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cc: AHM
Gray

Global Climate Coalition
1275 K St. N.W.
Suite 890
Washington, D.C. 20005
Tel: 202.682.9161
Fax: 202.638.1043

July 23, 1997

The Honorable Janet L. Yellen, Chair
Council of Economic Advisers
Old Executive Office Building
17th Street and Pennsylvania Avenue, N.W.
Washington, D.C. 20500

Dear Janet:

I was very pleased to meet you and Jeffrey Frankel last week during the break in the Senate Environment Committee's hearing on climate change and enjoyed discussing informally some of the dynamics surrounding this complex issue. Thank you particularly for your interest in a more active and open dialogue with the Global Climate Coalition which has sought to persuade the Administration to integrate economic considerations and assessments into our international negotiating position. As I mentioned, the industries participating in the GCC do not oppose actions to address potential human-induced climate change. But that action should be calibrated to the state of scientific knowledge concerning climate change, the contribution of existing and near term technology and the capacity of our economy to achieve realistic emissions reductions while maintaining reasonable levels of growth.

I have enclosed for your information the GCC's letter to the President, sent immediately after his address on climate change to the United Nations last month. In addition, I have enclosed a recent letter to Dr. John H. Gibbons, Assistant to the President for Science and Technology, and a March 1996 letter to your predecessor, Laura Tyson. From these, you will see a consistency in our position regarding the need for policymaking that balances the real economic costs to our nation of any international commitment with the environmental and economic benefits we expect to realize.

I look forward to meeting with you in the near future and thank you again for inviting a dialogue.

Sincerely,

William F. O'Keefe, Chairman

Enclosures

cc: Mr. Jeffrey A. Frankel, Council of Economic Advisers


# GLOBAL CLIMATE COALITION

July 2, 1997

The Honorable William J. Clinton
President
The White House
1600 Pennsylvania Avenue, N.W.
Washington, DC 20502

Dear Mr. President:

On behalf of the more than 60 national business organizations that make up the Global Climate Coalition, I am writing to express our disappointment and concern about the direction of your global climate policy as you enunciated it at the United Nations last week. Your remarks indicate a belief that the science is conclusive on the existence of human-induced climate change. That impression is reinforced by your more recent remarks suggesting that some damaging climate events over the past four or five years have been the result of greenhouse gas emissions. Mr. President, we believe that you have been seriously misinformed about the state of knowledge on this subject.

A U.S. position in the UN climate negotiations premised on such conclusions is at odds with the body of scientific knowledge expressed in the Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and the views of established scientists that were published in the May 16 issue of the journal *Science*.

We agree that potential for human-induced climate change deserves serious attention. The Global Climate Coalition shares your view that a realistic policy is required and we have made suggestions that are likely to be supported by Congress and the American people. The United States has an enviable record of improving energy efficiency while leading the world in economic performance. Already U.S. industry has made significant progress in reducing the rate of emissions growth, largely through participation in Climate Action Plan programs initiated by your administration in 1993. We should not jeopardize our record of achievement by actions that are driven by political expediency rather than hardheaded analysis.

1331 Pennsylvania Avenue, NW • Suite 1500 - North Tower • Washington, DC 20004-1703
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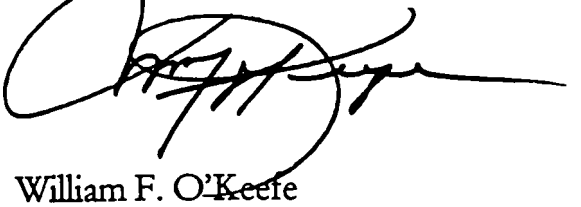
Any climate policy that is ultimately adopted will have global implications for decades to come. Therefore, it is imperative that there be a clear link to the scientific foundation that underpins it. Over the past few weeks eminent scientists have underscored the significant degree of uncertainty about the detection and attribution of climate change elucidated in the IPCC assessment. Indeed, recent modeled forecasts have not only reinforced the extent of uncertainty about the future changes in climate, but they also have revised downward the possible sea level rise and temperature increase in 2100 to perhaps as little as three inches and 1.5 degrees Celsius.

We believe that the most reasonable and defensible path forward will be guided by a U.S. policy that recognizes both the global and the long-term nature of the climate issue; recognizes that time properly used is an asset; and emphasizes investment in information to better inform policymakers of the costs and benefits associated with their decisions. Such a policy would increase research to reduce uncertainties; promote research and development of new technology; emphasize the diffusion of existing technology into developing countries; promote the economic turnover of our own capital stock; recognize different national circumstances; continue to promote voluntary initiatives to reduce greenhouse gas emissions; and balance greenhouse gas abatement activities with our national economic objectives.

You have expressed a desire to work with American business in addressing potential climate change. We stand ready to work to fashion a policy that will demonstrate both responsible action and protection of the nation's economic well being.

Yours truly,



William F. O'Keefe
Chairman

American Petroleum Institute

1220 L Street, Northwest
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William F. O'Keefe
Executive Vice President

June 10, 1997

Dr. John H. Gibbons
Assistant to the President
for Science and Technology Policy
424 Old Executive Office Building
17th and Pennsylvania Avenue, NW
Washington, D.C. 20504

Dear Dr. Gibbons:

As a result of our recent discussion of climate change at the German Embassy, I have re-reviewed the study, *Changing by Degrees*, by the Office of Technology Assessment. Further, I am told that *Changing by Degrees* has been one of the more influential engineering studies on the feasibility of curbing $CO_2$ emissions. Nonetheless, neither *Changing by Degrees* nor any of the other similar studies demonstrate that Americans can substantially curb their use of fossil fuels (and, hence, their emissions of $CO_2$) at negligible economic cost. The costs of such curbs, in fact, would be substantial.

Like other technology-based studies, *Changing by Degrees* attempts to show that Americans—both at work and at home—waste substantial amounts of energy. Also, like the other studies, it then simply takes it for granted that government representatives are wise enough and can implement the right policy tools to eliminate the alleged massive waste, and thereby cut carbon emissions at an economic cost approaching zero. Assuming such perfection in the political marketplace is quite a leap of faith.

If Americans really do waste vast amounts of energy, the implications would be enormous—extending far beyond energy and $CO_2$ emissions. *Changing by Degrees* presents findings that strongly imply that economic reasoning and evidence do not apply to energy markets, no matter how well they may explain behavior in other markets. Since the U.S. economy is and has been one of the most robust on the world stage, Americans *must* be using labor, capital and raw materials extraordinarily well to compensate for their alleged incompetence in using energy. But, if Americans know how to use other resources well, why do their intelligence and talents fail them when burning a gallon of gasoline or using a kilowatt of electricity? No engineering study to date has offered an answer for such inconsistent economic behavior—or even acknowledged this larger issue.

More specifically, *Changing by Degrees* projects that by 2015 the U.S. industrial sector will emit 556 million metric tons of carbon, and then asserts that the adoption of cost-effective practices would reduce those emissions by 17 percent. OTA offers no explanation why profit-seeking U.S. industrial firms literally throw away billions of dollars annually, year after year, on needless energy use in an era of "downsizing" and cost-cutting. Surely, this anomaly deserves recognition and an explanation.

Economist Dr. Robert Hahn, of the American Enterprise Institute and Carnegie-Mellon University, and who has published extensively on government regulation, observes that regulatory agencies often claim "that it would be in the interest of firms to adopt [the agencies' proposed] rules for purely economic reasons. Thus, the agencies effectively claim that firms are not maximizing profits without government intervention." Dr. Hahn concludes that "one must be skeptical" of such claims since "companies are in the business of making money, while the government is not."

Other findings in *Changing by Degrees* also raise important questions about the assumptions behind the study. For example:

- **What will be the consequences elsewhere in the economy if Americans start making the "correct" investments in energy-saving technology?** If Americans are not investing enough in energy-saving equipment, they must be spending too much money somewhere else. Dr. David Montgomery and his colleagues at Charles River Associates have found that, to finance the additional "cost effective" energy-saving investment, an implausibly large amount of money would have to be shifted away from other sorts of capital investment—thereby imposing substantial opportunity costs on the U.S. economy.

- **Why do consumers all make the *same* mistake: using too much energy?** Inherent human fallibility assures that it will never be cost-effective to attempt eliminating all mistakes—including all mistakes about energy use. However, while some mistakes are always to be expected, it is *not* realistic to believe that many millions of human beings will all make the *same* mistake—over and over again, decade after decade. Yet, this is what *Changing by Degrees* implies. Some people probably buy too much energy and others too little. As a consequence, total energy use in a world free of mistakes may not be that much different from what we observe in the real world. Furthermore, and most important, markets send signals and produce information. Why have not people learned from their mistakes and the pressures of competition?

- **How ~~well can~~ analysts measure the benefits and costs faced by energy users?** For instance, *Changing by Degrees* uses a discount rate of 7 percent to measure the cost of financing investments in energy-saving technologies. Since many (if not most) actual energy users use higher rates implicitly or explicitly in making investment decisions,

*Changing by Degrees* has undercounted the actual cost of making such investments and inferred "irrational" behavior when none may in fact exist. Furthermore, government intervention meant to improve energy efficiency will not change the financing costs faced by energy consumers. Also, OTA presumes that rational and cost-conscious energy users should expect higher energy prices. For instance, OTA assumes that the price of gasoline in 2015 will be $1.85 a gallon in 1987 dollars, or about $2.40 in 1995 dollars. It is interesting to note, however, that the U.S. Energy Information Administration's *Annual Energy Outlook: 1997* projects the average U.S. retail gasoline price in 2015 at $1.17 a gallon measured in 1995 dollars. Obviously, higher expected future energy prices make energy-saving technologies more attractive investments today—and OTA's projected price for 2015 is more than twice that of EIA. While I have no idea whether a gallon of gasoline in 2015 will cost $2.40, $1.17 or something else, neither do the authors of *Changing by Degrees*. I will simply state for the record that the dominant long-term trend for the price of gasoline (and other fossil fuels), adjusted for inflation, has been *downward* during the 20th century. I note, too, that proved world reserves of crude oil are at historic levels—representing nearly a half century of supply at current rates of consumption. In light of these facts, energy users—rational and cost-conscious—could be expecting lower future energy prices than the authors of *Changing by Degrees*.

In short, *Changing by Degrees* and other engineering studies raise provocative questions about energy use—and, indeed, about how capitalist economies function in general—that deserve further study. However, these studies do not show that we should junk mainstream economic reasoning or that a vast reservoir of "free" energy savings exists for enlightened government policies to tap.

Indeed, besides violating both reason and experience, promises of a "free lunch" invite people to give short shrift to the enormously important scientific and policy issue of potential climate change. Without a clear grasp of the basic economics, we cannot expect the political system to produce a comprehensive, flexible and cost-effective climate policy.

Sincerely,

William F. O'Keefe

American Petroleum Institute
1220 L Street, Northwest
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(202) 682-8300

William F. O'Keefe
Executive Vice President

March 20, 1996

The Honorable Laura D'Andrea Tyson
Assistant to the President for Economic Policy
The White House
2nd Floor, West Wing
Washington, D.C. 20500

Dear Dr. Tyson:

In response to your request at our meeting on March 6, I have attached an API list of "Additional U.S. Actions to Address Greenhouse Gas Emissions".

I hope these ideas stimulate further White House discussion of this complex issue and that industry can continue to contribute in a positive way to the domestic and international climate change policymaking process.

Please call me if you would like further elaboration or clarification of the attached list. I look forward to opportunities in the future to continue the dialogue on the climate policy issue.

Thank you.

Sincerely,

Enclosure

cc E. Holstein
E. Seidman
R. Brown

## Additional U.S. Actions to Address Greenhouse Gas Emissions

U.S. industry recognizes the legitimate concerns about the potential long-term effects of increasing greenhouse gas emissions on the Earth's climate system. Increased energy efficiency reduces greenhouse emissions and most companies have sought to improve energy efficiency--and lower costs--since the 1970s. The EOP Group, for example, reported in 1993 that the U.S. achieved a 30 percent reduction in total energy consumption per unit of GDP from 1970 to 1990.

More recently, companies have launched their own initiatives or joined in government/industry voluntary programs aimed at limiting carbon dioxide, methane and other fossil fuel emissions, both in response to the Framework Convention on Climate Change, which entered into force on March 21, 1994, and to the U.S. Climate Change Action Plan that was released in October 1993. To date, while overall results of industry's efforts are positive, the magnitude remains uncertain, both because the greenhouse gas programs are so new and because the federal reporting system does not capture all private sector actions.

Some have responded to this uncertainty and to statements that we face catastrophic consequences if emissions are not reduced promptly by proposing policies and measures that would mandate substantial near-term emission reductions. This strategy is inconsistent with the current state of climate science and with a growing body of economic analyses. Current proposals for near-term emission reductions would be extremely harmful to the U.S. economy, reducing output, costing jobs and placing U.S. industry at a competitive disadvantage. Moreover, the only way to achieve such reductions in a 10-15 year timeframe is by a large energy tax.

A more productive approach would include the following actions:

- o government and industry cooperatively identify and assess cost-effective, flexible voluntary programs;
- o a policy and investment environment that would be conducive to increased private investment in new technologies and processes;
- o impediments to the economic turnover of energy-inefficient capital stock should be identified, reviewed and modified or removed;
- o tax rules should be reviewed to explore the possibility of fostering greater investment in new energy-efficient R&D; and,

o an investment climate should be developed to encourage the export of U.S. energy-efficient technologies to developing nations.

The following list identifies several opportunities for government/industry cooperation.

## o Identify, Expand and Report Cost-Effective Near-Term Actions

- work with government to expand vehicle scrappage programs aimed at reducing emissions from older vehicles

- work with government officials to identify, assess and expand the most cost-effective programs within the U.S. Climate Change Action Plan

- ensure intellectual property rights and patents protection for climate change technologies and discoveries

- remove impediments to the voluntary reporting of company programs and public/private programs aimed at limiting emissions

## o Stabilize the Policymaking and Investment Environment

- focus funding of policy-relevant research on reducing major uncertainties about the climate system and on improving the accuracy of climate models, particularly with respect to possible regional impacts, and the role of oceans, clouds and water vapor

- encourage private investment in climate change research

- encourage corporations to include climate change considerations in their long-range business plans

## o Accelerate Capital Stock Turnover

- reduce corporate tax rate

- revise depreciation rules to remove any disincentives to the early retirement of energy-intensive equipment and facilities

- change regulations that now discourage capital stock turnover (e.g., Superfund and impediments in the Clean Air Act to new investments)

## o Stimulate Investment in Climate Change R&D

- explore the desirability of incentives aimed at increasing private sector R&D in energy-efficient technologies

- request the Treasury Department identify tax barriers that discourage investment in new energy-efficient R&D technologies and processes

- identify ways to encourage corporations to review current R&D plans and budgets and to consider enhancing investments in new energy-efficient technologies and processes

- explore ways to identify promising private technologies and whether accelerated commercialization would help limit greenhouse gas emissions

## o Strengthen Climate Change Technology Investment Abroad

- take steps to remove "additionality" as a criteria for "Joint Implementation" activities

- work with international bodies to broaden "sovereign risk insurance" to cover political and other risks to foreign direct investment in technologies aimed at reducing greenhouse gas emissions

- examine export restrictions to see if any unnecessarily constrain the export of U.S. climate technologies

- work with foreign governments to increase direct investment opportunities in a way that provides an opportunity to earn an adequate return on investment

- protect intellectual property rights and patents on technologies transferred

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

THE CHAIRMAN

Statement before the
Senate Committee on Environment and Public Works
Dr. Janet Yellen
Chair, Council of Economic Advisers
Thursday, July 17, 1997

Good afternoon, Mr. Chairman and members of the Committee. I appreciate the opportunity to discuss with you today the economics of global climate change.

## Introduction

In his speech to the United Nations Special Session on Environment and Development in June, President Clinton emphasized that the risks posed by global climate change are real and that sensible preventive steps are justified. This assessment accords with the views of the more than 2300 economists, including 8 Nobel laureates, who signed a statement supporting measures to reduce the threat of climate change. The economists endorsed the conclusions from last year's report by the Intergovernmental Panel on Climate Change (IPCC), which said that governments should take steps to reduce the threat of damage from global warming, and went on to argue that market-based policies can slow climate change without harming the American economy.

At this time the Administration has not settled on a particular set of new policies to reduce greenhouse gas emissions. Instead, the President indicated in his U.N. speech that he intends to engage in a discussion with all interested parties about the problems posed by greenhouse gas accumulations and the costs and benefits of corrective action. To this end, the President will hold a White House conference on climate change later this year, and Members of his Cabinet and other senior Administration officials will meet with Members of Congress, scientific and economic experts, environmentalists, local government officials, and business and labor leaders on a regular basis over the next several months to discuss issues related to climate change. This process is intended to inform the Administration's decision-making process, which will culminate in a U.S. policy position in the international negotiations in Kyoto in December of this year.

