development of policy?
- Which aspects of model specification have the greatest impact on the results, which assumptions are most prone to bias, and how should analysts treat biases identified in the models?
- What tools are best used to analyze sector-specific and regional economic impacts of policy options?
- How can a policy best be designed to harness market forces and induce technological change?
- What are the proper criteria for selecting between alternative policy mechanisms and implementation strategies?

The U.S. Government recognizes the need for further refinement of its continuing analytic work. This paper marks the beginning, not the end, of a process of analysis, assessment and development of climate change response strategies. The U.S. Government intends to rely on a range of experts and stakeholders to provide high-quality input on the difficult analytical problems that must be resolved in order to craft a cost-effective and forceful policy capable of preventing dangerous human interference with the Earth's climate.



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F
Sumner
Climate
Change

June 4, 1996

TO: DAN ABBASI, EPA
FROM: ALICIA MUNNELL *AM*
SUBJECT: JUNE 3RD DRAFT OF USG PAPER FOR CLIMATE ANALYTIC WORKSHOP

Thanks for the opportunity to review the paper. It is an improvement over the previous version. I have two recommendations.

- Omit the graphs all-together. The graph showing possible permit prices is too likely to be taken out of context. The others show too little difference between model runs to make a contribution to the discussion and appear to be in conflict with statements in the paper that different models have "profound impacts on ... predictions (p. 12)."
- Omit citing any specific numbers in the paper, as on p. 13, concerning loss of potential GDP.

c: David Gardiner, EPA
Marc Chupka, DOE

*A few minor editorial suggestions
are attached -
AM*

of evidence suggests that there is a discernible human influence on global climate." For the first time, this diverse group of highly respected scientists stated their belief that human beings have already begun to disrupt the planet's life-supporting climate system, a statement that is based on a multiplicity of peer-reviewed studies. This finding has reinforced the urgency that Parties attach to additional actions under the Berlin Mandate.

4. GREENHOUSE GAS EMISSION TRENDS

Global Trends: During the first half of the 1990s, greenhouse gas emissions grew in the U.S. and most of the rest of the world. However, due to the restructuring of the former Soviet Union and Eastern Europe, global emissions have been roughly stable. Nearly all of the countries of the Organization for Economic Cooperation and Development (OECD) are experiencing rising greenhouse gas emissions. The important exceptions are the U.K., which is eliminating its inefficient coal production in favor of cheap natural gas; and Germany, which is benefitting from the dramatic cut in emissions in the former East Germany. Projected U.S. emissions growth is expected to be slightly higher than the OECD average. Emissions are expected to grow somewhat more slowly in OECD-Europe, somewhat faster in OECD-Asia.

Over the next century, the bulk of emissions growth will occur in the non-OECD developing countries. While OECD carbon emissions are expected to grow by about 26% over the next twenty years, developing country carbon emissions are expected to double [Energy Information Administration's *International Energy Outlook*, 1996]. This observation underscores why the climate change problem can be solved only through international cooperation, and why U.S. leadership in addressing the issue is critical.

Figure 1: Relative growth within OECD

Figure 2: Long-term emissions trends

U.S. Emissions Trends: Total US emissions of greenhouse gases were 1,595 million metric tons of carbon equivalent (MMTCE) in 1990, of which 1,336 MMTCE. By 1994, the US was emitting 1,666 MMTCE of greenhouse gases. Of this total, 85% were carbon dioxide emissions, about 11% were methane (CH₄), 2% were nitrous oxide (N₂O), and 2% from other gases including the chlorofluorocarbons HFC, PFC, and SF₆. The transportation and industrial sectors of the U.S. economy were responsible for most of the CO₂ emissions, landfills and agricultural production were the greatest sources of CH₄ emissions, and the agricultural sector was the largest emitter of N₂O. Automotive air conditioning was largely responsible for the remaining emissions from HFC-134a.

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(4) Alliance of Small Island States (AOSIS) Proposal: Annex I Parties reduce emissions 20 percent below 1990 levels by 2005.

As noted earlier, the U.S. Government does not ~~favor or~~ endorse any of these proposals at this time. Rather, the Government is analyzing their economic consequences for the U.S. and for the rest of the world.

General Outline of Model: The U.S. Government has analyzed the economy-wide impacts of these targets and timetables using two distinct energy models linked to the DRI/McGraw Hill Macroeconomic Model of the U.S. Economy. The analysis assumes that America's OECD trading partners implement similar policies, and that the Federal Reserve reacts to the resulting changes in prices and employment in same way that it has reacted to these changes over the past decade. These models were used to estimate the potential economic impacts for a range of policy scenarios, including impacts on gross domestic product (GDP), consumption, investment, employment, and inflation; as well as regional, industrial, and energy market impacts.

Macroeconomic models have the advantage of representing economy-wide adjustments and responses to policies, particularly business cycle responses. Their weakness is that they do not provide detailed representation of specific markets and specific technologies. Furthermore, their characterization of the long-run determinants of economic growth is relatively limited.

To represent energy markets and technologies, the macroeconomic model is coupled with an energy sector model. The analysts have estimated price increases for the four emission target scenarios using the DRI/McGraw Hill Energy Market Model and the IDEAS model. These models incorporate different assumptions about the price responsiveness in energy demand and different characterizations of energy technologies. These assumptions yield different estimates of the magnitude of changes needed to achieve a given target in the energy sector.

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or

Open
Market Committee

reduction in marginal corporate income tax rates. The rationale for this approach is that households consume roughly 40% of all energy directly, while 60% of all energy is used by businesses in the production of goods and services.

For all of the targets, the initial effect of the permit and revenue recycling systems is to raise fossil fuel prices, generating a rise in the general price level and reducing demand. In response to inflation, the Federal Reserve Bank restricts the money supply to offset the inflationary impacts of the policy, further slowing the economy. GDP declines slightly in the near term – through at least 2008. However, by reducing business taxes, this permit allocation and revenue recycling system encourages business investment. In the long run, this boosts economic growth. GDP increases above the no-policy case throughout the rest of the forecast period. With more stringent targets, output dips more in the near term but rebounds more strongly in the out years.

Figure 5. Range of GDP impacts relative to the baseline for each scenario -- using the results from the latest DRI model. Permit Auction 40% 60% split.

How do different permit designs affect the economy? Figure 6 illustrates the GDP impact of alternative methods of distributing or auctioning marketable permits and recycling any revenues, using the stabilization target as an example. It is clear that the design of the permit system can significantly influence the GDP impacts of a given target. Every approach causes near term GDP losses as the economy adjusts to higher energy prices. However, the long term impacts depend critically on the permit distribution and revenue recycling scheme. When the revenues from selling permits are distributed to consumers and businesses based upon historical patterns of spending on energy – i.e., 40% to consumers and 60% to producers – higher investment actually raises economic activity above what it would have been without any policy. Alternatively, when the permits (or the revenues from selling permits) are distributed only to households, the economy's aggregate savings are lower. With fewer savings available for investment, GDP is lower even in the later years of the forecast.