An important step in this -- and any -- policy process is determining the impact it will have on the American economy. President Clinton's top priority, since his first days in office, has been revitalizing the U.S. economy, creating jobs and investing in people and technology to enhance long-term growth. And, we have made tremendous progress. The President is not going to jeopardize that progress. Any policy he ultimately endorses on climate change will be informed by his commitment to sustaining a healthy and robust economy.

In my testimony today, I would like to describe some of the principal lessons that emerge from the voluminous literature, much of it relatively recent, on the economic impacts of policies to address global climate change.

**Underlying Uncertainties**

Before I begin my discussion of the economic literature, I would like first to acknowledge the uncertainties associated with estimating both the costs and benefits of reducing greenhouse gas emissions. To provide some perspective: as you all know, it is difficult to gauge exactly what impact the balanced budget agreement will have on the U.S. economy's growth rate, levels of employment, interest rates and consumption over the next five years. But with global climate change, it is orders of magnitude more difficult to gauge the effects on the economy: we are concerned with not just the next five years and not just the American economy, but, rather, we are dealing with economic and physical processes that operate globally and over decades, if not centuries.

Although a great many scientists believe that global climate change is already underway, the more serious potential damages associated with increasing concentrations of greenhouse gases are not predicted to occur for decades. This means that the benefits of climate protection are very difficult to quantify. And, while the potential costs of reducing greenhouse gas emissions may be more immediate, they too, as I will discuss below, are difficult to predict with any certainty. Many unanswered questions exist about the biophysical systems, potential thresholds, and economic impacts. In short, if anybody tells you that he or she has the definitive answer as to the costs and benefits of particular climate change policies, I would suggest that you raise your collective eyebrows.

**Lessons from the Economic Literature**

Let me now turn to the economic literature and try to summarize what I think we know so far about this difficult topic. Most economists have not addressed the benefits of climate protection, but rather have focused on the costs associated with alternative paths for reducing greenhouse gas emissions. The economic literature includes estimates using many different models to evaluate numerous alternative emission reduction strategies. In fact, because there are so many different models, economists initially faced difficulties in comparing results: they could not sort out the extent to which differences in results stemmed from differences in models and assumptions versus differences in baseline emission paths and policies. To solve this problem, thereby enabling meaningful comparisons, many economists have calibrated the various models by performing a standardized simulation. Specifically, they have assessed the consequences of stabilizing greenhouse gas emissions at 1990 levels by 2010 or 2020.

Within the Administration, a staff level working group -- the Interagency Analysis Team (IAT) -- has attempted to estimate some of the economic implications of climate change policies. They took the emissions scenario most often used in academic literature -- that is, stabilizing

emissions at 1990 levels by 2010 -- as the starting point for their own analysis. I would emphasize that this scenario is not Administration policy; instead, it was picked to make comparisons with other models easier. The staff group employed 3 different models -- the DRI model, the Second Generation Model (SGM) and Markal-Macro model, all commonly available in the public sphere. In running these models, the staff adopted a common baseline and, to the maximum extent possible, similar economic assumptions. This modeling effort produced some useful lessons, but as we found from the peer reviewers' comments, it also suffered from some serious shortcomings. Both the lessons and the shortcomings point to one clear conclusion: the effort to develop a model or set of models that can give us a definitive answer as to the economic impacts of a given climate change policy is futile. Rather, we are left with a set of parameters and relationships that influence estimates of the impacts. In my view, it is more productive to employ a broad set of economic tools to analyze policy options than to seek to develop a single definitive model.

I understand that a draft of the staff analysis was given to the Committee earlier this week, along with the reviewers' comments. I would be happy to answer any questions you may have about this modeling effort.

**The Lessons.** Modeling efforts both inside and outside the Administration clearly indicate that economic analysis can do no more than estimate a range of potential impacts from particular policies and highlight how outcomes depend on underlying assumptions about how the economy works and the ways in which policy is implemented. However, the economics literature on climate change does point to several important lessons:

**How the economy works.** First, the magnitude of the costs of reducing greenhouse gas emissions in the various models depends crucially on a number of key assumptions about how the economy works. For instance:

- If firms in the economy can shift from high-carbon to low-carbon energy sources quickly, the costs of climate protection will be lower.
- If the economy has significant opportunities, even now, to employ energy-saving technology at low costs, the costs of climate protection will be lower.
- If technological change occurs at a rapid rate, or is highly responsive to increases in the price of carbon emissions, the costs of climate protection will be reduced.
- If the Federal Reserve pursues a monetary policy oriented toward keeping the economy at full employment, transitional output costs will be lower.

In short, the greater the substitution possibilities and the faster the economy can adapt, the lower the costs.

**How the plan is implemented.** Second, costs depend critically on how emission reduction policies are implemented. It boils down to this: if we do it dumb, it could cost a lot, but if we do it smart, it will cost much less and indeed could produce net benefits in the long run. The over 2300 signatories of the economists' statement argued that any

global climate change policy should be rely on market-based mechanisms. Such mechanisms allow for flexibility in both the timing and location of emission reductions, thereby minimizing the costs to the U.S. economy. The economists concluded that "there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run."

- The speed at which emissions reductions are required can have large effects on the estimated costs. It is important to allow sufficient lead-time for orderly investment in new equipment and technology. Alternatively, if emission reduction requirements are too far off in the future, the incentives to adopt energy efficient technologies are weakened because people may not view the policy as credible.
- A "cap and trade" system in which emission permits are issued and then traded among firms can substantially reduce the cost of meeting an emissions target by creating incentives for emissions to be reduced by those firms and in those activities where costs are lowest.
- International emission permit trading substantially lowers costs by applying the same cost-minimizing principle globally.
- So-called "banking" and "borrowing" of permits increases flexibility and lowers costs by allowing firms to change the timing of their emission reductions.
- Joint implementation, whereby US firms would receive credit for undertaking emission reductions in countries with low abatement costs, would also lower the domestic burden.

An additional aspect of implementation that profoundly affects the costs of reducing emissions concerns "revenue recycling." In many model simulations, emissions are reduced by using various market mechanisms. For many of these scenarios, the Federal government realizes an increase in revenues. Economic growth can receive a long-term boost if these revenues are used to reduce distortionary taxes that diminish the incentives to invest, save or work, or if the revenues are channeled into deficit reduction, thereby lowering interest rates and boosting investment. In fact, in some models and scenarios, emissions reduction generates a net economic benefit when the revenues are recycled in a growth-promoting fashion.

**Which countries participate.** The third lesson that emerges from a study of the economics of climate protection is that developing, as well as developed, countries must be part of the process. While developed countries are responsible for most of the greenhouse gas currently in the atmosphere, developing countries are starting to catch up. By 2040, the largest fraction of emissions is estimated to come from developing countries. Thus, any comprehensive plan to deal with this global problem must include a mechanism to bring developing countries into the process.

The timetable for the inclusion of developing countries is also important. The sooner that developing countries face incentives to move away from carbon intensive energy sources,

the less likely it is that they will become dependent on those types of fuels to spur their economic growth. In short, global problems require global solutions. We must find the technologies and solutions to lead the way.

**Conclusion**

Let me conclude. Policies to promote economic growth, create jobs, and improve the living standards and opportunities of all Americans have been and always will remain the top priority of the President and his Administration. In his remarks to the Business Roundtable on global climate change, the President said "[l]et's find a way to preserve the environment, to meet our international responsibilities, to meet our responsibilities to our children, and grow the economy at the same time."

Some of the key economic lessons we have learned that will help us achieve the President's goal include:

- Inherent uncertainty dictates that models should be expected to generate only a range of economic impacts, not definitive answers.
- Key assumptions about how the economy works directly influence the estimated costs of climate protection.
- Implementation of any policy needs to be market-based and flexible over time and space to achieve the lowest cost reductions.
- All nations, both developed and developing, need to participate.

Thank you. I would be happy to answer any questions you may have.

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

THE CHAIRMAN

Statement before the House Commerce Subcommittee on Energy and Power

Dr. Janet Yellen

Chair, Council of Economic Advisers

Tuesday, July 15, 1997

Good afternoon, Mr. Chairman and members of the Subcommittee. I appreciate the opportunity to discuss with you today the economics of global climate change.

**Introduction**

In his speech to the United Nations Special Session on Environment and Development in June, President Clinton emphasized that the risks posed by global climate change are real and that sensible preventive steps are justified. This assessment accords with the views of the more than 2300 economists, including 8 Nobel laureates, who signed a statement supporting measures to reduce the threat of climate change. The economists endorsed the conclusions from last year's report by the Intergovernmental Panel on Climate Change (IPCC), which said that governments should take steps to reduce the threat of damage from global warming, and went on to argue that market-based policies can slow climate change without harming the American economy.

At this time the Administration has not settled on a particular set of new policies to reduce greenhouse gas emissions. Instead, the President indicated in his U.N. speech that he intends to engage in a discussion with all interested parties about the problems posed by

greenhouse gas accumulations and the costs and benefits of corrective action. To this end, the President will hold a White House conference on climate change later this year, and Members of his Cabinet and other senior Administration officials will meet with Members of Congress, scientific and economic experts, environmentalists, local government officials, and business and labor leaders on a regular basis over the next several months to discuss issues related to climate change. This process is intended to inform the Administration's decision-making process, which will culminate in a U.S. policy position in the international negotiations in Kyoto in December of this year.

An important step in this -- and any -- policy process is determining the impact it will have on the American economy. President Clinton's top priority, since his first days in office, has been revitalizing the U.S. economy, creating jobs and investing in people and technology to enhance long-term growth. And, we have made tremendous progress. The President is not going to jeopardize that progress. Any policy he ultimately endorses on climate change will be informed by his commitment to sustaining a healthy and robust economy.

In my testimony today, I would like to describe some of the principal lessons that emerge from the voluminous literature, much of it relatively recent, on the economic impacts of policies to address global climate change.

**Underlying Uncertainties**

Before I begin my discussion of the economic literature, I would like first to acknowledge the uncertainties associated with estimating both the costs and benefits of reducing greenhouse gas emissions. To provide some perspective: as you all know, it is difficult to gauge exactly what impact the balanced budget agreement will have on the U.S. economy's growth rate, levels of employment, interest rates and consumption over the next five years. But with global climate change, it is orders of magnitude more difficult to gauge the effects on the economy: we are concerned with not just the next five years and not just the American economy, but, rather, we are dealing with economic and physical processes that operate globally and over decades, if not centuries.

Although a great many scientists believe that global climate change is already underway, the more serious potential damages associated with increasing concentrations of greenhouse gases are not predicted to occur for decades. This means that the benefits of climate protection are very difficult to quantify. And, while the potential costs of reducing greenhouse gas emissions may be more immediate, they too, as I will discuss below, are difficult to predict with any certainty. Many unanswered questions exist about the biophysical systems, potential thresholds, and economic impacts. In short, if anybody tells you that he or she has the definitive answer as to the costs and benefits of particular climate change policies, I would suggest that you raise your collective eyebrows.

**Lessons from the Economic Literature**

Let me now turn to the economic literature and try to summarize what I think we know so far about this difficult topic. Most economists have not addressed the benefits of climate protection, but rather have focused on the costs associated with alternative paths for reducing greenhouse gas emissions. The economic literature includes estimates using many different models to evaluate numerous alternative emission reduction strategies. In fact, because there are so many different models, economists initially faced difficulties in comparing results: they could not sort out the extent to which differences in results stemmed from differences in models and assumptions versus differences in baseline emission paths and policies. To solve this problem, thereby enabling meaningful comparisons, many economists have calibrated the various models by performing a standardized simulation. Specifically, they have assessed the consequences of stabilizing greenhouse gas emissions at 1990 levels by 2010 or 2020.

Within the Administration, a staff level working group -- the Interagency Analysis Team (IAT) -- has attempted to estimate some of the economic implications of climate change policies. They took the emissions scenario most often used in academic literature -- that is, stabilizing emissions at 1990 levels by 2010 -- as the starting point for their own analysis. I would emphasize that this scenario is not Administration policy; instead, it was picked to make comparisons with other models easier. The staff group employed 3 different models -- the DRI model, the Second Generation Model (SGM) and Markal-Macro model, all commonly available in the public sphere. In running these models, the staff adopted a common baseline and, to the maximum extent possible, similar economic assumptions. This modeling effort produced some

useful lessons, but as we found from the peer reviewers' comments, it also suffered from some serious shortcomings. Both the lessons and the shortcomings point to one clear conclusion: the effort to develop a model or set of models that can give us a definitive answer as to the economic impacts of a given climate change policy is futile. Rather, we are left with a set of parameters and relationships that influence estimates of the impacts. In my view, it is more productive to employ a broad set of economic tools to analyze policy options than to seek to develop a single definitive model.

I understand that a draft of the staff analysis was given to the Subcommittee this morning, along with the reviewers' comments. I would be happy to answer any questions you may have about this modeling effort.

**The Lessons**. Modeling efforts both inside and outside the Administration clearly indicate that economic analysis can do no more than estimate a range of potential impacts from particular policies and highlight how outcomes depend on underlying assumptions about how the economy works and the ways in which policy is implemented. However, the economics literature on climate change does point to several important lessons:

**How the economy works.** First, the magnitude of the costs of reducing greenhouse gas emissions in the various models depends crucially on a number of key assumptions about how the economy works. For instance:

- If firms in the economy can shift from high-carbon to low-carbon energy sources quickly, the costs of climate protection will be lower.
- If the economy has significant opportunities, even now, to employ energy-saving technology at low costs, the costs of climate protection will be lower.
- If technological change occurs at a rapid rate, or is highly responsive to increases in the price of carbon emissions, the costs of climate protection will be reduced.
- If the Federal Reserve pursues a monetary policy oriented toward keeping the economy at full employment, transitional output costs will be lower.

In short, the greater the substitution possibilities and the faster the economy can adapt, the lower the costs.

**How the plan is implemented.** Second, costs depend critically on how emission reduction policies are implemented. It boils down to this: if we do it dumb, it could cost a lot, but if we do it smart, it will cost much less and indeed could produce net benefits in the long run. The over 2300 signatories of the economists' statement argued that any global climate change policy should be rely on market-based mechanisms. Such mechanisms allow for flexibility in both the timing and location of emission reductions, thereby minimizing the costs to the U.S. economy. The economists concluded that "there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run."

- The speed at which emissions reductions are required can have large effects on the estimated costs. It is important to allow sufficient lead-time for orderly investment in new equipment and technology. Alternatively, if emission reduction requirements are too far off in the future, the incentives to adopt energy efficient technologies are weakened because people may not view the policy as credible.
- A "cap and trade" system in which emission permits are issued and then traded among firms can substantially reduce the cost of meeting an emissions target by creating incentives for emissions to be reduced by those firms and in those activities where costs are lowest.
- International emission permit trading substantially lowers costs by applying the same cost-minimizing principle globally.
- So-called "banking" and "borrowing" of permits increases flexibility and lowers costs by allowing firms to change the timing of their emission reductions.
- Joint implementation, whereby US firms would receive credit for undertaking emission reductions in countries with low abatement costs, would also lower the domestic burden.

An additional aspect of implementation that profoundly affects the costs of reducing emissions concerns "revenue recycling." In many model simulations, emissions are reduced by using various market mechanisms. For many of these scenarios, the Federal government realizes an increase in revenues. Economic growth can receive a

long-term boost if these revenues are used to reduce distortionary taxes that diminish the incentives to invest, save or work, or if the revenues are channeled into deficit reduction, thereby lowering interest rates and boosting investment. In fact, in some models and scenarios, emissions reduction generates a net economic benefit when the revenues are recycled in a growth-promoting fashion.

**Which countries participate.** The third lesson that emerges from a study of the economics of climate protection is that developing, as well as developed, countries must be part of the process. While developed countries are responsible for most of the greenhouse gas currently in the atmosphere, developing countries are starting to catch up. By 2040, the largest fraction of emissions is estimated to come from developing countries. Thus, any comprehensive plan to deal with this global problem must include a mechanism to bring developing countries into the process.

The timetable for the inclusion of developing countries is also important. The sooner that developing countries face incentives to move away from carbon intensive energy sources, the less likely it is that they will become dependent on those types of fuels to spur their economic growth. In short, global problems require global solutions. We must find the technologies and solutions to lead the way.

**Conclusion**

Let me conclude. Policies to promote economic growth, create jobs, and improve the living standards and opportunities of all Americans have been and always will remain the top priority of the President and his Administration. In his remarks to the Business Roundtable on global climate change, the President said "[l]et's find a way to preserve the environment, to meet our international responsibilities, to meet our responsibilities to our children, and grow the economy at the same time."

Some of the key economic lessons we have learned that will help us achieve the President's goal include:

- Inherent uncertainty dictates that models should be expected to generate only a range of economic impacts, not definitive answers.
- Key assumptions about how the economy works directly influence the estimated costs of climate protection.
- Implementation of any policy needs to be market-based and flexible over time and space to achieve the lowest cost reductions.
- All nations, both developed and developing, need to participate.

Thank you. I would be happy to answer any questions you may have.