These results highlight not only the importance of the permit system design, but the importance of the distribution of the permits or the disbursement of revenues from permit auctions. If the value of permits accrues mainly to households – whose aggregate savings are relatively low – ~~there will not be sufficient investment~~ to offset higher energy prices. In contrast, if the value of permits accrues mainly to businesses – which tend to retain and reinvest profits – there may be enough additional investment to offset the loss of energy inputs. Well-designed policies can thus actually enhance economic activity; while policies that are not targeted to alleviate the impacts of higher energy prices can dampen economic growth.

Figure 6. Comparison of allocation and auction of permits for stabilization scenario.

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utility sector, which projects similar carbon emissions reductions at lower energy price increases than DRI's utility sector model. The IAT will continue to assess this issue so that the best forecast of energy sector impacts from alternative greenhouse gas policies can ultimately be developed.

Figure 8. Price elasticity sensitivity analysis.

The macroeconomic impacts presented here are generally lower than those presented in other studies, even those using the DRI model. For example, when the Electric Research Power Institute (EPRI) examined the same GHG targets using the DRI model, it concluded that the losses in GDP could be quite large – up to 4.3% (see Figure 9).

A crucial questions remains. Why are the U.S. Government's current results so different from the EPRI-sponsored results? ^{4/1/96} There are three major reasons for these conclusions. First, in the U.S.G. analysis, the permit system has been phased in, so as to allow energy users more time to adjust to the policy change. By contrast, the EPRI-sponsored work "shocked" the system by imposing a carbon tax all at once. This greatly increases the GDP impacts. Second, in the EPRI study, carbon tax revenues were recycled only through an increase in the personal income tax exemption – the worst case for GDP. Third, EPRI assumed that the U.S. is pursuing a unilateral emissions reduction strategy, rather than cooperating with the rest of the OECD. Fourth, in the EPRI study, the Federal Reserve was assumed to pursue exactly the same monetary policy that it would have in the absence of the carbon tax. This has the effect of contracting the money supply – and causing output to decline – more than would be the case if the Federal Reserve responded as it normally does.

9/2/96

Figure 9. Comparison with EPRI analysis.

Taking account of the above factors, the U.S. Government's preliminary macroeconomic results show a wide range of impacts on the economy, although the results tend to show smaller impacts on output in the U.S. economy than the results obtained in several earlier studies that purported to show substantial negative impacts. Moreover, as discussed elsewhere in this paper, the impacts depend fundamentally on what kind of policy is implemented; intelligent policy design can dramatically reduce costs. The U.S. Government's analysis indicates that the U.S. economy will continue to grow at a healthy pace through the first decades of the next century under all of the options examined. The IAT is still synthesizing the results of these studies and exploring the how the timing, implementation, and the size of the emissions reductions may explain the range of outcomes.

EXECUTIVE OFFICE OF THE PRESIDENT

COUNCIL OF ECONOMIC ADVISERS
17TH & PENNSYLVANIA AVE., N.W.
WASHINGTON, DC 20502



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*Climate Model Paper**At 1019**Rev 220
6/2***FAX TRANSMISSION****U.S. EPA**

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*Environ.
Climate
Change*

To: Steve Seidel
Rosina Bierbaum
Ray Prince

Date: June 3, 1996

Fax #: 456-6546, 456-6025, 395-6853, **Pages:** 23, including this cover sheet.

From: Daniel R. Abbasi, U.S. EPA (260-4332)

Subject: Latest draft of USG paper for climate analytic workshop

COMMENTS:

Attached for your review and comment is the latest draft of the USG paper for the June 6-7 analytic workshop on climate change.

I am still resolving several issues between EPA and DOE, as noted in brackets in the text.

Please call me as soon as possible with any comments: 260-4332. We are aiming to finalize the text by the end of today, if possible. Sorry for the late circulation; I worked with staff throughout last night and into this morning, so it was not available earlier.

Thank you very much.

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2. Preliminary Lessons Learned from Analyses
3. Benefits of Policies to Reduce Greenhouse Gas Emissions – Or the Costs of Inaction
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7. **International Analyses**
GDP impacts
Carbon emissions leakage
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8. **Lessons from Previous Policies**
Sulfur Dioxide Allowance Trading
CFC Phase-out
9. **The Role of Advanced Energy Technologies**
10. **Next Steps: From Analysis to Policy**

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June 3, 1996 (1:44pm)

1. INTRODUCTION

International negotiations to address the risk of climate change have been underway for more than seven years. At the Earth Summit in Rio de Janeiro in 1992 -- formally known as the U.N. Conference on Environment and Development -- 154 nations signed the Framework Convention on Climate Change (FCCC). Article Two of the FCCC states its guiding objective: "to stabilize atmospheric concentrations of greenhouse gases at a level that would prevent dangerous anthropogenic interference with the climate system."

The FCCC obligates the United States and other industrialized nations -- known in FCCC parlance as "Annex 1" nations -- to aim to return greenhouse gas emissions to 1990 levels by the year 2000. In 1993, President Clinton unveiled the Climate Change Action Plan (CCAP), which included over 50 actions intended to bring the U.S. to the emissions level called for by the FCCC. Although the CCAP programs have in fact cost-effectively reduced emissions over the past three years, it now seems likely that the U.S. will fall short of the goal by over 100 million metric tons of carbon equivalent (MMTCE), due to substantial funding cuts by Congress, stronger than expected economic growth, and lower energy prices. A review of the CCAP is being completed for release in fall, 1996, and will include an update of baseline trends, a review of the effectiveness of current actions, and recommendations for additional actions.

At the first Conference of the Parties to the FCCC in Berlin in March 1995, the Parties decided that the provisions and goals of the FCCC were not adequate to address the long-term challenges of climate change. They recognized the FCCC commitments as an important first step but noted their silence with respect to emissions after the year 2000.

Accordingly, in the Report of the Conference, dubbed the "Berlin Mandate", the Parties agreed to launch a process to define actions to be taken by the industrialized Annex 1 nations in the post-2000 period, and to promote implementation of commitments by all nations. The U.S. successfully urged the Parties to include in the Berlin Mandate a call for an initial phase of analysis and assessment to inform the negotiation of a Protocol specifying post-2000 obligations. The adopted language follows:

The process will include in its early stages an analysis and assessment to identify possible policies and measures for Annex I parties that could contribute to limiting and reducing emissions by sources and protecting and enhancing sinks and reservoirs of greenhouse gases. (FCCC/CP/1995/7/Add.1)

The U.S. Government is participating actively in the series of international negotiation sessions intended to fulfill the Berlin Mandate and conclude with a legally binding Protocol to

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the FCCC in time for signing at the Third Conference of the Parties in Kyoto, Japan in late 1997. Three formal negotiating sessions have been held since the Berlin Mandate was issued at the First Conference of the Parties. In these sessions, a number of countries, as well as multilateral associations of countries, have proposed draft protocols under which the Annex I countries would be required to reduce their emissions by specific amounts by specific years -- goals that have customarily been called "targets and timetables", but have since been technically labeled Quantified Emissions Limitation and Reduction Objectives (QELRO's). In addition to these proposed targets and timetables -- which would by themselves permit Parties to select their own policy instruments for fulfilling the targets -- some countries have also proposed mandatory, internationally coordinated "policies and measures".

The United States Government has to date proposed **neither** a QELRO for reducing greenhouse gas emissions, **nor** a specific set of policies and measures. Instead, the U.S. Government is analyzing and assessing the proposals offered by other countries as a critical foundation for its own development of a policy and negotiating position.

This paper is the U.S. Government's first public document describing the partial and interim results of its ongoing analyses of climate change proposals advanced by other countries. The paper presents key findings from our analyses to date, with some reference to analyses by other stakeholders. These findings are being released on a preliminary basis at the U.S. Government's Analytic Workshop on Climate Change on June 6-7, 1996, in order to facilitate maximum feedback by convened experts and stakeholders.

The U.S. Government's Interagency Analytic Team (IAT) responsible for most of the analysis underlying this paper is composed of analysts from many of the U.S. government agencies that have a role in developing climate change policy, including the Environmental Protection Agency, the Department of Energy, the Department of Agriculture, the Department of Commerce, Department of Transportation, Department of the Treasury, and the White House Council of Economic Advisors. The IAT has adopted a diversity of perspectives and approaches -- from detailed technology assessments to highly aggregated domestic and international macroeconomic modeling exercises -- in making progress toward a balanced assessment of the impacts of climate change mitigation policy alternatives.

Among their other limitations, the partial scope of the analyses discussed in this paper should be acknowledged up front. Atmospheric greenhouse gas concentrations are a function both of emissions from a variety of sectors and activities and of available sinks. The U.S. Government continues to maintain that international commitments should be comprehensive, addressing both sources and sinks of all greenhouse gases. However, most of the analyses described in this paper focuses on energy-related greenhouse gas emissions. This focus reflects the availability of modeling tools that can be used to assess the relationships linking energy use and economic performance, as well as the fact that energy-related emissions account for over 86 percent of total U.S. greenhouse gas emissions and 70 percent of global greenhouse gas emissions.

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It bears emphasis that this paper marks the beginning, not the end, of a process of analysis, assessment and development of climate change response strategies. Beyond the June 6-7 Analytic Workshop, many other opportunities will be provided to potentially affected stakeholders to comment on U.S. Government analysis and to submit additional analyses for consideration.

2. PRELIMINARY LESSONS LEARNED FROM ANALYSES

The balance of this paper will discuss the strengths, weaknesses and findings of alternative models that have been enlisted to analyze the economic effects of implementing other countries' proposed climate change protocols. It will offer preliminary numerical results from the models in both textual and graphical form. It should, at this point, be noted that non-practitioners of economic modeling tend to attribute more significance to the absolute values of numerical results than do modelers themselves. Modelers tend to focus instead on qualitative lessons for policy formulation, derived from cases where a particular policy design or strategy shows consistently superior results under a variety of modeling frameworks and assumptions. Accordingly, this section distills key lessons that the U.S. Government has derived on a preliminary basis from its initial analytic work. The lessons follow:

- Rigorous assessment of the impacts of greenhouse gas mitigation requires a variety of analytic approaches since no single model is capable of capturing all relevant aspects of the economy. Each approach has its own strengths and weaknesses. Therefore, it is imperative to understand and reconcile insights gained from a diversity of analytic approaches in arriving at an informed and balanced assessment.
- The overall costs of emissions control depend critically on the stringency of the target and on the structure of the policy.
- Modest emissions reductions can be achieved with macroeconomic impacts ranging from mildly negative to slightly positive. More stringent targets will impose higher costs. The range of analytic results depends on the modeling framework used as well as the type of policy intervention simulated.
- Lower costs are associated with policies that are broad-based, flexible and phased. Such policies can help avoid disruptions and allow for rational planning by businesses and consumers.
- Responsibility for addressing the climate change problem rests on the global community, and will require unprecedented international cooperation. Cost-effective global solutions will require flexibility in the timing and location of greenhouse gas reductions, as well as institutions able to accommodate and promote such flexibility.

- Technological development and dissemination is critical to addressing climate change. In the short run, we need to understand and overcome the institutional barriers that slow the deployment of energy-saving technologies that pay for themselves. In the longer term, we need to encourage the development and dissemination of new energy-saving and low-carbon technologies.
- In the past, regulatory compliance costs have often been overestimated because of reliance on analytic tools that fail to account for dynamic technological, institutional and organizational innovations. Such responses have greatly reduced compliance costs from original estimates for some regulations, and future analyses of climate change policies should take this potential bias into account.
- A balanced assessment of climate change policies must account for the benefits that would accrue from their ability to avert the myriad economic dislocations projected to occur in a rapidly changing climate. Significant progress needs to be made in monetizing the range of impacts so that the costs of action can be compared not to the status quo, but more appropriately to the substantial costs of inaction.

3. BENEFITS OF POLICIES TO REDUCE GREENHOUSE GAS EMISSIONS -- OR THE COSTS OF INACTION

[TEXT ON MONETIZED IMPACTS FORTHCOMING FROM EPA/OPPE]

None of the models discussed in this paper measure the environmental and economic benefits of mitigating emissions in terms of reduced climate change impacts. Because the models do not measure these benefits, the fact that a policy is shown to impose significant costs cannot, by itself, rule out its selection for implementation if the overall benefits of reducing climate change impacts outweighs those costs.

Global greenhouse gas emissions are projected to increase anywhere from two- to six-fold over current levels by the end of the next century (i.e., by the year 2100) under the set of possible "business as usual" futures considered in the recent report of the Intergovernmental Panel on Climate Change (IPCC). Atmospheric greenhouse gas concentrations will ultimately have to be stabilized in order to achieve the FCCC's objective of preventing dangerous human interference with the climate. Even in the "business as usual" IPCC scenarios, the scientists asserted that the rate of warming due to human emissions will be, in their words, "greater than any seen in the last 10,000 years." In other words, since before the first human city was built. Therefore, it will ultimately be necessary to reduce emissions to achieve the goal of the Convention.

The most striking conclusion in the IPCC Second Assessment Report, drawing on the work of 2,500 scientists from around the world, was their consensus finding that: "The balance

of evidence suggests that there is a discernible human influence on global climate." For the first time, this diverse group of highly respected scientists stated their belief that human beings have already begun to disrupt the planet's life-supporting climate system, a statement that is based on a multiplicity of peer-reviewed studies. This finding has reinforced the urgency that Parties attach to additional actions under the Berlin Mandate.

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Without additional policy intervention, U.S. greenhouse gas emissions are expected to rise by at least 20 percent by 2010. Seventy five percent of the emissions growth will be in the energy sector, mainly in electricity generation and transportation. Emissions of HFCs – substitutes for chemicals being phased out under the Montreal Protocol – are expected to increase substantially. Carbon sequestration in American forests is expected to decline.