GROUNDS FOR 01/17/97
1) flexible, market based approaches
2) technological innovation
3) renewable targets + timetables

## RESPONSE TO IAT

While some worthwhile insights have emerged from the staff level analysis, the results in this document do not constitute an Administration forecast. I have tried to summarize the things we learned that have some general validity--they concern the importance of flexibility in the design of any climate change mitigation policy. The numbers in this document have some utility, but they are limited. We found out that flexibility really has the potential to mitigate the economic effects of any policy we would propose. But we do not have a policy, and we recognize that it is futile to rely on any single model or even any small group of models for economic analysis of climate change policy.

As we work to develop a policy, we will rely on the advice of experts in a variety of fields and use a broad range of economic tools of analysis.

It is utterly futile to try to perfect a model.

## WHAT WAS THE PURPOSE OF THE IAT EXERCISE?

I believe that Under Secretary Ehrlich and the staff were trying to facilitate communication among the staff of the various agencies with capabilities in the energy modeling area. These staff engaged in a useful exercise in which they were able to see why they were arriving at different answers with different models. To the maximum extent possible, the different staff chose a standardized set of economic assumptions and baseline forecasts and were able to run their models and compare results. By choosing a rather standard policy exercise, the staff were able to compare their own approaches with those of outside researchers.

We wanted to get a sense of what the value would be of having flexibility in the various proposals. And we found it that it matters a lot--this justifies the U.S. approach in emphasizing flexibility.

Some may have hoped that this exercise would arrive at a good forecast for use in Administration policymaking but there were also, as I understand it, many skeptics of the project.

## DOES THE IAT ANALYSIS REPRESENT THE ADMINISTRATIONS' POSITION?

No. It is useful staff work but does not represent the views of the Principals. The models used are not the Administration's models.

## IS THIS THE BEST EFFORT THAT CAN BE DONE?

No. There is no best to be achieved. It is just futile to try to get a best estimate of any economic impact. We ended up recognizing the same things as every other researcher in this field--the morals I have tried to summarize in my testimony.

Modelling gives a misleading sense of certainty. It relies on assumptions that are untested and

assumed to hold over decades. The models just are not robust enough to be a definitive guidepost for policy. At the end of the day, we will need to use good judgement. To reach a policy decision we will use all of the tools of economic analysis and make what we think is a sensible policy judgement.

**WHAT CRITERIA WILL THE PRESIDENT USE IN EVALUATING A PROPOSED POLICY?**

Does it begin to address the problem – is it sensible.

Some believe that climate change is not an established scientific fact and that no policy actions are justified now to address it. Others argue that climate change is so serious that we should make large policy changes to address it immediately. The President has made it clear that he believes the science is clear ~~with respect to policy change~~, that the risks are real, and we should address it now. But he endorses a practical, pragmatic, sensible approach that will put us on the right road without damaging the economy.

The President has made the economy his top priority since day one on the job and he continues to consider it the top priority. This President will not endorse policies that would damage the economy. Growth and job creation are key goals and he has a record of success which he is not about to damage.

He agrees with the 2000 economists who argued that there are sensible policies that can address climate change without damaging the economy and he will be judging policies in reference to that standard.

We don't have a policy. The President will engage people in this issue to find out what's best.

**WHY ACT NOW? WHY NOT WAIT?**

The science is clear. It is prudent to begin to address the risks and to create incentives for improvements over time. We need to make a credible commitment now to induce the appropriate private sector investments and to achieve a global solution.

**THE IAT MODEL SAYS THAT ADDRESSING CLIMATE CHANGE COULD RESULT IN GDP LOSSES BETWEEN .2 - 1.0% AND JOB LOSSES OF 900,000.**

Those estimates come from one model with one very special set of assumptions about Federal Reserve policy and are transitory losses. The losses refer to a policy we have not proposed and use a model we would not endorse which received criticism from the reviewers.

There are certainly people who would advocate proposals that would hurt people to deal with climate change just like there are those who want to do nothing. The President wants a sensible policy that will not harm the economy but he has also indicated that the process of climate change, left unattended, will also cause harm and that we should begin to address that now.

Some would do a lot
Some would do nothing
We will try to do something sensible.

**WON'T THIS BE HARD ON THE POOR?**

The President is not about to endorse a set of policies that will harm America's families. He will have to be satisfied that any package of policies is good for hardworking families. But remember, this is an important problem. If we con't address it, it will also hurt the poor.
It is really premature to be discussing policy options and impacts. Everything depends on the package of policies we adopt and how they are implemented and on the assumptions one makes about how the economy makes.

One thing I can say is that we have concluded that market mechanisms are important and will lower the impact of policies we might adopt.

**ARE YOU CONSIDERING A TAX HIKE?**

1. POTUS has just proposed to cut taxes while balancing the budget. He is committed to cutting taxes to help hardworking families trying to raise children and send their kids to college.

2. He certainly doesn't want to raise taxes.

3. Modellers and outsiders analyzing climate change policy sometimes focus on options that could result in revenue increases, but most consider revenue neutral policies to be a natural baseline.

4. At this point, I don't think we should be ruling anything in or out at all with respect to climate change. We have no policy position.

**DON'T YOU HAVE TO HAVE HIGHER ENERGY PRICES TO SOLVE THIS PROBLEM?**

Climate change is a long term problem and to solve it, we will have to figure out how to reduce our dependence on fossil fuels. We need a technological fix. That will require new technologies and signals to the private sector to undertake the kinds of investments necessary to reduce that reliance and develop new technologies.

Certainly, many would suggest market policies that impact the price of carbon as part of the solution to this problem. Technology and R&D can go a certain way alone. However, the large numbers that you see in the staff report are based on models that are not official Administration models and have been criticized and on policies that are not Administration policy. Moreover, the implied price change depends dramatically on how policy is implemented--whether it is implemented flexibly or not.

**AUTOMOBILES:** The President emphasized in his speech at the U.N. that a program to address climate change would create opportunities for the private sector and not just costs. Autos are a case in point. I believe there are opportunities for us to work with the auto industry in a partnership to develop a new generation of fuel-efficient vehicles that will be good for the industry and good for the environment. The President cares enormously about jobs and there have been over 100,000 new jobs in the automobile industry over the last four years.

**COAL:** The President's top priority is jobs. He is not about to propose the kind of radical policies that are sometimes suggessted. He will look for a sensible policy. He is focused on jobs.

**DEVELOPING COUNTRIES:**

1. Yes, LDCS must be in.
2. The U.S. pushed this strongly.
3. Developing countries must be part of the solution.

Nobody can be allowed to evade their responsibilities on this critical issue. Clearly, POTUS would not want to see industry move off shore. That would not help redcuce CO2 in the environment and it would harm American jobs. As we look at policies, this is a very important criterial. We don't think it makes economic or environmental sense to have that happen. We don't have a policy position, so it is really premature to address the issue.

Remeber, we have 4% of the world's population and emit over 20% of the GHGs. We have a responsibility hear. We need to take it on and show leadership. But the developing countries also need to be involved.

**WHY NOT JUST ADAPT RATHER THAN PREVENT?**

An ounce of prevention is worth a pound of cure. Climate change can have very harmful side effects. Remember that about 1/3 of the U.S. population lives near the coastline.

# Draft Q&A on the IAT Report
## July 15, 1997

**Q: What is the Interagency Analytical Team?**

**A:** When the Administration evaluates possible policies, it normally sets up a variety of staff-level working groups to inform the principals' discussions. The Interagency Analytical Team (IAT) was one such group -- an informal group of modelers from various agencies in the Federal government who conducted a preliminary analysis of various *hypothetical* emissions reduction policies. Once the relevant principals reviewed the work and the peer review comments on it, it was decided that further activity would be futile because of the difficulty of developing a model or set of models that can give us a definitive answer as to the economic impacts of a given climate change policy. Professional and policy judgement will always be necessary.

**Q: What is the Interagency Analytical Team (IAT) Report?**

**A:** The staff-level Interagency Analytical Team wrote a report of their early results from modeling a few emissions reduction policies that are widely examined in the literature. I should emphasize that the scenarios examined were not and are not Administration policy; instead, they were picked to make comparisons with other models easier.

The working group's draft report, which was released on July 15, summarizes the preliminary results of the team's modeling effort. That modeling effort produced some useful lessons, but -- as illustrated by comments from peer reviewers -- it also suffered from some serious shortcomings. As Chairman Yellen emphasized in her testimony on July 15, the lessons and the shortcomings of the exercise point to one clear conclusion: the effort to develop a model or set of models that can give us a definitive answer as to the economic impacts of a given climate change policy is futile. Rather, we are left with a set of parameters and relationships that influence estimates of the impacts. As she indicated, it is more productive to employ a broad set of economic tools to analyze policy options, than to seek to develop a single definitive model.

[I would refer any more technical questions about the draft report to Chairman Yellen.]

**Q: Why was the release of the Interagency Analytical Team (IAT) report delayed?**

**A:** After the staff-level working group received comments from peer reviewers of the draft report, and after the relevant principals reviewed the draft report and the comments, it became apparent that it was futile to refine the modeling process further -- that it would be more productive to employ a broad set of economic tools

to analyze policy options, rather than seeking to develop a single definitive model. After the decision had been made that further refinement of the econometric analysis would be futile, the draft report was issued on July 15.

[I would refer any more technical questions about the draft report to Chairman Yellen.]

**Q: The Interagency Analytical Team (IAT) draft report indicates that energy prices will rise markedly as a result of the Administration's climate change policies. Are substantial price increases necessary to reduce greenhouse gas emissions?**

**A:** First, let me emphasize that the Administration has not settled on any climate change policies. The results generated in the staff report suggest that policies to reduce emissions to 1990 levels by 2010 -- which is a common metric, and not necessarily the Administration's policy -- tend to rely on price signals that call forth new technologies and induce fuel switching. However, even within that hypothetical scenario, the staff results also suggest that various assumptions have the potential to substantially change the outcomes. For example, more flexible implementation plans, more rapid development and deployment of technology, and more pro-investment fiscal policy all act to mitigate any upward pressure on prices.

[I would refer any more technical questions about the draft report to Chairman Yellen.]

**Q: The Interagency Analytical Team (IAT) report indicate that economic growth will slow markedly as a result of the Administration's climate change policies. Must economic growth suffer to reduce greenhouse gas emissions?**

**A:** First, let me emphasize that the Administration has not settled on any climate change policies. The results generated in the staff report suggest that reducing emissions to 1990 levels by 2010 -- which is a common metric, and not necessarily the Administration's policy -- tend to leave economic growth rates somewhat below baseline levels in the medium term. However, even within that hypothetical scenario, the staff results also suggest that the particular policies relied on have the potential to substantially change the outcomes -- with more flexible implementation plans (including international emissions permit trading), more rapid development and deployment of technology, and more pro-investment fiscal policy all acting to mitigate any reduction in growth rates.

[I would refer any more technical questions about the draft report to Chairman Yellen.]

**Q: The Interagency Analytical Team (IAT) report indicates significant job losses will occur as a result of the Administration's climate change policies. Must American workers suffer to reduce greenhouse gas emissions?**

**A:** First, let me emphasize that the Administration has not settled on any climate change policies. The results generated in the staff report suggest that policies to reduce emissions to 1990 levels by 2010 -- which is a common metric, and not necessarily the Administration's policy -- tend to leave employment growth somewhat lower than it would otherwise be the case. However, even within that

hypothetical scenario, the staff results also suggest that the particular policies relied on have the potential to substantially change the outcomes -- with more flexible implementation plans (including international emissions permit trading), more rapid development and deployment of technology, and more pro-investment fiscal policy all acting to attenuate any impact on overall employment.

[I would refer any more technical questions about the draft report to Chairman Yellen.]

**Q&A for Global Climate Change**
from meeting in Janet's Office
15 July 1997

**Answers**

*Decide what you want to say*

1. This is a potential long-term problem
2. Requires: a change in consumption patterns
   a change in production patterns
   a technological fix
3. Price signals are needed
4. Many ways to send price signals
5. The President is exploring all the different options

*Don't let them get you to say what you do not want to say. Therefore, frame the answer to bridge to your message:*

- A "what if" question: "I don't answer hypothetical questions....it depends on..."

- A #s question:

  A. "In the middle" approach
     1. Some want to take such stringent response
     2. Others want to take much less action
     3. The President wants a sensible policy because job creation and economic growth has been and remains his top priority

  B. "Qualitative not quantitative"--"glad to discuss how the think about that issue"

- A tax question:

  The 1-2-3 response
  1. President--cut taxes in balanced budget deal
  2. President clearly does not want to increase taxes
  3. People outside the Administration who think about increasing taxes usually explore a revenue neutral plan
  4. The right approach is to consider all the options

**Questions**

1. Ev Ehrlich, former Undersecretary at Commerce, ran the IAT--do you consider him staff?

   Dr. Ehrlich was asked to coordinate an interagency effort at the staff level so as to achieve a standardized baseline and a common set of assumptions.

2. Why was this exercise started and who authorized?

   Although I wasn't here when this all started, it is my impression that the IAT was started so as to provide directional information on the effectiveness of flexible policy options.

3. Yes or no: Are you now distancing yourself for the IAT?

   The IAT is one attempt to understand the directional impacts of climate change, and many other modeling efforts exist outside the Administration that attempt to do the same directional analysis. Sound economic judgement requires input from many sources.

4. Is the IAT the best the Administration can do?

   GCC is too big and too uncertain for any one modeling effort. The President will base his decision on the best information available.

5. If the science is so uncertain, why is the Administration dumping this policy on the American people?

6. When this policy is decided, when will you give us some information on the impact on the economy?

   The Administration will use the best tools and minds to get good economic analysis to understand the impacts of any policy. Sound economic judgement will help guide the President's decision.

7. These are Administration policies that have big projected impacts--how can you justify this?

Some people out there who might make these proposals; other people have argue for less significant changes. The President will take a sensible approach to this problem. His Administration's top priority has been and will continue to be economic growth and job creation.

8. If GDP goes down by 2%, what happens to the personal income of African-Americans?

It is not useful to try and answer hypothetical questions. It depends: Some people have made strong proposals; others have argue for less significant changes. The President will take a sensible approach to this problem. His Administration's top priority has been and will continue to be economic growth and job creation.

9. How can you contemplate a policy that will raise the price of energy--a policy that punishes the poorest citizens on a wild goose chase?

The President believes that GCC is an issue. But no policy has been decided on yet. The President has set the wheels in motion to begin engaging in a dialogue with the American people to understand

10. Are you considering raising taxes--yes or no?

The President is very committed to cutting taxes in his balanced budget proposal. Clearly he is not interested in raising taxes. Those out there who propose tax increase usually talk about a revenue neutral plan. But the President has not made a decision yet.

11. Can you make a commitment today that the Administration will not raise taxes?

We are not proposing policies, we are looking at everything. The President is very committed to cutting taxes in his balanced budget proposal. Clearly he is not interested in raising taxes. Those out there who propose tax increase usually talk about a revenue neutral plan. But the President has not made a decision yet.

12. What about taxes on carbon-intensive energy? How can the Administration avoid an increase in the price of energy?

This is a potential long term problem. It will require a change in consumption patterns. Price signals are an important tool to help make these changes. Many ways exists to send a price signal. Flexibility, technology, R&D in any policy are key factors to help send these price signals. We are not proposing policies, we are

looking at everything.

13. A Dingle question: There will be a negative impact on the coal sector and the automobile industry. What are you going to do about the hard-working people put out of work in the automobile industry because of the Administration's policy?

Some people out there who might make these proposals; other people have argue for less significant changes. The President will take a sensible approach to this problem. His Administration's top priority has been and will continue to be economic growth and job creation.

14. What will be done for the workers in the coal industry who lose their job because of climate change policy?

Some people out there who might make these proposals; other people have argue for less significant changes. The President will take a sensible approach to this problem. His Administration's top priority has been and will continue to be economic growth and job creation.

Flexibility is a key to keeping costs low.

15. Will the Administration be exploring any transition policies?

The President has not yet made a decision on any policy.

16. You praised the letter of the 2300 economists. Professor Jorgenson signed that letter; and he also testified last week that the best policy was to start with a $5 tax that rises up to a $10 tax. Does this sound like a good policy?

Some economists out there who might make these proposals; others have argued for more significant changes. The President will take a sensible approach to this problem. His Administration's top priority has been and will continue to be economic growth and job creation. All options are being considered.

17. Should developing countries sign a binding emission agreement too?

Developing countries are an important part of any GCC treaty. The US has pushed this point stronger than any other nation.

Pass to Tim Wirth

18. Won't this treaty without developing countries just push US industry off-shore?

The President's top priority has been job creation and economic growth. It does not make any sense, economically or environmentally, to shift carbon emissions elsewhere.

19. Is the developing country issue a deal-breaker in Kyoto?

Pass to Tim Wirth

Q&A for Climate Change Hearings
7/14/97

IAT Questions:

**Models:**

Under-Secretary of State Wirth stated at the June 19 hearing before the Senate Foreign Relations Committee: "These are the same models [IAT models] that were very wrong about what happened with the energy bump up in pricing after the Arab Oil Boycott of 1972. They were the same models that, for the most part, were very wrong about the cost of the Clean Air Act." Why should we base our policy on models that have a track record of being "very wrong"?

> I would not characterize these models as being "very wrong". These models have provided and continue to provide useful information on how the economy operates, especially when government implements new policy. While the models may not pinpoint the exact state of the economy 15-25 years into the future, they do provide a reasonable range of the state of the economy. Further, they illustrate how different sectors and different energy inputs vary through time with policy implementation.

If one model cannot fully describe the effects of climate policy on the economy, then why 3? Why not 4 or 5, or 16 (as in the Repetto and Duncan analysis)?

> The IAT selected the 3 models it did because the strengths of each one compensates for weaknesses in the others. The IAT process was designed to provide policy-makers with economic information on the effects of climate policy. The process did not necessitate an assessment with every available economic model in existence. The IAT process is another useful set of information that complements the existing economic literature on climate change.

The panel of reviewers of the draft of the IAT report made several significant criticisms of this process. Regarding the selection of the models, do you share their concerns about them? Specifically, do the models insufficiently address international trade? If they cannot capture international trade well, then how can we estimate the effects of climate policy on competitiveness?

> Every model has a weakness, and in the case of the models used in the IAT process, none of them do a good job of describing the international trade implications of climate policy. Economists, both within the government and in the private sector, continue to conduct research on this issue. The key to minimizing negative impacts to U.S. competitiveness is ensuring that a climate change agreement requires non-annex I countries to participate in emissions reductions.

Do you have faith in the assumptions used in creating the baseline projection? Should there be more than one baseline so that we have a range of possible predictions? Is the baseline sensitive to the assumptions that oil and gas prices will rise in the future (even though they have been declining thus far this decade)? What about new discoveries of fossil fuel reserves that can push down prices of these energy sources even more (and result in higher costs for a carbon constraint)?

> Any forecasting exercise involves a large set of uncertainties, as I mentioned in my opening statement. Our efforts to assess the economic impacts can provide us with information on the range of costs, but cannot give a definitive answer. Drawing from the economic literature and further analyses on the sensitivity of these assumptions can assist in improving our confidence in the range of estimates we generate for policy-makers.

**Benefits:**

What are the benefits of preventing climate change estimated by the IAT models? If there are no estimates of benefits, how do we know what we are getting with these expensive policies? If the state of the science and the economics is insufficient to generate estimates on benefits, doesn't that imply that we don't know enough about the problem to enact costly policy measures?

> The benefits of climate policy have not been quantitatively assessed in this process, in large part because of the uncertainties in the biophysical and economic responses to climate change. However, the benefits from reducing the risk of climate change are significant enough to warrant the statement by 2000 economists in support of cost-effective climate policy.

**GDP:**

Some of the studies on this issue indicate that climate change policy might actually increase U.S. GDP. How can this be? If there are great win-win technologies already in existence, why hasn't the private sector already adopted them? Isn't the Administration's Climate Change Action Plan supposed to encourage voluntary adoption of these energy efficiency technologies?

> Some of these "win-win" technologies aren't fully adopted in part because of the bias in favor of low energy costs (for example, by subsidizing coal and hydro power and ignoring the environmental costs such as carbon dioxide emissions). The Climate Change Action Plan does attempt to encourage the adoption of these technologies, but low funding levels have prevented the program from being more successful.

Based on the three models used in the IAT analysis, it is difficult to determine if the hypothetical climate policy subsumed in the analysis will lead to an increase or a decrease in GDP over the baseline by 2020? The DRI model yields results that the economy under climate policy would be 0.3% larger in 2020, while the economy is about 0.2% smaller than baseline with the SGM model, and the Markal-Macro model generates estimates that the economy would be about 0.6% smaller under climate policy in 2020 than otherwise. The report notes that these values should serve as brackets about a reasonable range. However, this range is much smaller than the one provided in the Repetto and Duncan (WRI) analysis (about 2% gain to 2% loss in 2020). Why should an analysis of 3 models generate a more reliable range than an analysis of 16 models?

> The report is correcting in using these point estimates simply as markers of a range of expected responses by the economy to climate policy. The more broad range in the Repetto and Duncan analysis represents greater variation in assumptions than the IAT analysis. Several of their low estimates of losses in GDP reflect assumptions not considered by the IAT (such as no low-cost substitute for fossil fuel energy, inefficient economic responses, and no joint implementation). Several of their high estimates of gains in GDP include other assumptions not considered by the IAT (such as averted air pollution damages and climate change damages). It should be noted then that the IAT range is fairly consistent with the Repetto and Duncan analysis.

The DRI model indicates that consumer expenditures fall below baseline and do not at anytime reach baseline. The report notes that consumer expenditures are "closer to consumer 'welfare' than total GDP". Doesn't this mean that individual consumers will be made worse off under climate policy, even if we do have a positive effect on GDP? Should the appropriate evaluation of policy then be based on GDP or consumer expenditures?

> IAT reports most modeling results in terms of GDP. This is consistent with most economic analysis on climate change where researchers have estimated the effects of emissions reductions on economic output. Further, providing only information on consumption misses the larger picture that includes potentially substantial increases in investment. To paint a fuller picture of the effects of climate change, however, both consumption and GDP results should be provided to inform policy-makers.

**Revenue Recycling:**

Do some of these gains in GDP reflect revenue recycling? Is the argument for revenue recycling unique to climate change? Isn't it just a reflection of the more basic idea that the economy would improve if government removed more distorting taxes and replaced them with less distorting taxes?

> Many of the modeling efforts use economic instruments that increase federal revenues. Effectively targeting these revenues, towards deficit reduction or cuts in income or investment taxes, can help the economy grow. While this is not unique to climate change, it is important in considering the implementation of climate change policy.

The IAT analysis assumes that the revenues from a permit auction would go towards deficit reduction. How would the results change if the revenues financed a tax cut? Or additional government spending?

> The economic literature indicates that revenue recycling that targets investments better stimulates economic growth than alternative recycling strategies. Therefore, revenue recycling through deficit reduction, which has the effect of reducing the real interest rate, or through tax cuts for investments are likely to generate more economic growth than other forms of recycling.

The IAT analysis assumes that by using the revenues from an auction of carbon permits to reduce the deficit, the real interest rate will fall and thereby stimulate investment. How far will it fall?

> How far the real interest rate falls depends on how the Federal Reserve Board interprets the economic conditions after the implementation of climate policy. The decision about whether or not to employ revenue recycling and the method of recycling used are very important. Different revenue recycling approaches can affect the inflation rate and the unemployment rate differently, yielding different responses by the Federal Reserve. IAT analysis found that climate policy with recycling through deficit reduction resulted in almost a 2% fall in the real federal funds rate relative to the base case.

If we allocate permits to existing emitters of carbon dioxide instead of auctioning them, what will be the economic impacts? The IAT analysis indicates that the economy under climate policy will be larger by 2012 than it would have been under baseline conditions with this grandfathering of permits. The reviewers doubt that this is plausible. In fact, grandfathering of permits appears to outperform an auction with revenues used to reduce the deficit and any auction with revenues used to reduce personal income taxes. Should we grandfather permits?

> As you note, the reviewers questioned the likelihood that grandfathering could be that effective. On issues as important as permit allocation, we will do a careful and comprehensive assessment of the economics literature to ensure that any mechanism the administration supports can achieve our emissions goals cost-effectively.

**Announcement Effect:**

Could you explain this "announcement effect" phenomenon described in the IAT Report? The reviewers of the report appeared to be skeptical of the impact and magnitude of this effect.

> The announcement effect implies that announcing a policy to curb carbon dioxide emissions in the future will provide a stimulus for the private sector to invest in R&D and smoothen the transition to climate policy. The reviewers differed on what the appropriate rate of gains in energy efficiency should be resulting from this effect, and recommended that future analyses assess a range of values.

Why would an agreement in Kyoto increase the diffusion of technologies at a faster rate through the "announcement effect", but the President's Climate Change Action Plan, the primary purpose of which is to increase technology diffusion, apparently does not have this effect in the IAT modeling?

> The IAT modelers could make this assumption for two reasons. First, the Climate Change Action Plan includes a set of voluntary actions for the private sector to take. Since these are voluntary, they may not generate the same kind of incentive as a mandatory cap-and-trade program. Second, the announcement effect is weakened for circumstances where the private sector discounts the likelihood of the policy actually being implemented. In this case, the low levels of funding for CCAP may make the private sector hesitant to invest in energy efficiency technologies.

How sensitive are the results to the assumption on the improvements in energy efficiency and the "announcement effect"?

> For climate policy, the costs of achieving emissions reductions are sensitive to the diffusion of energy efficiency technologies. The size of the announcement effect in the analysis affects the results generated by the models. The IAT tested two values for the announcement effect, and based on the recommendations by the peer reviewers, we will cast a wider net across the economic literature to identify the impacts of different announcement effects.

Couldn't an announcement result in higher emissions prior to implementing the announced climate policy than under a baseline scenario with no announcement?

> Private firms undertake behavior to maximize their profits. Under the baseline scenario, firms are assumed to be producing at an optimal level. This question assumes then that under the announcement, but prior to policy implementation, firms would find it optimal to increase carbon emissions. Since the announcement generates expectations of higher prices in the future, firms are likely to invest in energy efficiency R&D. It is not likely that they would pump up emissions prior to policy implementation, unless the government implemented a grandfathering permit allocation scheme that rewarded that kind of behavior.

Do the models account for the opportunity costs of investing in energy efficiency? The reviewers believe that the models do an inadequate job of representing these costs.

> The reviewers made some valid comments on the capacity of these models to account for the opportunity costs of capital. The IAT process is simply another piece of knowledge on the economics of climate change. On issues such as this, we will incorporate some of the pool of knowledge to complement our understanding of the potential effects of climate policy.

If this "announcement effect" is supposed to increase the rate of diffusion of energy efficient technology, then shouldn't investment expenditures parallel this faster diffusion rate? If so, then why is investment under climate policy lower than baseline investment between 2000 and 2005?

> By instituting a climate policy, there will be a short period of time for the economy to make the transition to energy efficiency. Since there will be real costs, the economy will actually contract. During this period, investment falls below the expected baseline investment level. However, the surge in investment after this transition period brings the economy to well above the expected GDP under baseline in the later years.

**Energy Prices:**

Why do the models yield such different results? DRI estimates that in 2010 the price of carbon will be $95 per ton while Markal-Macro estimates that the price will be $145 per ton. Interestingly, DRI estimates the price of carbon will increase through 2020, while Markal-Macro estimates that the price will decrease through 2020.

> These models vary in their results because they model how the economy works in different manners. By providing a set of estimates from several models that employ different assumption about the opportunities for substitutions, investments in energy efficiency, and the effects on business activity generates a reasonable range of information for policy-makers.

The IAT analysis estimates the price of carbon to be about $100 per ton in 2010. The report notes that this will have the effect of raising gasoline prices by 26 cents per gallon, natural gas by $1.50 per thousand cubic feet, and electricity by 2 cents per kilowatt hour. These are very substantial price hikes. How will they affect businesses? Consumers?

> The exact value can vary based on the assumptions used. Other simulations by the IAT found that the price of carbon could be as low as $9 per ton with annex I country trading and joint implementation with non-annex I countries. How businesses and consumers are affected depends on the magnitude of the price increase. We do know that businesses and consumers will adapt to changes in the price, by investing in more energy efficient technology for example, thereby mitigating the effects of higher carbon prices.

How will the higher energy prices affect lower income households? Won't these prices translate into higher heating costs and higher food bills, and make life tougher for households just trying to make ends meet?

> This depends on the extent of higher prices. Research by several economists have found that the burden of higher energy prices does not fall disproportionately on lower income households. Adaptive behavior by industry, by making substitutions in their production of goods, and investing in energy efficiency, can minimize the costs of higher energy prices.

Why do two models (SGM and Markal-Macro) estimate that climate policy will increase natural gas consumption in 2010, while DRI has natural gas consumption falling more than 15%?

> This is a result of how different models model the nature of the economy. Some economic models assume that the prices for renewable energy sources will become competitive and utilities will substitute them for coal and natural gas. Other models do not assume that substitution can occur that quickly.

Based on the IAT analysis, how much of the reductions will be achieved by cutting coal emissions? How will this affect the coal-producing states? What kinds of job losses are predicted?

> Estimates on the reductions based on cutting coal emissions range between 50-80% of all carbon dioxide reductions. Again, this range is broad because of the uncertainties associated with how businesses and individuals adapt to a new set of economic incentives. Employment values in the IAT report assumed no international trading -- with trading, they would likely be lower. Mining employment in the west-south central region will decrease by about 15,000 in 2010, or 6% of its total mining employment. The east-south central region will lose about 8,000 mining jobs in 2010, or 22% of its total mining employment. It should be noted that regions that can support production in goods and services that take advantage of the need for improvements in energy efficiency could experience gains in employment.

Based on the IAT analysis, how much of the reductions will be achieved by cutting car emissions? How will this affect the price of gasoline and the price of cars? What kinds of job dislocations does the IAT predict?

> It should be noted that two counteracting influences affect the impacts of climate policy on transportation. Higher energy prices can negatively impact transportation by increasing variable costs of transport, while lower interest rates can positively impact transportation by increasing capital investments. The IAT analysis indicates that these lower interest rates actually increase automobile production by 2.2% in 2010 over the baseline scenario. This illustrates again the importance of effective revenue recycling.

**Employment:**

The DRI model indicates that the unemployment rate is higher under climate policy than under the baseline assumption of no-policy for all but 3 years between 2000 and 2020. How many jobs will be lost because of this policy?

> Given the uncertainties in the modeling, it is more important to consider employment effects in terms of a range. DRI estimates in 2010 a drop in employment of 400,000, assuming no international trade. With international trade, the costs of implementing a climate policy drop significantly, and the effects on employment would be lessened.

**International Cooperation/Non-Annex I**

Some economic analyses indicate that attempting to stabilize U.S. emissions by 2010 without stabilization assurances by non-annex I countries is worse than doing nothing. Why should we then implement an expensive climate policy?

> To achieve the goals of a global climate policy and to minimize the costs of such a policy, non-annex I countries must participate. As I noted before, "any comprehensive plan to deal with this global problem must include a mechanism to bring developing countries into the process."

**Flexibility**

What does the IAT analysis tell us about the value of emissions budgets?

> The IAT analysis did not focus on the effect of emissions budgets. We do know from other economic analyses that emissions budgets can increase the flexibility of climate policy and lower the costs to the economy.

Q. The Administration is planning to implement a climate change agreement which would require developed countries to reduce emissions, but not require developing countries to do so. Won't this agreement negatively affect the international competitiveness of U.S. industry?

A. Work that the U.S. government has commissioned by DRI, a private consulting firm, suggests that the international competitiveness implications for U.S. economy will be slight. DRI estimates that only 1% of all U.S. industrial sector energy use (and emissions) will shift overseas as a result of the agreement. The degree to which particular industry is vulnerable to overseas competition will depend upon (1) its energy intensiveness (2) the degree to which it is in direct competition with imports from countries not likely to be subject to our binding targets for emissions and (3) whether the particular U.S. industry exports to countries not subject to the agreement.

For most industries, either (a) energy is not a large fraction of their costs, or (b) the industries do not have direct competitive pressure on their products. However, there may be particular industries that will be more adversely affected.

# ARGONNE REPORT Q'S AND A'S

Q1. WHAT WAS THE PURPOSE OF THIS STUDY?

A1. The purpose of this study was to explore the possible effects of a set of hypothetical fuel price increases on six energy-intensive industries that are subject to significant foreign competition:

- basic chemicals;
- iron and steel;
- petroleum refining;
- paper and allied products;
- aluminum; and
- cement.

Panels of industry representatives and experts from academia, environmental groups, organized labor, the financial community, and government were asked to assume a projection of energy price increases that incorporated specific assumptions about the energy price effects of a postulated climate change agreement, and reflect on the possible industry responses. Panels for each of the industries met to discuss the possible impacts on industry output, employment, energy usage, technology, costs, prices, imports, and exports.

Q2. WHAT DID THE PANELISTS FIND?

A2. Overall, the participants reported negative impacts on the six industries under the assumed energy price increases. Panelists predicted that the industries would experience reductions in output and employment from the projected baseline levels.

Less-developed countries, which were assumed in the workshops not to adopt binding commitments to lower greenhouse gas emissions in the timeframe considered, would capture an increasing share of the respective markets. Some industries would locate new plants in the less developed countries, and some would increase the utilization of existing production facilities already located in these areas.

Q3. WHAT IS THE DEPARTMENT'S RESPONSE TO THIS INPUT FROM INDUSTRIAL EXPERTS?