Figure 3: US Greenhouse Gas Emissions 1990-1995. With baseline projections through 2020

Figure 4: Sectoral Energy-Related U.S. Carbon Emissions 1990-2020

5. DOMESTIC TECHNOLOGICAL COSTING ANALYSES

Past Studies: A number of studies have suggested that greenhouse gas emissions can be reduced significantly at *net economic savings*. Two of the more prominent studies endorsing this conclusion are the National Academy of Sciences (NAS) report, Policy Implications of Greenhouse Warming (NAS 1991) and Changing by Degrees. Steps to Reduce Greenhouse Gases, by the U.S. Office of Technology Assessment (OTA 1991). The NAS study found that 100 to 480 million metric tons of greenhouse gas emissions could be reduced at negative or no cost. The OTA study identified a greenhouse gas emissions reduction potential of up to 472 million metric tons at negative cost or net benefit.

[ADD TEXT ON 1995 EPA STUDY CITED IN CHUPKA TESTIMONY – 330 MMTCE]

[EPA/OPPE WILL ADD TEXT SUMMARIZING NAS AND OTA STUDIES]

To help provide additional insights into individual policies and measures that might be used to reduce emissions, DOE is now completing an update of its 1989 report A Compendium of Options for Government Policy to Encourage Private Sector Response to Potential Climate Change. This update summarizes, on a sector-by-sector basis, the results regarding individual policies and measures to mitigate emissions reported in the literature since issuance of the original report. The report considers the extent to which each of the factors affecting the end-user adoption of relevant technologies are incorporated in the analysis and which appear to be most relevant for successful introduction of measures in each specific sector.

The strength of the technology costing approach is that it demonstrates the extent of

technological opportunities available to save energy and reduce greenhouse gas emissions. The primary weakness of this approach is that it fails to address the institutional and organizational reasons why businesses and consumers do not take full advantage of these obvious opportunities.

[Mark: delete this – Domestic Institutional, Organizational and Technological Analyses:

The large store of potentially profitable energy-saving investments suggests that an effective policy must include the institutional and organizational change necessary to unlock these profitable opportunities and promote the diffusion of higher efficiency technologies. A new EPA study focuses on the impact of policies that would resolve market failures in the commercial, residential, industrial, transportation and electric sectors. The study confirms the findings of earlier reports, finding even greater greenhouse gas emissions reductions at net economic savings.

The study examines institutional and organizational changes that would ensure that households and businesses receive the information, technical assistance, and financing they need to purchase and profit from proven higher efficiency technologies. The institutional and organizational changes would also be structured to give equipment manufacturers and building owners the opportunity to capture some of the profit from the higher efficiency technologies, thus stimulating diffusion and innovation. The study finds that successful implementation of institutional and organizational change could yield greenhouse gases reductions of up to 39% over baseline 2015 levels (or 21% over 1990 levels) with a positive GDP impact of 0.5%.]

Figure 10 (OAR graph labeled 8)

6. DOMESTIC MACROECONOMIC ANALYSES

[DOE TO PROPOSE ADDITIONAL MODIFICATIONS TO THIS SECTION]

Four Emissions Reduction Scenarios: The U.S. Government's domestic macroeconomic analysis has focused almost exclusively on proposals that have already been advanced by other nations in the international negotiating process, including by the Alliance of Small Island States (AOSIS), Germany and the United Kingdom. The four scenarios follow:

- (1) Stabilization Proposal:** Annex I Parties stabilize emissions at 1990 levels in 2010;
- (2) United Kingdom Proposal:** Annex I Parties reduce emissions 10 percent below their 1990 levels by 2010;
- (3) German Proposal:** Annex I Parties reduce emissions 10 percent below 1990 levels by 2005; 20 percent below 1990 levels by 2010;

(4) Alliance of Small Island States (AOSIS) Proposal: Annex I Parties reduce emissions 20 percent below 1990 levels by 2005.

As noted earlier, the U.S. Government does not favor or endorse any of these proposals at this time. Rather, the Government is analyzing their economic consequences for the U.S. and for the rest of the world.

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Implementation Timing: The analysis assumes that policies are phased in after 2000. Energy prices gradually increase throughout the period, and emissions generally decline to the target by the end of the phase-in (2005 for AOSIS and German proposals; 2010 for all others).

Five Modeled Permit Allocation Policies: For each emission target, the IAT assumed that the government would introduce a tradeable permit system, distributing or selling a fixed number of permits to sell fossil fuels based on their carbon content. Those receiving or purchasing the permits would have the right to sell fuels that contain carbon or to sell their permits. Primary fossil fuel producers would be required to obtain permits reflecting the carbon content of their fossil fuel sales.

A system of marketable tradable permits is considered one of the most cost-effective and flexible policies for reducing emissions. The ability to trade permits in a market assures that permits are put to their highest-value use. Given the limit imposed by the number of permits, fossil fuel consumers can be expected to make the least-cost emission reductions available, thus minimizing overall costs. Another reason why the IAT has analyzed international proposals with a permit trading scheme is that this type of policy readily lends itself to analysis in the available large-scale economic models. However, despite these virtues, the analysis of marketable permit systems should not be taken as an endorsement by the U.S. Government. The U.S. Government continues to examine a variety of options to achieve climate goals.

The IAT examined five very different schemes for allocating the permits to analyze their economic and distributional impacts. The fundamental insight from the analysis is that the economic impacts of mitigation depend to a very great extent on how the permits – and thus the costs – are allocated across different sectors of the economy. If the permits are simply handed out, their allocation creates a type of property right that has value. On the other hand, if the permits were auctioned off by the government, their sale would generate revenues for the government. How the government uses the revenues can have profound impacts on the economy.

The IAT analyzed three distinct auction scenarios to determine the impacts of various mechanisms for redistributing the revenue:

- 1) **Auctioned Permits, Revenues to Consumers Only:** distributing revenue to consumers by increasing the personal income tax exemption;
- 2) **Auctioned Permits, Revenues to Consumers and Business:** sharing revenue between consumers and producers by reducing personal and corporate marginal income tax rates; and
- 3) **Auctioned Permits, Revenues Used to Reduce Deficit:** using the revenue to reduce the Federal budget deficit and retire Federal debt.

In addition, we analyzed two distinct allocation scenarios:

- 4) **Permits Distributed to Consumers:** all permits are allocated to individual households, who in turn sell their permits to primary fossil fuel producers; and
- 5) **Permits Distributed to Consumers and Business:** permits are allocated to both consumer and businesses, based on their historical energy use.

Results of Domestic Macroeconomic Models: Figure 5 shows the GDP impacts from 2000 through 2015 of different levels of GHG emissions abatement. In each case, the target is achieved by auctioning off permits and returning roughly 40% of the revenues to consumers through an increase in the personal income tax exemption and 60% to businesses through a

reduction in marginal corporate income tax rates. The rationale for this approach is that households consume roughly 40% of all energy directly, while 60% of all energy is used by businesses in the production of goods and services.