A3. The workshops provided valuable information that reinforced the need to pursue sensible climate change policies. The negative conclusions expressed by the participants and summarized in this report are predicated on the specific energy price scenarios assumed in mid-1996, which do not reflect key policies advocated in international negotiations by the Clinton administration in the intervening year. For example, the assumed fuel price

scenarios do not take into account the impact of multi-year emissions budgets, international emission trading, and joint implementation. If adopted, these provisions would lower the costs of achieving emission reductions in the U.S. and other developed countries and would significantly lower the energy price increases assumed in the workshop scenarios. The Administration has also argued that the developing countries should assume additional obligations in the near future to reduce the projected rapid growth of greenhouse gas emissions. No such actions were reflected in the workshop scenarios.

The environmental and socio-economic issues surrounding the stabilization of greenhouse gas emissions have been the subject of considerable debate, but are especially sensitive now as participating nations are engaged in a new round of negotiations for further commitments within the Framework Convention on Climate Change that will conclude in December of 1997 in Kyoto, Japan. The U.S. position taken in these negotiations stresses that international agreements to combat the threat of climate change must be flexible, cost-effective, realistic, achievable, and ultimately global in scope.

By examining scenarios that do not reflect such policies, the workshops identified important economic risks in key industrial sectors that reaffirm the wisdom of the U.S. approach.

Q4. HOW DOES THIS VERSION OF THE REPORT COMPARE TO THE EARLIER (DRAFT) PAPER BY SUTHERLAND?

A4. A draft paper providing a personal interpretation of the workshops was circulated prior to completion of this report by an individual employee of Argonne National Laboratory. That paper was apparently prepared in advance of the participants' review of the workshop summaries and prior to the lead authors' completion of the revised focus papers based on comments received at the workshops. The Argonne report issued this week provides an accurate and complete summary of the workshop findings.

Q5. DOESN'T THIS REPORT UNDERCUT THE ADMINISTRATION'S POSITION ON CLIMATE CHANGE?

A5. No. Rather, it highlights the need for flexibility in implementing emissions reduction and the need to engage developing countries in the process of emissions reduction. Flexibility, including emissions trading, joint implementation, and multi-year emissions budgets and provisions to ensure the future participation of developing countries in binding emissions reductions are central elements of the Administration's climate change strategy.

Q6. HOW DOES THIS STUDY RELATE TO DOE'S INITIATIVES TO INCREASE INDUSTRIAL ENERGY EFFICIENCY?

A6. The study is unrelated to the activities of the Department's Office of Industrial Technologies, which is actively cooperating with many of these industries to achieve dramatically improved energy efficiency. Success of these efforts has the potential to improve the competitiveness of U.S. producers while reducing their energy use and greenhouse gas emissions. Increased energy efficiency also makes U.S. producers less sensitive to the adverse effects of any future energy price increases, regardless of their source.

Q7. WHAT WAS THE BASIS FOR THE PRICE SCENARIOS ASSUMED, AND HOW DO THEY COMPARE TO THE PRICE SCENARIOS BEING USED FOR THE INTERAGENCY ANALYSIS TEAM WORK?

A7. The hypothetical fuel price scenarios used in this project are within the range suggested by analyses presented at the inter-agency Climate Change Analysis Workshop held at Springfield, Virginia in June, 1996. These analyses were preliminary in nature and did not incorporate cost-saving features currently included in the U.S. negotiating position such as emissions trading, joint implementation, and multi-year emission budgets. The industry workshop participants did not assume any complementary technology-oriented policy measures, nor were they asked to consider price scenarios which included ameliorative policy measures that could offset the impact of energy price increases on industry.

Q8. WHAT IS THE BASELINE STATUS OF THESE INDUSTRIES IN THE ABSENCE OF CLIMATE POLICY?

A8. In many of these industries, recent U.S. investment has been in the form of refurbishing existing plants rather than building new "greenfield" plants. Even without the assumed fuel price increases, countries with lower costs for energy and other inputs or more rapidly growing demands may be more attractive than the U.S. as sites for new greenfield plants.

Q9. HOW IMPORTANT ARE DEVELOPING COUNTRY COMMITMENTS TO THE LONG RUN RESULTS?

A9. The Administration has argued that developing countries should assume additional obligations in the near future to reduce growth in their GHG emissions. While developed countries now account for the lion's share of emissions, developing country emissions are projected to grow rapidly. The potential for shifting production of energy-intensive products to developing countries identified in the Argonne report would exacerbate emissions growth. It will not be possible to achieve the long run objective of the Climate Convention without substantial

emissions reductions by developing countries. Their commitment to such reductions, which were not reflected in the workshop scenarios, would be likely to significantly reduce the potential for shifts in industry location identified at the workshops.

It is likely that energy-intensive industries in other developed countries would be subject to similar challenges as their U.S. counterparts under the energy price increase scenarios developed for this study. Energy -intensive industries in other Annex I would also benefit from the cost-reducing flexibility provisions included in the U.S. proposal, and from an approach that assures developing country participation in emissions reductions will occur in the near future.

Q10. DOESN'T THIS REPORT PROVE SENATOR BYRD'S POINT THAT ENTERING INTO INTERNATIONAL AGREEMENTS WITHOUT THE FULL PARTICIPATION OF DEVELOPING COUNTRIES WOULD BE RUINOUS TO THE U.S. ECONOMY?

A10. The panelists felt that if less-developed countries did not adopt binding commitments to lower greenhouse gas emissions, they would capture an increasing share of the markets. The current Administration position, which was not reflected in the energy price scenarios considered by the panelists in mid-1996, is that developing countries should assume additional obligations in the near future to reduce the projected rapid growth of greenhouse gas emissions.

Q11. WHY DID IT TAKE THE DEPARTMENT SO LONG TO RELEASE THIS REPORT? WEREN'T THESE WORKSHOPS HELD OVER A YEAR AGO?

A11. The participants at the workshops focused their discussions around an initial draft of an expert author's paper. The expert authors then revised and clarified their papers over the following months in response to the panelists suggestions. Summaries of both the papers and the workshop proceedings were then forwarded to all participants for their review and to confirm that the workshop summary provided an accurate characterization of the workshop discussions.

Q12. THIS REPORT SHOWS HOW SOME INDUSTRIES WOULD BE HURT BY LARGE ENERGY PRICE INCREASES. WOULDN'T SOME INDUSTRIES, LIKE COMPACT FLUORESCENT BULB MANUFACTURERS, ACTUALLY BE HELPED? HOW COME THEY WERE NOT INCLUDED IN THE STUDY?

A12. The study focused on energy-intensive industries in order to develop information that would help in assessing the validity of the existing approaches to modeling the impacts of regime changes on energy use in the industrial sector, which accounts for over 1/3 of total U.S. energy use. The industries considered in this study account for over 80 percent of energy use in manufacturing. An understanding of the forces driving production decisions in these sectors is critical to comprehending and projecting the implications of alternative policy scenarios for the national energy market, a primary function of the Policy Office. Identifying changes in the relative performance of different economic sectors is also important. A second phase of our effort, which is now ongoing, is examining those industries that might benefit from higher energy prices.

Friendly questions

Q. Why are you and 2000 other economists optimistic that we can address climate change without hurting our economy?

A. The cornerstones of smart climate change policy are:

--market based approaches (such as emissions trading) that will result in the most economically efficient response
--technological innovation
--reasonable targets and timetables

Q. What is the role of technology in mitigating climate change?

A. As President Clinton stated at the United Nations, if we can channel the ingenuity of American industry, academia and government labs to work on solving this problem, this could become an economic opportunity rather than a burden. Our goal in developing a specific proposal will be to allow for adequate lead time to avoid costly capital stock retirements and to allow for the development of alternative technologies that can reduce the costs of compliance.

Our partnership with the U.S. automakers is a good example of what we hope to be able to achieve through technological progress. The goal of the Parnership for a New Generation of Vehicles is to achieve three times today's fuel efficiency without increasing costs or sacrificing safety. If successful, this one technological program would go a long way toward reducing greenhouse gas emissions.

Q. Are we sure market-based approaches can work?

A. Yes. The acid rain program under the Clean Air Act is just one of many examples of how we can reconcile our economic and environmental goals and reduce pollution at the lowest possible cost. Under the acid rain program, we have an excellent record of early compliance, low costs, and an active emissions trading market.

Q. What targets and timetables are reasonable?

A. The Administration has not yet decided, although it has decided that the targets and timetables advocated by the European Community are not reasonable. The Administration will be engaging in internal and external discussions over the next several months before finalizing our position on targets and timetables.

Q. What is the potential role of nuclear power in addressing climate change?

A. Nuclear power faces enormous challenges including the waste disposal question, and whether new plants can be economically competitive, particularly as a deregulated electric utility industry will be less favorable to capital-intensive technologies.

However, nuclear power is playing a role in mitigating greenhouse gas emissions now. It is a zero-carbon-emitting technology that provides 22% of our electric generation. Improvements in reliability and availability of nuclear plants have been reducing, and can continue to reduce greenhouse gas emissions. In fact, a significant fraction of the utility industry's voluntary greenhouse gas reductions under the Department of Energy's voluntary programs come from nuclear power plant improvements.

Most analysts believe that these plants will retire over the next few decades and be replaced by new gas-fired generation, resulting in some increase in greenhouse gas emissions. DOE recently began an initiative designed to resolve technical issues around extending the lives of these plants. This program could contribute to greenhouse gas reductions.

Q. Senator Byrd and 64 other Senators have expressed concern that U.S. competitiveness will be badly damaged by a climate treaty that requires developed countries only--and not developing countries--to reduce greenhouse gas emissions. In addition, the recently released Argonne study shows a devastating impact on U.S. energy-intensive industries. What is your view of the competitiveness implications of the current U.S. policy?

A. First of all, let me say that there is a much greater difference between the U.S. negotiating position and the rest of the world than there is between the Administration and Senator Byrd. We agree that developing countries have to be part of the solution to the problem of climate change. We believe that the U.S. must lead, and that the developing countries must follow. The U.S. negotiating position is that (1) we should go first and (2) there should be an agreement on a date certain by which developing countries would agree to negotiations for them to take on binding obligations.

The Argonne study assumed that developing countries never take on obligations. This is not the U.S. position. The Argonne study assumed no international trading. That is not the U.S. position. The Argonne study assumed no technological advances in energy efficiency. That is not the U.S. position.

The Administration believes that addressing climate change will result in both impacts and opportunities. In general, we believe that with the help of smart policies and American ingenuity, we can minimize the impacts and maximize the opportunities.

We need to do more work on the competitiveness question, but my view of this problem is more sanguine than what is reflected in the Argonne report. First of all, energy prices are only one of many factors that affect competitiveness. And the energy price changes that might occur under a climate change mitigation policy are small compared to the differences that now exist between nations.

Secondly, most of our trade is with other Annex I countries, who would have similar obligations to us. Thirdly, there are trends affecting our basic industries which are much bigger than climate change. After shakeouts in the past decades, our competitive position in many of these industries is solid, based on the utilization of existing world class facilities. However, there is a trend of locating new facilities overseas due to a host of factors which have nothing to do with climate change.

Finally, technological innovation is the key to maintaining competitiveness, and American industry has demonstrated again and again that it has an enormous ability to innovate. Thus I believe that our energy intensive industries will respond to the challenge of climate change with innovation rather than movement offshore.

Q: Several of the peer reviewers were highly critical of the Administration's analysis. Some argued that the models selected were inappropriate, that our treatment of technology was biased, and that we failed to adequately consider issues related to international trade impacts. What is your response on these issues and what changes do you intend to make over what time frame?

A: MODEL SELECTION

-- The IAT spent several months evaluating a wide range of models before selecting three to use DRI, Second Generation Model, and Markal-Macro). These models represented a range of analytical tools covering key issues.

-- Reviewers criticized the lack of a true general equilibrium model. However, one of the models we employed (Second generation Model) has many of the features of a general equilibrium model.

-- Other reviewers criticized our reliance on a macromodel, stating that because it is structurally inflexible, should only be used for projections over several quarters to a few years and would overestimate costs for a problem that will be addressed over several decades.

B. TECHNOLOGICAL CHANGE

-- Many reviewers criticized our use of an "announcement effect" to raise the rate of technological change. Two reviewers suggested that technological change will occur at a greater rate than our analysis assumed.

-- Predicting technological change is one of the most challenging elements of this analysis.

-- Any credible analysis must include a range of assumptions about the rate of technological change.

-- The President made it clear in his speech at the United Nations that we intend to more fully engage the research community within industry, our universities and government research labs in developing the technologies of the future needed to reduce greenhouse gas emissions.

-- We need to accelerate our research activities both to reduce our own emissions but also to insure continued leadership of U.S. industry in these future high growth sectors in the global marketplace.

Likely friendly question

Q: I have a copy of a statement which I understand has been signed by more than 2300 economists, including eight Nobel laureates. That many economists agreeing on anything is impressive enough, but listen to what they said:

> "Economic studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs. For the United States in particular, sound economic analysis shows that there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run."

If I understand this correctly, they're saying that policies to curb greenhouse gas emissions could actually improve the economy. How can this be?

A: Flexible policies, investments in new, more efficient technologies and substantial environmental benefits together produce outcomes where benefits of climate policies exceed costs.

The Administration is confident that the US private sector, given flexible policies and clear market signals, will move rapidly to provide the technologies the world will need to combat climate change. Under smart policies, U.S. businesses will not only save money and reduce dependence on foreign oil , but they will be better positioned to lead markets for the high efficiency technologies the world will need in the future.

Given flexible implementation, US businesses have outperformed even the most wildly optimistic expectations:

> in acid rain, EPA predicted a cost of $500-$600/ton of sulfur emissions; under emissions trading the cost is only $100/ton;
>
> in the Montreal Protocol, we predicted a cost of $3.50/kilo for a 50% reduction of CFCs; we're now looking at $2.45/kilo for a complete phase-out.

The economists also recognize the great benefits of policies that improve the environment. Avoiding the human health, natural resource and economic impacts of climate change will greatly benefit the economy.

Clearly, we have a great opportunity to design policies which simultaneously protect the environment and boost economic performance. We look forward to working with the Congress and the American people to do that.

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| | |
|---|---|
| To Judy Greenwald | From Bill White |
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NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

# ECONOMISTS' STATEMENT ON CLIMATE CHANGE

*We the undersigned agree that:*

I. The review conducted by a distinguished international panel of scientists under the auspices of the Intergovernmental Panel on Climate Change has determined that "the balance of evidence suggests a discernible human influence on global climate." As economists, we believe that global climate change carries with it significant environmental, economic, social, and geopolitical risks, and that preventive steps are justified.

II. Economic studies have found that there are many potential policies to reduce greenhouse-gas emissions for which the total benefits outweigh the total costs. For the United States in particular, sound economic analysis shows that there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run.

III. The most efficient approach to slowing climate change is through market-based policies. In order for the world to achieve its climatic objectives at minimum cost, a cooperative approach among nations is required—such as an international emissions trading agreement. The United States and other nations can most efficiently implement their climate policies through market mechanisms, such as carbon taxes or the auction of emissions permits. The revenues generated from such policies can effectively be used to reduce the deficit or to lower existing taxes.

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BY MAIL:
ONE KEARNY STREET • 4TH FLOOR
SAN FRANCISCO, CA 94108

Likely friendly question

Q: The Administration has been assessing the costs of climate change policies for over a year. What are you finding?

[redacted]

A: [redacted] The Administration's results are consistent with the lessons learned from a recent assessment by the World Resources Institute. Specifically:

**Developing and diffusing new technologies** will be a key to minimizing the costs of reducing greenhouse gas emissions. Investing in the development and dissemination of new energy-saving and low-carbon technologies will reduce overall costs and enable US companies to capture the emerging international market for these technologies.

**International trading and joint implementation of commitments**, as called for by the US, will increase the flexibility of countries in meeting treaty obligations and greatly reduce costs.

**Actions will be implemented efficiently.** Options being considered by the Administration will provide resources that can be used to offset distortionary fiscal policies.

**Local air pollution will be reduced.** Improving energy efficiency and increasing our use of clean-burning fuels will reduce **both** our emissions of greenhouse gases and traditional air pollutants. Greenhouse gas policies will significantly lower the costs of complying with new air quality standards.

**The benefits of avoiding climate change are large.** It is important to remember why we are taking these actions in the first place. The potential damages from climate change are great, including ..... These costs will occur across countries and generations. It is not feasible or proper to attempt to add up the costs of climate change in a simple balance sheet. While we cannot simply monetize all of these costs, we should qualitatively compare the costs of our policies with the costs of doing nothing.

**Q: Is it the intention of the Administration to adopt policies which would triple the price of coal, raise gasoline prices by 25 cents, and put thousands in energy intensive industries like coal mining out of work?**

A: No, and the best and most recent work on the subject clearly shows that this would not be necessary. Robert Repetto of the World Resources Institute recently published a study of the cost of mitigating greenhouse gas emissions in which he concluded that efficiently implemented flexible policies that encourage investments in new technologies would actually generate net benefits to the overall economy. In addition, more than 2300 economists, including 8 Nobel Laureates, have said that many policies exist to reduce greenhouse gas emissions for benefits outweigh the costs.

We are confident that, working together, we can design policies that will meet the challenge of climate change while improving the US economy.