For all of the targets, the initial effect of the permit and revenue recycling systems is to raise fossil fuel prices, generating a rise in the general price level and reducing demand. In response to inflation, the Federal Reserve Bank restricts the money supply to offset the inflationary impacts of the policy, further slowing the economy. GDP declines slightly in the near term – through at least 2008. However, by reducing business taxes, this permit allocation and revenue recycling system encourages business investment. In the long run, this boosts economic growth. GDP increases above the no-policy case throughout the rest of the forecast period. With more stringent targets, output dips more in the near term but rebounds more strongly in the out years.

Figure 5. Range of GDP impacts relative to the baseline for each scenario -- using the results from the latest DRI model. Permit Auction 40% 60% split.

How do different permit designs affect the economy? Figure 6 illustrates the GDP impact of alternative methods of distributing or auctioning marketable permits and recycling any revenues, using the stabilization target as an example. It is clear that the design of the permit system can significantly influence the GDP impacts of a given target. Every approach causes near term GDP losses as the economy adjusts to higher energy prices. However, the long term impacts depend critically on the permit distribution and revenue recycling scheme. When the revenues from selling permits are distributed to consumers and businesses based upon historical patterns of spending on energy – i.e., 40% to consumers and 60% to producers – higher investment actually raises economic activity above what it would have been without any policy. Alternatively, when the permits (or the revenues from selling permits) are distributed only to households, the economy's aggregate savings are lower. With fewer savings available for investment, GDP is lower even in the later years of the forecast.

These results highlight not only the importance of the permit system design, but the importance of the distribution of the permits or the disbursement of revenues from permit auctions. If the value of permits accrues mainly to households – whose aggregate savings are relatively low – there will not be sufficient investment to offset higher energy prices. In contrast, if the value of permits accrues mainly to businesses – which tend to retain and reinvest profits – there may be enough additional investment to offset the loss of energy inputs. Well-designed policies can thus actually enhance economic activity; while policies that are not targeted to alleviate the impacts of higher energy prices can dampen economic growth.

Figure 6. Comparison of allocation and auction of permits for stabilization scenario.

The IAT used two different versions of the DRI Macro model to project the macroeconomic impacts of greenhouse gas policies. In one – an older version – the economy's productive capacity is determined by the capital stock, the labor force, and the total quantity of energy consumed. In the more recent version, productive capacity (also called "potential GDP") is directly influenced by domestic oil and natural gas production rather than by total energy demand. While this change may seem minor, it has profound impacts on the model's predictions of the impacts of reducing the amount of energy available. Further research is underway to determine which of these approaches is most appropriate, or whether another approach is needed. All of the above results use the most recent version of the DRI model.

Figure 7 Impact of potential GDP stabilization for stabilization scenario.

Figure 7 shows the different GDP impacts, using the two model versions, of a single target and policy: an auctioned permit system with revenues returned to both consumers and businesses. The figure illustrates that the form of this one equation in the model can significantly influence the estimate of the economic impact of a given policy.

Another source of uncertainty is the energy sector impacts of the a marketable tradeable permit system. The key consequence of the permit system is to raise energy prices by limiting fossil fuel use. How consumers and businesses respond to these price changes is one of the critical determinants of any policy's costs. If consumers and businesses respond very strongly to price signals, then relatively small price increases – and thus relatively low permit prices – will be necessary to achieve a given emissions target. On the other hand, if consumers and businesses are not very responsive to price signals – if they have "low energy demand elasticities" – then it will take large price hikes to achieve the same target.

[DOE PROPOSING TO DELETE REFERENCE TO AVERAGE ELASTICITY DERIVED FROM LITERATURE SURVEY AND SUBSTITUTE MORE CREDIBLE BENCHMARK] The Department of Energy has sponsored research on how consumers and businesses respond to energy price increases. The DOE research seems to suggest that energy users are more responsive to changes in energy prices – they have higher demand elasticities – than is suggested by the DRI model.]

As a sensitivity analysis, we replaced DRI's own long-run energy elasticities with average estimates from the Department of Energy literature. This minor change had a dramatic effect on permit prices. In the current version of the DRI model, the value of permits must rise to roughly \$125 per metric ton of carbon in order to stabilize greenhouse gas emissions in 2010. With the higher elasticities, the value of permits had to rise only to \$60 per ton in order to stabilize GHG emissions in 2010. The projected permit prices are shown in Figure 8.

The lower estimate is roughly in line with the average of estimates derived from a large number of economic models in the Stanford Energy Modeling Forum 12. It is also consistent with results obtained from the technology-rich ICF Integrated Planning Model of the electric

utility sector, which projects similar carbon emissions reductions at lower energy price increases than DRI's utility sector model. The IAT will continue to assess this issue so that the best forecast of energy sector impacts from alternative greenhouse gas policies can ultimately be developed.

Figure 8. Price elasticity sensitivity analysis.

The macroeconomic impacts presented here are generally lower than those presented in other studies, even those using the DRI model. For example, when the Electric Research Power Institute (EPRI) examined the same GHG targets using the DRI model, it concluded that the losses in GDP could be quite large – up to 4.3% (see Figure 9).

A crucial questions remains. Why are the U.S. Government's current results so different from the EPRI-sponsored results? There are three major reasons for these conclusions. First, in the U.S.G. analysis, the permit system has been phased in, so as to allow energy users more time to adjust to the policy change. By contrast, the EPRI-sponsored work "shocked" the system by imposing a carbon tax all at once. This greatly increases the GDP impacts. Second, in the EPRI study, carbon tax revenues were recycled only through an increase in the personal income tax exemption – the worst case for GDP. Third, EPRI assumed that the U.S. is pursuing a unilateral emissions reduction strategy, rather than cooperating with the rest of the OECD. Fourth, in the EPRI study, the Federal Reserve was assumed to pursue exactly the same monetary policy that it would have in the absence of the carbon tax. This has the effect of contracting the money supply – and causing output to decline – more than would be the case if the Federal Reserve responded as it normally does.

Figure 9. Comparison with EPRI analysis.

Taking account of the above factors, the U.S. Government's preliminary macroeconomic results show a wide range of impacts on the economy, although the results tend to show smaller impacts on output in the U.S. economy than the results obtained in several earlier studies that purported to show substantial negative impacts. Moreover, as discussed elsewhere in this paper, the impacts depend fundamentally on what kind of policy is implemented; intelligent policy design can dramatically reduce costs. The U.S. Government's analysis indicates that the U.S. economy will continue to grow at a healthy pace through the first decades of the next century under all of the options examined. The IAT is still synthesizing the results of these studies and exploring the how the timing, implementation, and the size of the emissions reductions may explain the range of outcomes.

7. INTERNATIONAL ANALYSES

The IAT is also pursuing a variety of analyses using a diverse set of models of the international economy, including the Oxford and G-Cubed models that are being discussed in separate papers prepared for the June 6-7, 1996 Analytic Workshop. A wide range of results has been obtained, with review and synthesis still pending. It is possible, however, to draw three tentative conclusions.

1. GDP impacts: There may be significant differences across OECD countries in the costs of meeting any specific target. Some countries, such as Germany and the United Kingdom, face special circumstances that will make it relatively inexpensive to reduce emissions during the next decade. Countries expected to grow relatively rapidly, such as Japan, should find it more difficult to meet particular targets. Low-carbon economies such as France, which rely on nuclear power for much of their electricity, will have fewer opportunities to reduce emissions.

2. Carbon emissions leakage: Some analysts argue that if the developed nations constrain the use of fossil fuels in order to reduce greenhouse gas emissions, two confounding effects could lead to an offsetting increase in developing country fuel use and greenhouse gas emissions. First, reduced demand could cause world oil prices to decline, thereby potentially spurring increased oil demand in the developing world. Second, over the longer term, energy-intensive industries facing higher energy prices in developed countries might migrate to developing countries that are not controlling emissions. Taken together, these two influences are called the "leakage effect."

[An increase in emissions in the developing world could eviscerate an emissions program pursued only by developed countries, so that their energy-intensive industries would make a sacrifice with no ultimate benefit. However, the U.S. Government's initial modeling results suggest that, although reduced energy demand in OECD countries would lead to lower world oil prices, a decrease in OECD emissions would not be significantly offset by an increase in non-Annex I countries' emissions. Also, the analysis did not find that energy-intensive industries are likely to migrate from industrialized to developing countries as a result of control regimes implemented in the former. These results, however, are preliminary and await more detailed analysis in the future.]

3. "Where" and "When" Flexibilities: Some of the preliminary international results illustrate how both the level, design and timing of commitments could affect the costs of greenhouse gas mitigation. One recent study used four different models to evaluate the extent to which flexibility in the international location and timing of emission reductions should reduce costs. The results suggested that costs of achieving the same cumulative emissions reductions over the next fifty years could be significantly reduced by allowing reductions anywhere in the world and by allowing a slower pace of early emission reductions which are then "made up" with more extensive reductions later. According to this analysis, the cost reduction for locational flexibility alone could be roughly 70 percent, timing flexibility alone 40 percent, and both types

of flexibility together 85 percent. The cost reductions from timing flexibility are significantly reduced as the time horizon over which higher initial emissions must be "made up" is shortened.

These results are very dependent on a number of important assumptions built into the models. The models assume a fixed path of technological development, and do not make allowance for technological developments in response to control regimes. This means that they do not consider the effect of early signals to induce a technological response. Moreover, the models assume perfect foresight, so that economic actors know with certainty what technologies will be available in the future, and what the ultimate emissions limit is. Finally, the analysis assumes that the institutional infrastructure need to undertake emissions trades internationally can be implemented without cost, negotiated effectively, and that no countries will "game" the system. Relaxing any of these assumptions would reduce the gains from "where and when" flexibility.

8. LESSONS FROM PREVIOUS POLICIES

Past practice reveals common biases in the analyses of costs of pursuing control policies. The private sector has demonstrated an ability to respond to market-based policy signals with technological innovation that reduces the costs of meeting environmental and other goals. A change in greenhouse gas policy would also be likely to stimulate a private sector effort to develop low-carbon energy technologies. The U.S. Government recognizes that differences between the climate change problem and either acid rain or stratospheric ozone destruction limit the transferability of lessons from those cases. Nevertheless, insights gained from previous regulatory experiences may be suggestive of analytic biases.

Lessons may be drawn from two successful and innovative American environmental policies: the acid rain control program and the Montreal Protocol, designed to limit the release of ozone-depleting chemicals into the atmosphere. Our experiences with the phase-out of ozone-depleting CFCs and with implementation of the 1990 Clean Air Act Amendments demonstrate that when the government sends a clear signal concerning its environmental goals and preserves operational flexibility for businesses, innovative technologies tend to emerge and costs tend to fall well below early projections.

Sulfur Dioxide Allowance Trading: The price of sulfur dioxide emissions permits under the Acid Rain market trading mechanism has plummeted far below initial industry estimates, demonstrating that the projected costs of meeting the goal had been exaggerated. In 1989, industry projected that they would have to pay \$1,500 for the right to emit one ton of sulfur dioxide. Due to such factors as improved methods of blending coal types to meet emission limits and innovations in smokestack scrubber technology, the actual price of a one-ton permit on the Chicago Board of Trade in 1996 is just \$66.

CFC Phase-out: Similarly, initial industry cost estimates for car air conditioning retrofits of CFC substitutes were between \$800 and \$1,500. These retrofits are now available at a cost of \$200-800.

[OAR MAY ADD ADDITIONAL NARRATIVE ON CFC EXPERIENCE, INCLUDING 2 CHARTS]

Analyses of proposed climate policies may tend to underestimate these types of dynamic responses because they are difficult to quantify. Much better modeling of innovation and technological change is needed. On the other hand, it should also be noted that precisely because they are hard to quantify, the impact of such technological responses on control costs will always be difficult to forecast.

19. THE ROLE OF ADVANCED ENERGY TECHNOLOGIES

[DOE PROPOSES FOLDING THIS SECTION INTO SECTION 8]

One weakness of all of the modelling approaches described above is that they cannot describe the technological innovation response to the proposed policies analyzed in this paper. Policies that limit energy use will tend to stimulate investment in research that will produce technologies that cannot be predicted in advance. The modeling approaches discussed above assume a relatively fixed path of technological change that does not respond to policies.

This analytic blindspot in the models becomes especially important when one considers that over the long term, global energy demand will be driven by expanding economic growth and a rapidly growing population. These factors drive current projections of ever increasing greenhouse gas emissions. Ultimately, it is difficult to envision how humanity can meet the twin goals of raising global living standards and reducing energy-related emissions without developing advanced energy technologies.

Both government and the private sector have legitimate, complementary roles to play in fostering the development of advanced, clean energy technologies. While the private sector should take the lead role in commercial development activities, government-supported energy research can play a complementary role in overcoming market failures that lead to systematic underinvestment in research and development activity.

For the climate change issue, electricity and transportation fuels and technologies are of particular importance. A wide variety of projections show electricity generation and transportation to be the major sources of growth in energy-related emissions in throughout the world over the foreseeable future. Recent activities at the National Renewable Energy Laboratory -- focusing on biofuels, wind and solar energy -- are excellent examples of the types of research and development that can help provide attractive long-run answers to the challenge of

emissions mitigation.]