## Revenue Recycling

**Q: The Administration is considering an emissions cap-and-trade system. How will the Administration allocate permits? Does the Administration plan to auction permits, what does it plan to do with the revenue?**

A: The Administration is considering an emissions cap-and-trade system. Market-based mechanisms are among the most efficient for addressing long-term environmental problems. We are evaluating a number of allocation and auction systems as well and other policies that could complement a cap-and-trade system or that could work in place of a cap-and-trade system.

As noted by Robert Repetto, in his recent review of climate change analysis, revenue recycling can be used to significantly offset the direct costs of reducing greenhouse gas emissions. We will continue to solicit comments from you, the public, and stakeholders on how to efficiently implement greenhouse gas reduction strategies.

**Q: What are the potentially impacts on human health and the environment if climate change is left unabated? What are the consequences of inaction?**

A: Climate change will have wide ranging impacts on human health, ecological systems, and socioeconomic sectors. Human health, natural ecological systems (*e.g.*, water resources, coastal zones including wetlands and drylands, biodiversity), and socioeconomic systems (*e.g.*, agriculture, commercial timber) are all sensitive to both the magnitude and the rate of climate change. The Intergovernmental Panel on Climate Change (IPCC) concluded in its 1995 Second Assessment that, "With the growth in atmospheric concentrations of greenhouse gases, interference with the climate system will grow in magnitude, and the likelihood of adverse impacts from climate change that could be judged dangerous will become greater."

**Human health.** The IPCC concluded that if climate change is left unabated, it "...is likely to have wide-ranging and mostly adverse impacts on human health, with significant loss of life." Health effects will potentially include increased incidences of illness and death from: (1) increased contributions of heat stress to cardiovascular and respiratory disease; (2) reduced air quality and increased levels of air borne pollen and spores which exacerbate respiratory disease, asthma, and allergic disorders; (3) extended geographic ranges of insects such as mosquitos and other disease carrying vectors which can increase the populations exposed to diseases such as malaria, dengue and yellow fever; and (4) ecological changes that can increase the incidence of cholera, diarrheal and other infectious diseases.

**Socioeconomic sectors.** Climate change poses risks to agriculture, coastal zones, and water resources. Climate change could adversely impact food production and increase the incidence of hunger and famine among the poorest populations of the world. Although total global food production may not substantially change, the effects will vary considerably across regions and localities, and some areas, including parts of the US, could sustain severe reductions in their ability to produce food. Rising sea level, if not addressed, can inundate large land areas, displace human populations, and place more people at risk of flood from storm surges. In the US, a 50 cm rise in sea level is estimated to inundate more than 5,000 square miles of dryland and 4,000 square miles of wetlands if no protective measures are taken. Measures to prevent or limit these effects would cost billions of dollars. Finally, climate change poses risks to the availability of fresh water. Relatively small changes in temperature and precipitation can cause large changes in water runoff, affecting the quantity and quality of water supplies for domestic and industrial uses, irrigation, hydropower generation, navigation, instream ecosystems and water based recreation. Also affected will be the frequency and intensity of floods and droughts.

**Ecological systems.** The impacts of climate change on the natural environment are difficult to predict. But impacts there most assuredly will be; some of them dramatic and many of them irreversible. The environmental impacts of climate change threaten to undermine our efforts to protect natural areas that provide habitat for wildlife, reservoirs

of genetic material for future medicines, foods and fibers, regulation of water runoff and flood control, and refuge from a modern world. For example, precipitation changes and salt water intrusion from sea level rise could adversely affect the ecological communities of the Florida Everglades and degrade this critical and unique habitat for many species of wading birds. The wetlands of the prairie pothole region of North America, which supports half the waterfowl population of this continent, could diminish in area and change dramatically in character in response to climate change. Such changes could be devastating to migratory bird populations and species survival.

**Q: Why should we act today to reduce greenhouse gas emissions when there are so many uncertainties -- especially about the expected impacts? Shouldn't we wait until these uncertainties can be resolved?**

A: It is a scientific fact that since the Industrial Revolution, the atmospheric concentrations of greenhouse gases have been increasing substantially due to human activities. There is strong scientific evidence that the continued addition of these gases into the atmosphere will alter global climate, increasing temperatures, changing rainfall and other weather patterns, and causing sea level to rise.

It is true that uncertainties remain about the timing, magnitude and regional patterns of these changes. But the best available science (as summarized in the 1995 Second Assessment of the IPCC) suggests that the wide range of potential impacts of climate change poses wide-ranging risks to human health, the economy, and the environment, that will add to existing stresses on resources caused by other factors such as population growth, land use changes, and pollution, resulting in a world very different than that which exists today. Climate change will pose risks for forests, wetlands, fisheries, coral reefs, and other ecosystems. In turn, these environmental effects will translate into economic impacts, and have possible repercussions for expenditures on health care, timber production, expenditures to protect our coastal areas and wetlands, prospects for hydropower generation, and agricultural productivity.

We need to deal with this problem now. The greenhouse gases that we emit into the atmosphere today will remain there for many decades -- and in the case of carbon dioxide, for centuries. How much we emit over the next years and decades will be determined by economic decisions we make today; for example, decisions about the type and energy efficiency of capital equipment that we invest in now. Consequently, if we delay taking action, more greenhouse gases will be emitted over time and we will leave the atmosphere with a higher concentration of greenhouse gases for the next century and beyond.

The emission reductions that we invest in today are a "down payment" to ensure that we can sustain our quality of life and economic growth in the future – a down payment to ensure that human health, welfare and the environment are protected. Although scientific uncertainties still exist, current commitments may be viewed as an ***"insurance"*** investment; *i.e.*, insurance against uncertain future "bad" impacts of climate change.

Furthermore, as the science of climate change improves and uncertainties are reduced, we may very well discover that the magnitude of the global warming problem is even worse than expected. Therefore, failing to reduce emissions now will mean that the eventual reduction will be even more drastic, if we want to prevent concentrations from exceeding a particular level. It is less expensive to begin to gradually reduce greenhouse gas emissions today, than to take no action and later institute draconian reductions.

**Q: Won't we simply be able to adapt to any adverse effects? Haven't we done this for changes that we already have seen?**

A: The rate at which climate change occurs may be the most important factor affecting both natural and managed ecosystems. The faster the warming, the harder it will be to adapt.

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. The rate of increase in global temperatures will be greater than those which have occurred naturally over the last 10,000 years. However, the ability of natural ecosystems (forests, wetlands, barrier islands, national parks) to adapt to a rapidly warming climate is limited. Rates of natural migration and adaptation could be much slower than the rate of climate change. Populations of many species and inhabited ranges could decrease, and many may face extinction. The ultimate effects could last for centuries and would be virtually irreversible.

Intensively managed systems, such as agriculture, water resources and developed coastlines, may show more resilience to climate change than natural systems. Technological and management options exist which can, to some extent, cope with the stresses associated with a changing climate. However, it is difficult to currently design effective adaptation strategies because of uncertainties about the geographic location of impacts. These strategies also may be costly to implement.

**Q: Isn't it true that any of the actions that are being contemplated for a protocol (*e.g.*, stabilization of greenhouse gas emissions at 1990 levels) would have a negligible impact on future climate change and the resulting impacts?**

A: It is not true that actions taken today will have a negligible impact on future climate change and the resulting impacts. **Policy decisions in the near term -- particularly decisions about whether or not to begin reducing greenhouse gas emissions now -- will have long-term consequences.**

Human-induced climate change is a complex problem, which can affect the quality of life for this and future generations. The lag time between emission of greenhouse gases and their impacts is on the order of decades to centuries; so too is the time needed to reverse any effects. Proactive measure taken today to begin reducing emissions of greenhouse gases will have two important effects: (1) They will influence the ultimate level of concentrations of greenhouse gases that occurs in the atmpsphere; and (2) They will begin to slow the *rate* at which climate changes, which may have important implications for the ability of natural ecosystems to adapt to long-term climatic changes. The rate at which climate change occurs may be the most important factor affecting both natural and managed ecosystems. The faster the warming, the harder it will be to adapt.

In contrast, decisions not to reduce greenhouse gas emissions will have important long-term implications for human health and the environment. The longer emissions continue to increase, the greater reductions would eventually have to be to stabilize concentrations at a given level. However, 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.

Finally, actions taken today to begin reducing greenhouse gas emissions can be viewed as consistent with the "precautionary principle." If the climate changes more than expected, we will not have the option of returning the climate to that of today because the CO2 will stay in the atmosphere for more than a century. It is therefore prudent to undertake some emissions policies that do not pose extreme risks to the U.S. economy as a precaution ("insurance") against this potential outcome.

**Q: The World Resources Institute recently published "The Costs of Climate Protection: A Guide to the Perplexed" which shows that the assumptions made in the analysis have a great deal of influence over the results. What are the key assumptions being made by the Administration?**

A: ~~While I cannot release specific results from the Administration's analysis until it is completed with the peer review,~~ I can say that the Administration's results are consistent with the lessons learned from the WRI assessment:

**Developing and diffusing new technologies** will be a key to minimizing the costs of reducing greenhouse gas emissions. Investing in the development and dissemination of new energy-saving and low-carbon technologies will reduce overall costs and enable US companies to capture the emerging international market for these technologies.

**International trading and joint implementation of commitments,** as called for by the US, will increase the flexibility of countries in meeting treaty obligations and greatly reduce costs.

**Actions will be implemented efficiently.** Options being considered by the Administration will provide resources that can be used to offset distortionary fiscal policies.

**Local air pollution will be reduced.** Improving energy efficiency and increasing our use of clean-burning fuels will reduce both our emissions of greenhouse gases and traditional air pollutants. Greenhouse gas policies will significantly lower the costs of complying with new air quality standards.

**The benefits of avoiding climate change are large.** It is important to remember why we are taking these actions in the first place. The potential damages from climate change are great, including [see climate benefits q & a]. These costs will occur across countries and generations. It is not feasible or proper to attempt to add up the costs of climate change in a simple balance sheet. While we cannot simply monetize all of these costs, we should qualitatively compare the costs of our policies with the costs of doing nothing.

NOTE TO MICHELLE JOLIN

RE: Climate Change Hearings

Attached are a number of background questions and answers for next week's climate change hearings. These should also be reviewed with Mark and in light of any relevant discussions on Friday.

If you have any questions, I can be reached at home this weekend at 301/656-3272.

Thanks,

Steve Seidel

would you endorse a policy of 1990 by 2010? Do you think the costs are reasonable?
What other policies are under consideration? How will you exclude them?

draft 7/12

BACKGROUND QUESTIONS AND ANSWERS ON CLIMATE CHANGE

Q. When will the Administration release its economic analysis of the costs of acting to reduce greenhouse gas emissions?

A. -- We intend to release this report by the end of the month.

-- The report will summarize the current understanding from the economics literature and discuss how the analysis ~~we have undertaken~~ fits into that broader picture.

Q. The Administration has been working on this analysis for several years and promising it to Congress and the public for almost that long. Why have you withheld this information for so long a time?

-- By its very nature, climate change is a long-term issue requiring analysis that spans many decades.

-- Needless to say, neither energy models or economics models do a very good job of forecasting over a such a long period of time.

-- It's critical to recognize that there is no "right" model and no "right" answer.

-- Nonetheless, as the analysis has progressed we have learned quite a bit both about the models themselves and about the implications for policy design.

-- This has taken time. Longer than we thought it would take. But it nonetheless has and will continue to be useful in guiding our policy process.

-- We look forward to issuing this report and continuing the dialogue about the appropriate actions to address climate change and its impact on the economy.

Q: How can the Administration be off negotiating an international treaty without having completed its analysis and without having had a public dialogue about the impact of such actions on American jobs and our economy?

A: -- The Administration's position in the negotiations has been informed throughout by the economic analysis in the literature and its on-going analytical efforts.

-- For example, we have rejected proposals calling for significant near-term reductions in emissions because we think they are too costly.

-- We have also pushed for flexibility in how a target is set (e.g., multi-year, banking and borrowing) and for the use of market-based approaches (emissions trading and joint implementation), because we believe that these approaches will be substantially reduce the costs of achieving any given target.

-- We have not , however, yet proposed any specific target or timetable. This obviously critical dimension of our position must await further analysis and dialogue as the President clearly stated in his speech at the United Nations last month.

Q: A copy of the Administration's draft analytical report has been circulated widely. How will the final report differ from that draft?

-- I believe it is generally inappropriate to comment on details of a draft report.

-- I will say however that we got a number of useful comments from the peer reviewers that will substantially alter the draft report.

-- For example, the reviewers thought it was important to put our analysis in the context of the existing economics literature on climate change impacts. We will be doing this in the final draft.

-- The reviewers also thought we placed far too great an emphasis on the results from a macroeconomic model (DRI) and that such a modeling approach is largely inappropriate for looking at changes on a timescale beyond a few years.

Q: When will the Administration release its peer review comments?

A: -- We intend to release the comments received from peer reviewers by the end of the month when our report is made publicly available.

Q: We remain very concerned that the Administration is going to agree to actions in Kyoto that will cripple our economy and drive jobs overseas? Can you assure us that we would not sign on to any such agreement?

A: -- The President has stated that he would oppose any plan that would be harmful to our economy, but that he believes we can take and need to take prudent steps to begin addressing this issue, and that we can do so consistent with continued economic prosperity.

-- We have opposed proposals calling for significant near-term reductions that could adversely impact on our economy.

-- We need to avoid causing costly premature retirement of our nation's capital stock, while at the same time spurring research and investment in the energy technologies that will lead us and the world into the next century .

-- In his recent speech at the United Nations, the President made a strong commitment to channel our technological prowess toward producing the energy solutions for the next century.

-- While taking steps to reduce greenhouse gas emissions will not be free, we also have to keep in mind that there are costs of a changing climate associated with not acting to reduce greenhouse gas emissions.

Q: Many in Congress are very concerned that the current negotiations are simply a bad deal for the American public. Why should we incur costs to reduce emissions when developing countries are not required to do anything? From an economic perspective, how can you advise the President that this path makes sense?

A: -- Equity is often an important part of any economic discussion. Since the U.S. is the largest emitter of greenhouse gas emissions and developed countries are responsible for about 75% of emissions in the atmosphere, we have a responsibility to show leadership.

-- However as developing countries economies grow and as their emissions grow, the U.S. proposal calls on them to incur increasing obligations.

-- Specifically, the U.S. proposal calls for agreement on a date certain by which developing countries would agree to negotiations for them to take on binding obligations.

Q: The Dept. of Energy through Argonne Labs conducted a study of 7 basic manufacturing industries that are critical to the U.S. industrial base. Press accounts report that thus study concluded that the current negotiations are likely to lead to widespread shifts in these industries from the U.S. to developing countries with huge job loss here. Why has DOE withheld this study from the public? Do you disagree with its findings?

-- I am not personally familiar with this study. But I have been told that the Argonne study does not take into consideration any of the flexibility contained in the U.S. position and assumes incorrectly that developing countries never take on any obligations. Thus, the study in no way represents an analysis of what the U.S. has proposed during these negotiations.

Q: The draft Administration analytical report states that stabilizing greenhouse gas emissions at 1990 levels in 2010 would result in throwing 900,000 workers out of jobs. How can the Administration even contemplate entering into such an agreement?

A: -- I am certain that we would not agree to a proposal that would have that impact.

-- There are many dangers in working from a draft report.

-- The numbers you cite are based a scenario that doesn't reflect U.S. positions in these negotiations calling for flexibility and market-based approaches. In addition, they are based on a macroeconomic model that our peer reviewers criticized as being inappropriate for this type of analysis.

-- We have worked hard to achieve the most robust economy in the world and if we continue to work together we can develop the technologies that address this problem and enhance our economic prowess.

-- Our partnership with the U.S. automakers is a good example of what we hope to be able to achieve through technological progress. The goal of the Partnership for New Generation of Vehicles is to achieve three times

today's fuel efficiency without increasing costs or sacrificing safety. If successful, this one technological program would go along way toward reducing greenhouse gas emissions.

Q: The draft Administration's analysis suggests that gasoline prices will increase 35 cents per gallon and coal prices will triple in order to stabilize emissions at 1990 levels. Is the Administration prepared to ask Congress for this new tax and does it really think we would approve such a measure?

A: -- The Administration has not made any decision on a specific target and timetable and therefore, I cannot comment on possible increases in energy prices that might result.

-- Our goal in developing a specific proposal will be to allow for adequate lead time to avoid costly capital stock retirements and to allow for the development of alternative technologies that can reduce the costs of compliance.

-- As President Clinton stated at the United Nations, if we can channel the ingenuity of American industry, academia and government labs to work on solving this problem, this could become an economic opportunity rather than a burden.