10. NEXT STEPS: FROM ANALYSIS TO POLICY

While a significant amount of analysis has been conducted to date, much remains to be done. Among the remaining questions to be addressed over the next several months are:

- How can a policy best be designed to harness market forces and induce technological change?
- How can improved performance be stimulated in renewable energy and energy efficiency?
- How can the impacts of proposed policies be effectively specified with regard to sectors and regions?
- How can the employment impacts, both positive and negative, of policy options best be assessed, both in the aggregate economy and in specific sectors?
- What are the proper criteria for selecting between alternative policy mechanisms and implementation strategies?

The United States is committed to ensuring that the process of developing and negotiating further commitments, and advancing those already made, is based on a solid analytical foundation. Analysis and assessment is helping to guide the way toward an appropriate level of commitment and, equally or more important, toward a structure of commitments and domestic implementation approaches that will cost-effectively meet our environmental goals.

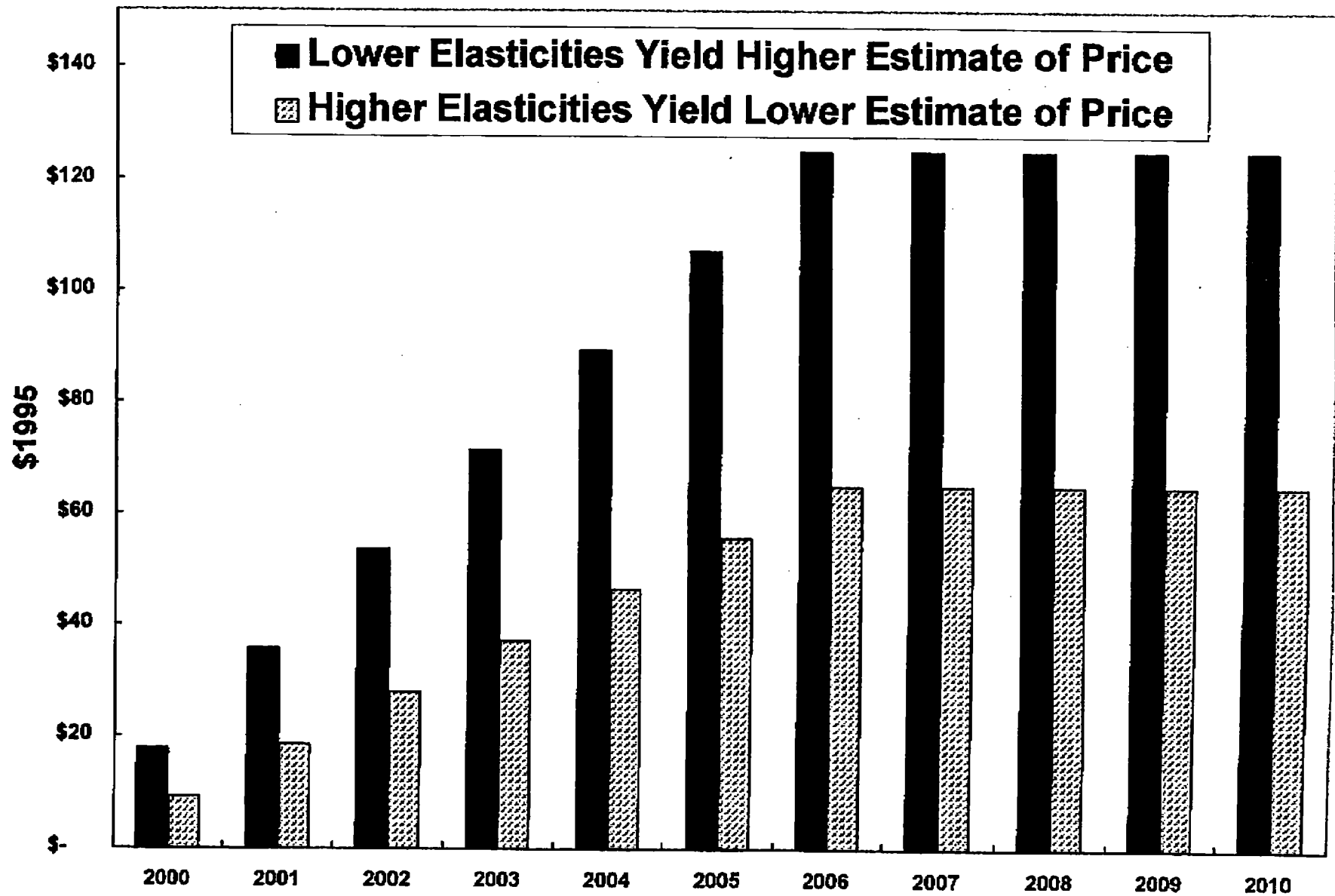
Analysis and assessment together constitute an evolutionary process that informs policy development. Together, these two functions account for the costs and benefits — both economic and environmental — associated with alternative policy strategies. Analysis provides a neutral picture of the range of possible outcomes that would result from implementation of alternative domestic and international policies. Assessment, by contrast, weighs the range of analytic results and identifies those that are most plausible. Policy development then formulates positions based on the conclusions of the assessment process.

The U.S. Government is presently focused on analysis — gathering the set of policy-relevant results from analysts inside and outside of the Government. The Analytic Workshop on June 6-7, 1996 is a significant milestone in the analytic phase, in that it will provide the U.S. Government an opportunity to hear more than 50 diverse presentations from a wide range of sources. Over time, the balance of U.S. Government activities will shift to a greater emphasis on

assessment, i.e., the consideration of which analytical results are most plausible and which should receive the most consideration in the policy development phase.

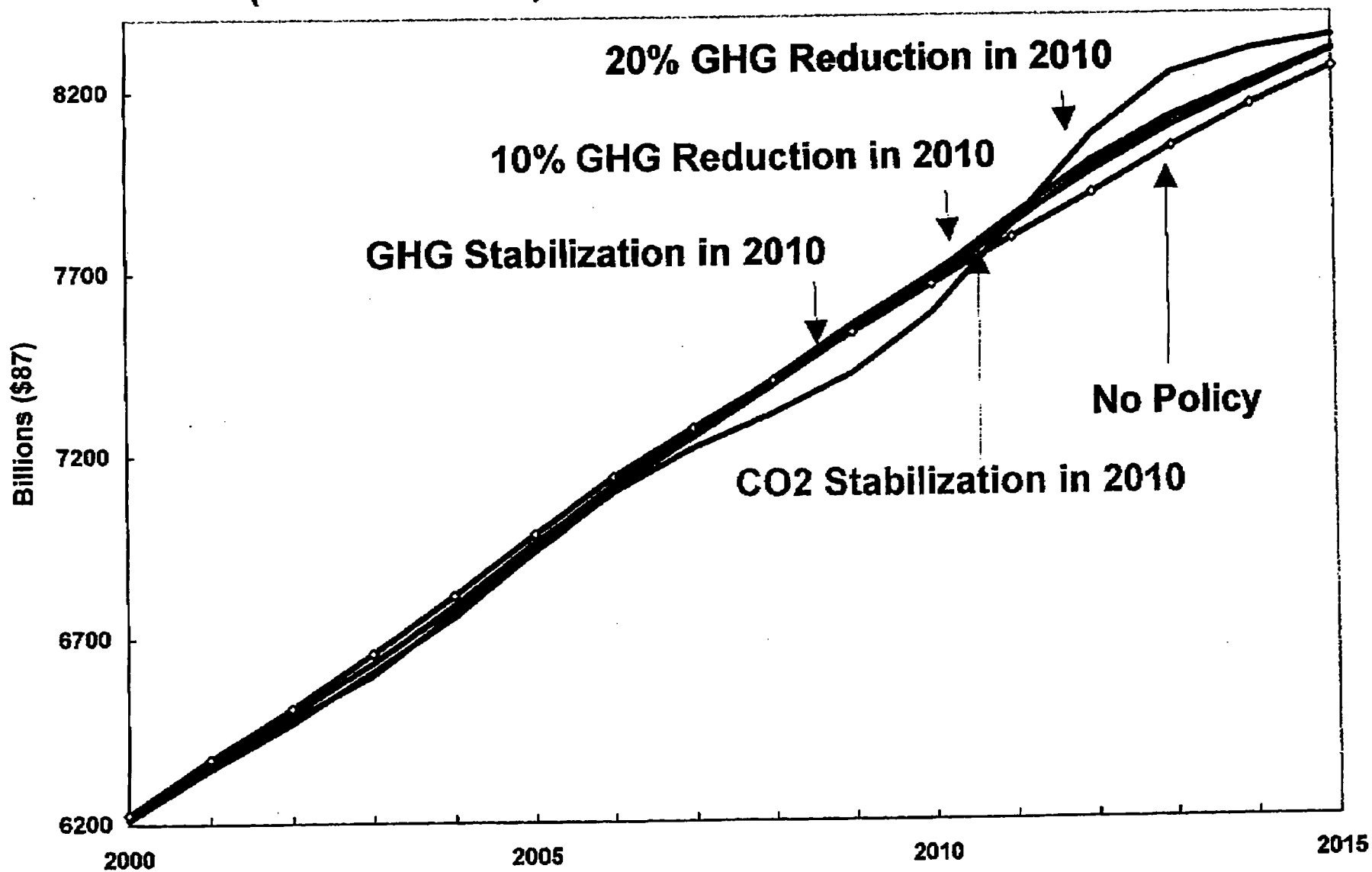
The U.S. Government recognizes the need for further refinement of its continuing analytic work. This paper marks the beginning, not the end, of a process of analysis, assessment and development of climate change response strategies. The U.S. Government intends to rely on a range of experts and stakeholders to provide high-quality input on the difficult analytical problems that must be resolved in order to craft a cost-effective and forceful policy capable of preventing dangerous human interference with the Earth's climate.

Permit Price Needed to Stabilize GHG Emissions in 2010



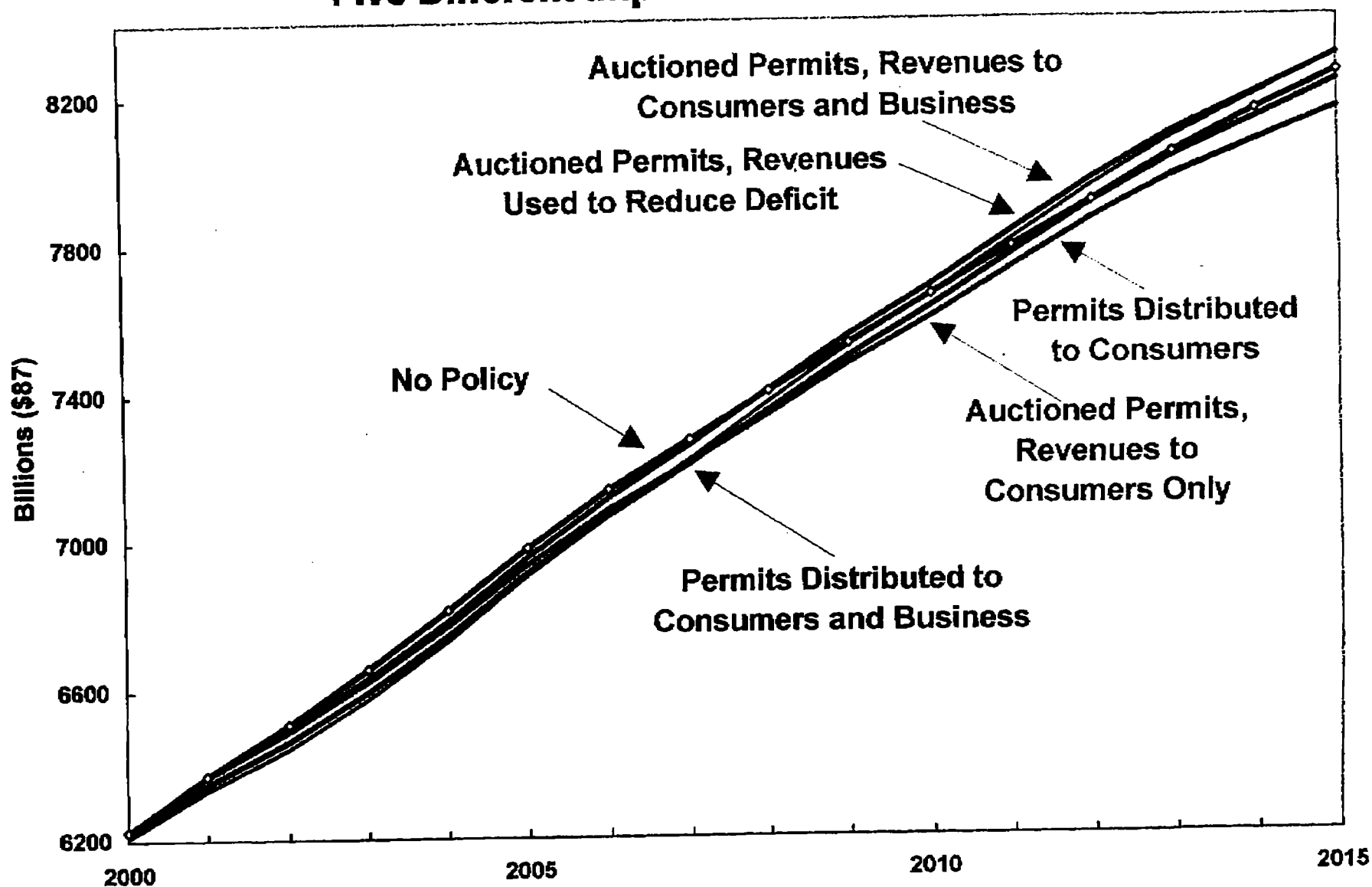
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GDP Impact of Different GHG Targets (Permit Auction, Consumer/Business Recycling)



GDP Impact of GHG Stabilization in 2010

Five Different Implementation Policies



GDP Impact of GHG Stabilization in 2010

Different Model Versions w/ Permit Auction, 60/40