Jason Shogren
07/12/97 02:40:18 PM

Record Type: Record

To: Janet L. Yellen/CEA/EOP

cc:
Subject: Re: analysis question

the climate tsar finally asks the right question.

we have not done enough of this to answer todd's question--we do not have a benefit side in any of the three IAT models, so the benefits have not really been debated. OSTP is drafting "impact" papers separately. we need, if we are going to do more analysis, an Integrated Assessment style model to answer todd's question. otherwise, the enviro-side will always claim dooms day is just around the bend.

below are two potential responses to Jorgenson's "worse than nothing"

**Is the Administration's approach worse than doing nothing at all?**

First, the Administration's final policy has yet to be decided on by the President. Projecting the Berlin statement of target and timetables as final Administration policy is **premature**. The Administration recognizes the importance of global climate change policy and the US economy. And that is why the President has called for a national dialog over the next few months to layout the pros and cons of alternative climate change policies.

We know good climate policy depends on a good understanding of the relative magnitudes of benefits and costs. While costs of abatement are relatively straightforward to evaluate, the benefits of climate protection are more difficult to quantify. Reasonable people can disagree over the potential short-term and long-term benefits of climate protection. This is a complex question. Again the national debate asks for the people to reveal what they perceive as the potential benefits from climate protection.

Damage fn uncertain.
Need a credible policy giving clear signals;
Can give impetus to a worldwide tech. push.
Need to show leadership; get int'l. cooperation

July 4, 1997

# THE IAT REPORT: ECONOMIC EFFECTS OF GLOBAL CLIMATE CHANGE POLICIES

- Produced by a team of staff from many agencies. Purpose is to understand the economic effects of climate change policies. This is not an official White House forecast or analysis. It is a helpful working paper to facilitate understanding of economics of climate change.

- Uses a group of economic models to assess the economic effects of policies to limit emissions of greenhouse gases. No model is perfect--trying to bracket an estimate of the economic effects and study the sensitivity of outcomes to assumptions and policies.

  - **DRI** (identifies transition issues for specific industries and regions and the economy as a whole based on short-run behavior); (Reviewers:) *But uses a fixed-coefficient input-output model which goes against the primary objective of climate policy.*

  - **Second Generation Model (SGM)** - a CGE model good at identifying an economy's long-term trends in economic growth, consumption and energy use in response to climate policies--international in scope. Used to look at permit trading and JI. (Reviewers:) *May fail to adequately capture the opportunity costs of technical substitution and understate the costs of abatement policies; models based on technical options may fail to fully recognize the tradeoffs faced by real economic agents.*

  - **Markal-Macro model (DOE)**. An integrated energy supply and demand modeling system combined with a macro model--useful for translating technological assumptions into economic outcomes. Recognizes 11 primary fuel sources and dozens of fuel conversion technologies. Useful for answering the question: How do we get there from here? Focuses on technology and its interaction with the economy and helps determine whether expected energy efficient technologies hold the key to continued economic growth.

- **Each model has strengths and weaknesses**. The models do not deal well with trading ~~program~~, effects on international flows and U.S. competitiveness; technical progress and its costs; benefits.

- There is no attention in the IAT report to deriving an ~~optimal~~ policy by working backward from a long term goal. There is no comparison of how different policies attain various goals.

- Baseline estimates for energy use and carbon emissions are questionable--assume faster price increases and slower reductions than in the past. Need to use alternative baseline

estimates.

- Start from a consistent, **common baseline** with regard to projections of baseline GDP, total energy consumption and carbon emissions. Carbon emissions in the baseline are projected to increase by about 1.2% per year through 2010 and by 0.6% per year from 2010 to 2020. In 1990, carbon emissions were 22% below the 2010 baseline projection and 36% below DRI's projection for 2020.

    - Technological change in the baseline: In the 1970s and 1980s, energy intensity declined about 2% per year--1.5% due to price effects and 0.5% due to nonprice effects. Baseline projection incorporates a 1% annual reduction in energy consumption per unit of output.

- **Starting point scenario**: Focuses on limiting emissions to 1990 levels by 2010--subject of numerous analyses by academic researchers. Facilitates comparison with outside work. Assumes tradable emission permits at earliest point of energy production or when imported into the U.S. The policy is announced in 2000 and phased in over a ten year period to reach the 2010 goal. Permits are initially auctioned so that all revenues generated through permits would be recycled through deficit reduction. Assumes no international cooperation or trading.

    - **Technological change in the starting point scenario:** Incorporates an improvement in the pace of energy efficiency from 1.0% to 1.25% over the baseline due to forseeable increases in the future price of energy in the climate change policy undertaken, because of implementation of the CCAP, or other policies. The announcement effect leads to a faster rate of diffusion of energy efficient technologies and a higher rate of innovation through R&D in anticipation of future higher energy prices.

**Starting Point Results:**

- **Implicit price of carbon in the economy** (the estimate of the permit price) rises to about **$100 per ton of carbon in 2010 in 1995 dollars**. This result is reasonably consistent across models. A permit price of $100 per ton is the equivalent of a price increase of 26 cents per gallon of refined petroleum product, $1.49 per thousand cubic feet of natural gas, $52.52 per ton of coal and 2 cents per kilowatt hour of electricity produced.

- The price of carbon rises somewhat over time, reflecting the fact that the 1990 emission ceiling becomes progressively more binding over time given projected growth in base case emissions.

- Higher energy costs impose burdens on households but these are partially offset by

conservation and subsequent efficiency improvements.

- **GDP losses, at peak, are between 0.2 and 1.0% of GDP** by 2005 and -0.6% to +.2% in 2020.. Economy eventually bounces back or stabilizes. **Losses in the model are real but transient.**

- **The IAT baseline policy of 1990 by 2010 implies about 26% reduction below baseline emissions in 2020. In the Repetto-Austin analysis, looking at all the models, they find that, under unfavorable assumptions, GDP would be 2.4% lower in 2020 than under baseline and under favorable assumptions, 2.4% higher.** The 4 key influences are (whether there are significant short term adjustments--macro model; whether JI; whether recycling of revenues via reducing other taxes; whether benefits from abating pollution. Under reasonable assumptions, the predicted GDP impact would be neutral or even favorable.

- **Consumption** declines even through 2020--peaking at about 1.5% in 2007 and declining to about -0.30% in 2020 in the DRI model. This is a better measure of the change in economic welfare.

- **Impact on investment:** If the permit revenue is saved, the cost of capital declines. Also, the marginal profitability of investment rises because new investment allows firms to neutralize higher energy costs. Capital is a long-term substitute for energy and is favored after a transition period. The faster rate of investment creates a newer and larger capital stock, raising growth modestly after a transition.

- **Sensitivity to policy:** Size of losses and carbon price increase depend on **size of emission reduction.**

- Some **sectors**, particularly energy producers, bear large burdens. Energy-intensive sectors face greater losses. Other sectors expand as the economy undergoes the adjustment.

  - Coal bears the brunt of greenhouse gas stabilization. The reduction of coal use under utility boilers is generally the largest, cheapest option to reduce carbon emissions in the economy. This is accomplished through better operating rates and substitution of gas-fired combined cycle units for coal fired units. The implicit price of carbon in most model runs is usually the one that accomplishes this transition in electricity baseload. And the $100 per ton estimate is as high as it is because most coal-fired units are fairly old and already fully amortized. The price of coal, therefore, must rise considerably to make coal-fired electricity more expensive on the margin than electricity generated by a new gas-fired plant that entails new capital costs.

- The effect of the emisssions policy is to raise unemployment about 0.2% from 2001

through 2011 in the DRI model. Inflation rises about 0.3%. The increase in the energy tax is akin to the oil shock

- Paths depend critically on **revenue use and monetary policy**.

- **International trading of carbon permits among the Annex I countries leads to sizable reductions in costs needed to stabilize emissions**. This has been proposed by the U.S. for inclusion in a multinational agreement. It would increase efficiency and lower the cost of reducing global emissions by giving all emitters the incentive to search for least-cost solutions across national boundaries.

    - The U.S. could purchase additional emissions rights (permits) from other countries (with low emissions reduction costs.) The forces of supply and demand would set the permit price and market incentives would push the group as a whole to institute the least cost emissions reductions first. **International trading reduces the implicit price of carbon dramatically--from $82 to $56**. The source of cheap emissions is the FSU and the Eastern European nations with lax environmental standards and slow economic growth. Trading is a win-win situation. The U.S. is projected to purchase $4 billion of permits from FSU and Eastern Europe. This saves $12.2 billion of higher costs under domestic implementation only.

    - FSU countries are below 1990 emissions levels and would be allowed to sell to other nations their right to emit up to those levels. In this instance, emissions trades would not result in corresponding reductions in annual emissions.

- **Joint implementation** with non Annex I countries would further reduce costs. Under this scenario, the FSU and Eastern Europe lose their monopoly on permit sales. We would likely buy from China and India pushing them to reduce their use of coal.

- The United States has smaller output losses than Japan or Western Europe predominatly because it has more "cheap" carbon-abating opportunities. It is somewhat easier for the U.S. to reach emission targets than other regions which have already picked the low hanging fruit.

- **Sensitivity analysis.**

    - **cross-border trading** of emissions rights or permits

    - **Pace of technological progress as measured by energy intensity**--energy use per dollar of GDP greatly affects the GDP losses and carbon price. This measures the growing efficiency with which the economy uses energy. The results are very sensitive to this assumption. (Faster efficiency--the 1.25% rate assumed in the

starting point simulations) could be achieved through faster diffusion of off the shelf technology and new technologies that are near commerical viability. However, a 1.75% pace of change requires a new set of advanced energy efficiency technologies. These include fuel efficient cars (55 mpg) The models fail to account for the costs of the investments needed to reach a higher rate of technological progress.

- Increasing the **implementation period** from 5 to 10 years dampens the negative effects on GDP. A 5-year ramp up between 2005 and 2010 results in a maximum output loss in 2010 that is 65% greater than that associated with a ten year ramp up and a return to the baseline two years later.

- Raising or lowering emission targets lead to larger/smaller economic losses.

- Using any resulting **revenues**--to reduce growth distorting taxes or deficit reduction--leads to less impact on the economy during the transition and greater returns to the economy in the long term. Better outcomes are associated with greater investment and capital formation. Recycling to consumers results in the worst GDP path but a better consumption path.

- The economic effects of recycling and of a carbon limitation per se should be separated.

- Reducing carbon emissions would also reduce other pollutants, creating some economic benefits.

- The **Federal Reserve's reaction** affects the results. For example, if the FR maintains nominal reserves at baseline, the size of the GDP loss is approximately doubled. Since the IS curve has shifted to the left, the Fed can offset through easing. The willingness to ease is likely to be related to the impact on price inflation.

- Regional effects--analysis hinges on use of revenue for savings cum investment.

**PROBLEMS WITH THE MODELS:**

- Some questionable results--See a bigger long term GDP gain with a stricter emission standard. DRI is prone to depicting large effects of interest rates on investment. Thus, the use of the revenue for deficit reduction stimulates growth a lot.

- Grandfathering of permits raises investment--impossible.

**ISSUES**:

1. Increase in carbon tax is like an oil shock.

2. Concern that forcing an energy price increase on U.S. producers will disadvantage them substantially through trade, particularly with those countries outside of Annex I that may not be subject to emissions limits. This is proxied in the IAT model by a lower pace of import price increase. This has an impact on the exchange rate.

**Reviewer Critiques of the IAT Report**

- Models are inadequate for the purpose--cannot deal sufficiently well with emissions trading, international flows, technical progress and its costs.
    - None of the models focuses adequately on how economic agents respond to market and non-market signals.
    - Should add more models to the suite (EMF)
- **International Issues**. The analysis ignores the possibly large effects of international flows resulting from an international carbon trading system. These could affect the U.S. current account requiring currency and or capital adjustments. Existing models cannot deal with this. Also investment diversion needs to be examined if only Annex 1 nations are included.
- **Technology**: Most reviewers were skeptical of the assumed rate of autonomous technological change and the representation of the announcement effect. Models can not easily represent industry response to government policies. There is little consensus among experts as to how technological change will affect the costs of emissions reduction policies or how to model that process. No empirical support for the values chosen for the announcement effect.
- **Need more sensitivity analysis to bound the range of costs and more than one set of baseline assumptions**. Objective is to describe the range of possible outcomes.
- Current modeling focuses on a **few limited scenarios**--not enough to answer questions of timing and optimal reduction.
    - Cannot address the timing debate on 2010 vs. later. Issues of intertemporal trading should be included
    - What are cost effective strategies for limiting concentrations to alternative levels?
    - May be better to use discounted PDV of costs to compare scenarios.
- Revenue recycling
- Need to place the IAT exercise in the context of other models (Stanford EMF etc.)

## REPETTO-AUSTIN ANALYSIS

- Most recent scientific assessment by the Intergovernmental Panel on Climate Change emphasized that the continued buildup of greenhouse gases could have long-lasting climactic effects, some of which would impose significant economic burdens on nations and vulnerable populations. The effects are warming are hard to predict but a precautionary approach seems warranted.

- Voluntary efforts, as pledged in Rio, are insufficient. The U.S. has pledged to accept a legally binding commitment in the Kyoto protocol.

- **Efforts to limit $CO_2$ will imply significant changes in energy use and sources, probably changing energy costs substantially**. Household budgets and business profits will be affected. There could be an impact on inflation, international trade, patterns of investment and the macroeconomy.

- **The cost can be reduced by taking action using market-friendly instruments and implementing changes with adequate time and flexibility for economic adjustments to occur**. One of the most effective and efficient mechanisms to reduce emissions is a carbon tax--levied on all fossil fuels in proportion to their carbon content. A tradable permits program in which a permit is required in order to sell or use fossil fuel is an alternative. The permit price in the marketplace would signal how much firms should spend on abatement. The permits could be auctioned and the revenues used to reduce other taxes or deficits.

- Emissions trading: may be difficult to include small fuel users through their aggregate energy use is important, without creating administrative burdens. If new scientific information necessitated further emissions reduction, canceling carbon permits could be difficult--more so than raising a carbon tax.

- As interest in climate change has accelerated, more than a dozen models have been constructed. Many predictions have been derived from many models. There are some systematic reasons that the models reach different conclusions. **Assumptions matter.**

- Repetto-Duncan reviewed 162 analysis of climate change policy coming from 16 models.

- **All models reviewed show an initial loss in aggregate economic output, but the loss is not very large**.

- **Key assumptions**: Size of loss depends predictably on assumptions: although the models are very complex, important results depend more on different key assumptions than on structure.

- **Extent to which substitution among energy sources** (substitute less carbon-intensive fuels like gas for more intensive fuels like coal; substitute non-fossil energy for fossil fuel), **energy technologies, products** (substitute less energy-intensive goods for energy-intensive ones), **and production methods** (substitute L, K and materials for E) **is possible**. The longer the time for adjustment, the lower the burden of adjusting and the larger the substitution possibilities. Producers can bring in new technologies with new equipment and consumers can adapt when they replace durable goods.

- **Bottom-up models** examine technological options for energy savings and fuel switching that are available in individual sectors of the economy. Information on the costs of these options is aggregated to calculate the overall cost of reducing $CO_2$ emissions. **These models estimate substitution possibilities by considering the actual technologies firms can use, not historical substitution possibilities.** These models are more optimistic than top-down models, partly by overlooking barriers to implementation, such as management and retraining tim, risk-aversion, capital constraints, household preferences, or lack of information. **They highlight energy inefficiencies and technological opportunities.**

  - Companies that joined EPA's voluntary Green Lights Program found numerous opportunities to save energy and money

  - There are inefficiencies that can be remedied through **building improvement measures** such as better insulation and low-energy lighting; through conversion of industrial processes. Engineering studies suggest 20-25% of emissions could be eliminated at an overall cost savings and that further cuts could be made at relatively low cost.

  - Some inefficiencies are due to energy market imperfections such as divergence in incentives between tenants and landlords etc. However, some savings may entail overlooked costs. Energy service companies which seek to find and implement energy saving opportunities on a contract basis have not found unlimited business opportunities at current low energy prices.

  - We **currently have energy subsidies that encourage excessive fuel use.** These include favorable tax and credit treatment for energy producers. Hydropower subsidies reduce carbon emissions. Tax breaks for independent oil drillers merely replace foreign oil

with domestic oil. On balance, removing U.S. energy subsidies could significantly reduce CO2 emissions according to one study.

- Top down models that assume limited substitution, slow technological change and limited response to price signals and low availability of non-fossil energy sources predict high costs.

- **Extent to which market and policy distortions create opportunities for low-cost (or no-cost) improvements in energy efficiency**

- **Rate of technological innovation and responsiveness of such change to price signals.** Hard to reach consensus on AEEI but value is critical. For example, a change from 0.5% to 1.0% cuts projected 2100 emissions levels by half and markedly affects the cost of meeting a CO2 target. Induced technological change in response to price increases is a distinct possibility.

- **Availability and likely future cost of non-fossil backstop energy sources** (hydroelectricity, nuclear power, wind and solar energy and biomass) Alternative, low carbon energy sources exist but aren't currently cost-effective. They will become increasingly so as carbon energy sources rise in price and technology makes them less expensive. The availability of these backstop non-carbon energy technologies has a large impact on the costs of meeting whatever emission reduction goal is chosen.

- **Number of years available to achieve a specified $CO_2$ reduction**. Merely stabilizing emissions rates will allow concentrations to continue rising for centuries. Recent analysis shows that **adopting an explicit long-term target for atmospheric concentrations and then choosing policies to achieve the most efficient time path for emissions reductions to meet the target could significantly lower the economic impact**. A target for concentrations is like a carbon budget limiting CO2 emissions within a specified period of years. Under some circumstances, it is cheaper to use more of the budget early on and postpone cutbacks because the capital stock is so durable. In a system of emissions trading, **there should be banking and borrowing of permits to allow flexibility over time.** When time is allowed for capital stock to be replaced, overall abatement costs could be reduced. Also, R&D will yield new technologies so postponing costs reduces them. Flexibility in timing of global reductions could lower costs by more than 35% compared to a less flexible program to achieve the same concentration.

  - Under some assumptions, we should adopt a carbon tax now to encourage early development of energy efficient and low-carbon technologies and

discourage long-lived investments in carbon-intensive energy facilities. **Realistically, action today is likely to be necessary to induce investors to make commitments and not just the expectation of a tax in a decade or more.** To quell doubts, a credible policy signal is necessary at the outset--e.g., a carbon tax introduced at a low level that rises, perhaps significantly, in future years.

- **Potential for international joint implementation.** This would allow a utility in Norway to achieve reduced emissions by contracting to pay a factory in Poland to install more fuel-efficient furnaces. Finding the lowest cost abatement possibilities is cost effective. JI cannot be used more widely until countries have set binding emissions reduction targets. But getting countries to agree on the baselines that should apply to each, from which emissions reductions will be measured is a formidable task. Monitoring and verification and a mechanism to enforce contractual obligations is essential if JI is to work. The potential savings are substantial.

- **Recycling to reduce economically burdensome tax rates or lump sum rebates.** Without recycling the carbon tax is highly deflationary, lowering GDP substantially. Lump sum recycling enables a modeler to separate the economic impact arising from climate abatement from that arising from other tax cuts. However, it would be possible to reduce taxes that distort economic activity--payroll taxes, on investment earnings. Some economists have argued that there could be a double dividend--a gain purely from substituting an energy tax for a more distoring tax on labor or capital income. This is questionable. etc.

- **Benefits in form of avoided economic damages from climate change and other pollution reduction damages**. Can avoid pollution associated with auto emissions and higher medical expenditures.

- Under a reasonable standardized set of assumptions, most models predict a small macroeconomic effect of a carbon tax to stabilize emissions and potentially favorable outcomes.

- **The IAT baseline policy of 1990 by 2010 implies about 26% reduction below baseline emissions in 2020**. Looking at all the models we find that, under unfavorable assumptions, GDP would be 2.4% lower in 2020 than under baseline and under favorable assumptions, 2.4% higher. The 4 key influences are (whether there are significant short term adjustments--macro model; whether JI; whether recycling of revenues via reducing other taxes; whether benefits from abating pollution. Under reasonable assumptions, the predicted GDP impact would be neutral or even favorable.

- A carbon tax might have a disproportionate impact on low income households but it could be offset through other taxes reductions.

- The impact of a tax on coalmining and coal carrying railway lines would be substantial. However, the baseline predicts a substantial expanison in coal mining in the western U.S.

- Reduced energy demand in the U.S. would help hold down world oil prices, improving our terms of trade.

- **Impact on competitiveness.** If the U.S. alone imposes a significant carbon tax, international trade and investment in some energy intensive industries might shift abroad. However, evidence suggests that differential environmental policies have a weak impact on trade and investment flows and many nonOECD countries have raised energy prices unilaterally. Coordinated international action could avoid these trade effects.

**MAJOR POINTS:**

- **2000 economists** endorsed taking measures to reduce the threat of climate changes on the grounds of the Intergovernmental Panel on Climate Change finding that "the balance of evidence suggests a discernible human influence on global climate." The economists concluded that global climate change carries with it significant environmental, economic, social and geopolitical risks, and that preventive steps are justified. They concluded that proper policies can significantly reduce greenhouse gas emissions without harming the American economy. Some policies could even improve U.S. productivity in the longer run. Market based policies (such as carbon taxes or emissions permits) would lower the costs of control substantially. They said that there are many policies with total benefits in excess of costs. Revenue could be used to lower the deficit or reduce existing taxes. Nations need to cooperate to achieve climactic objectives at minimum costs--international emissions trading.

- A great deal of controversy surrounds the issue of climate change with some saying that climate change is one of the greatest threats facing humankind and others saying the risks are weakly documented. The same kinds of divides arise in discussing costs and benefits of various policy options. The President believes there is a risk so that policy action is needed, but will look for policy actions that are sensible, cost effective and consistent with continued economic growth and job creation.

- It is particularly difficult to measure the benefit of climate change action especially when one takes a broad interpretation and thinks about the value of reducing risk related to ecological impacts.

- Economists differ in their views about emissions policies, some advocating a "broad, then deep" approach in which we begin with a broad but low cost agreement and others favoring a deep, then broad perspective, by first establishing a narrow coalition of developed nations and then reaching out to developing countries to join later via evolution. The problem with the latter approach is that costs rise for a narrow coalition of countries leading carbon intensive industries to migrate and making nonparticipant countries even more carbon dependent.

- Any agreement without the cost flexibility provided by international trading or JI will at least double the US costs.

- Models are helpful in understanding implications of climate change policies--give orders of magnitude and sensitivities to assumptions. There is no single correct set of assumptions or appropriate model. It is a mistake to offer just a best guess assessment of either costs or benefits. One should think about ranges of possible outcomes

- IAT exercise is an attempt to get different modelers from different parts of the government using different tools to begin to speak a common language--standardizing assumptions and understanding where the differences in results come from.

- Some useful morals emerge. Results are in same ballpark as broader literature.

- No analysis in IAT of optimal policy.

- No policy has been chosen by the Administration. Administration wants to conduct a dialogue with the public over how best to go about choosing a policy to deal with climate change.

- President Clinton's top priority has been to restore prosperity to the American economy and he would not take a step that would bring serious damage to it. We need to proceed pragmatically--taking steps that are reasonable and justifiable given what we know and the dangers.

- This is an effort that will need to be maintained over decades rather than years. Especially since we will be in this for years it is important to proceed sensibly. We must make sure that any policies that are adopted are cost effective and flexible (market based).A system of tradable permits at the international level and over time (when and where (bank and borrow) flexibility) receives wide support from economists. Faster technological change will decrease the cost.

- The benefit of proceeding slowly is that we will have more time to invest and benefit from technological change, as well as more time to allow existing capital to depreciate.

- Thre is some consensus on the need to take low-cost medium-term actions than can reduce the costs of substantial reductions in future emissions hould they become necessary.

- Developing country participation is important

- Need to carefully consider the timetable for emission reductions.

**THE SCIENCE**

- There is now fairly wide scientific consensus that anthropogenic climate change is occurring.

- While uncertain, the possible risks include loss of coastal areas from rising sea levels, changes in rainfall and agricultural productivity, and increased incidence of diseases such as malaria, yellow fever, and cholera.

- Nordhaus has estimated that U.S. GDP would drop 1% with a 3 degree C warming. Jorgenson estimates a 1.34% loss in world GDP by 2050 as a result of climate change. Agriculture and forestry would probably benefit from climate change.

- Carbon dioxide accounts for approximately 86% of the total global warming potential of all U.S. anthropogenic emissions not covered by the Montreal Protocol to protect stratospheric ozone and combustion of fossil fuels, primarily coal and oil, is the main source.

## U.S. POLICY

In July 1996, UnderSecretary Wirth announced that the

- "United States recommends that future negotiations focus on an agreement that sets a realistic, verifiable and binding medium-term emissions target."
- Call for "market-based solutions that are flexible and cost-effective."

In December 1996, the U.S. issued a position paper expanding:

- Need to examine an intl. Greenhouse gas emissions trading system among annex I (OECD plus former Soviet block) countries.
- Joint implementation (projects that reduce emissions below baseline in host country which are credited to the target of the partner country) between Annex I and the rest of the world.
- Need for a concerted global effort that eventually would mean targets for all countries.
- Support for multi-year, rather than single year, targets.
- Urge consideration of a right to bank and borrow permits.

cc: JRA
JS
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THE WHITE HOUSE

WASHINGTON

July 14, 1997

MEMORANDUM FOR DISTRIBUTION

FROM: MARK MAZUR
DAVID SANDALOW

SUBJECT: Climate Change

Per our discusssion today, our next meeting will be tomorrow, Tuesday, July 15 from 2:00-4:00 in OEOB Rm. 231. The agenda is:

1. Domestic emissions trading (one hour)

2. Technology programs (one hour)

The meeting will start promptly at 2:00. Everyone on the attached list has been cleared into the building. For questions concerning clearance, please call Adam Cox (456-5145).

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# OFFICE OF THE ASSISTANT SECRETARY ENERGY EFFICIENCY AND RENEWABLE ENERGY

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# The Role of Technology Policies in Limiting Greenhouse Gas Emissions

"Economics studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs. For the United States in particular, sound economic analysis shows that there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the long run."

— The Economists' Statement on Climate Change, Feb. 13, 1997 (signed by more than 2,400 economists, including eight Nobel Laureates)

A strategy to accelerate the diffusion of existing technologies and the research, development and deployment of more advanced technologies is a critical component of any U.S. policy to stabilize greenhouse gas emissions. Any emissions control program — without such a technology strategy — would result in higher prices for carbon allowances than would otherwise be the case. Analysis suggests than an accelerated technology effort has a large potential for bringing down this price, and thus the cost to the economy.

In addition to major studies in the early 1990s[1], forthcoming analysis by five leading National Laboratories finds that a large potential remains for reducing U.S. energy consumption and greenhouse gas emissions while meeting the full energy needs of U.S. businesses and families. In the long term, stabilizing concentrations at even twice pre-industrial levels, which will likely still have severe national and global environmental impact, poses an unprecedented challenge that can only be met with superior technology brought about by aggressive diffusion and significantly higher levels of R&D.

Two types of technology provide significant opportunities to reduce greenhouse gas emissions in the near- to mid-termwhile providing our full energy needs. First, energy-efficient technologies are currently underutilized in all sectors of the economy. These technologies allow us to do more while consuming less energy and reducing pollution. Through increased energy efficiency, we can maintain GDP growth while cutting energy usage and associated greenhouse gas and other air pollution. Second, a variety of low- and zero-carbon technologies, such as solar, wind and biomass power, advanced industrial processes and highly efficient fuel cells, are becoming increasingly competitive. These technologies can supply energy or produce energy services with little or no carbon emissions, allowing us to further sever the link between GDP and greenhouse gas emissions and other air pollution. Working together, energy efficiency and low-to-zero carbon technologies provide the means of sustaining economic growth while meeting medium- and long-term limits on greenhouse gas emissions. In the longer term, greater technology opportunities exist - including a variety of advanced low-to-zero carbon technologies and carbon sequestration.

In addition to reducing greenhouse gas emissions, these technologies provide other benefits to the nation that have long been the basis of national policy, including: achieving major reductions in criteria air pollutants, decreasing dependence on foreign oil, increasing productivity of domestic

[1]See National Academy of Sciences, Policy Implications of Greenhouse Warming (1991) and Office of Technology Assessment, Changing by Degrees: Steps to Reduce Greenhouse Gases (1991).

industries, and promoting U.S. leadership in the large and growing international market for advanced technologies. Greater penetration of today's energy-efficient technologies can also enhance economic productivity through more efficient use of our energy resources. Shifting capital from energy expenditures to new investments elsewhere in the economy will help drive economic growth, employment and consumer income.

A clear policy on limiting U.S. greenhouse gas emissions would help to focus attention on energy consumption and will provide important incentives for the diffusion of existing technologies and the development of even more advanced technologies. The technological response to past environmental policies, such as acid rain controls and the ban on CFCs, has been dramatic. In both cases, the actual cost of control has been substantially less than early projections.

Unfortunately, even with a clearer market signal, the technology response to a greenhouse gas policy will continue to be restrained. A host of market barriers contribute to today's large energy efficiency gap — the significant underutilization of existing, cost-effective, energy-efficient technologies. Many federal programs, many of which were launched in the President's Climate Change Action Plan, are successfully overcoming market barriers to key energy-efficient technologies through partnerships with the private sector. These programs need to be fully supported, and additional initiatives need to be put in place to target the remaining barriers to the use of energy efficiency and low-to-zero carbon technologies.

Additional barriers lead to systematic under investment in important research and development of new technologies. To achieve a sustainable emissions pathway through the year 2010 and beyond, there is an unavoidable need for advances in low-to-zero carbon energy technologies. As global population and energy demand continue to rise, technological advances provide the key to stabilizing global concentrations of greenhouse gases at safe levels without jeopardizing our quality of life. In order to stabilize greenhouse gas concentrations at safe levels, new technologies will have to reduce emissions by more than a factor of ten during the next few decades and be competitive enough to achieve deployment throughout the world. This need for major and continual advancements can only be met through a strong commitment to Federal RD&D.

## Existing Technologies Offer Significant Potential to Control Emissions

There is clear evidence that the full potential of existing, profitable technologies is not being realized. Many of these energy-efficient technologies have relatively small market shares and low rates of technology diffusion. Their penetration is restrained because of a number of institutional, organizational, and other barriers that work against the diffusion of existing, energy-efficient technologies and the development of advanced technologies. Consumers and decision makers in business are often not aware of the availability of reliable, energy efficient equipment, nor the significant cost savings this equipment can offer. Even if they are aware, they may lack the information needed to make important investment decisions, or access to reasonable finance terms.

A number of federal, voluntary programs are currently enhancing markets by overcoming the barriers to energy efficiency. The Administration's Climate Change Action Plan (CCAP) launched over 40

initiatives in 1993. Building on other DOE and EPA programs, the CCAP's goal was to return U.S. greenhouse gas emissions to 1990 levels by the year 2000. Despite large Congressional funding cuts,[2] the CCAP programs are successfully overcoming market barriers and are currently expected to deliver approximately 70% of the emissions reductions originally projected. With continued support beyond the year 2000, these programs will significantly restrain growth in U.S. greenhouse gases through 2010 and beyond. Even at current funding levels, Administration projections indicate that these programs will eliminate 1/4 of total emissions growth through the year 2010, resulting in annual energy bill savings of approximately $30 billion (in 1995 dollars). A sustained commitment to these programs beyond the year 2000 is needed to achieve these results, and restored full funding of CCAP programs will further cut the growth in greenhouse gas emissions. Some examples of CCAP programs include:

- DOE's Rebuild America program and EPA's Green Lights and ENERGY STAR Buildings programs are demonstrating that many of the barriers to energy efficiency in the commercial buildings sector can be overcome. By providing valuable information (no subsidies are provided), these programs have formed over 2500 partnerships to improve energy efficiency in buildings. Partners can reduce their energy use by up to 40% through technology investments with annual rates of return of 20-50%. This potential is significant because total greenhouse gas emissions from energy use in commercial and industrial buildings is equal to all emissions from U.S. light duty vehicles. Program partners have already invested over $1 billion dollars in energy efficiency improvements, and partners are saving over $280 million per year on their energy bills.

- EPA and DOE's ENERGY STAR Consumer Labeling programs are removing barriers that consumers have faced in purchasing energy-efficient home products, such as heating and cooling equipment and appliances. The programs have already transformed a number of markets, including cutting the energy used by computers, monitors, and printers by 50% at virtually no incremental cost to the customer. Other energy-efficient technologies, such as heating and cooling equipment, do have higher initial price tags. The programs are providing important information to consumers through a national education campaign on the highly profitable opportunities that efficient equipment offers when energy bills are considered. Manufacturers of home products are partnering with the federal government and labeling their more efficient products with the Energy Star logo. Through 1996, this program has seen thousands of products labeled and billions of dollars invested in ENERGY STAR products. Consumers are savings over $500 million per year on their energy bills.

Because the CCAP's focus on the year 2000 limited the options that were implemented, a longer term goal provides significant new opportunities to overcome remaining market barriers and develop key technologies.

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[2] Total expenditures on CCAP programs in 1997 is $183 million, 40% million below the President's requested budget of $305 million.

## Research, Development, and Deployment of Clean Technologies

A strategy of continued diffusion of energy efficient and low-carbon technologies and accelerated development of key new low-carbon technologies during the next decade sets the stage for development and diffusion of a number of longer term low-to-zero carbon technologies that may begin to see limited penetration by 2010, but will have substantial impacts after 2010. The accelerated technology development effort must focus on four strategic thrusts: (1) clean power generation, (2) energy efficiency, (3) carbon sequestration accompanying a transition to a hydrogen-based economy, and (4) basic and very advanced research. Responding to the climate problem may require breakthroughs in all of these areas, and in any case the high-risk nature of R&D requires the pursuit of multiple pathways.

Increasing the probability of achieving these desirable outcomes will require expanding the government's current R&D spending in these areas, which is roughly $1.3 billion per year. Also, the policies described in the previous section, including partnerships with industry, market pull deployment initiatives, and improved regulatory processes, will be required to ensure technological success and accelerated market penetration. The benefits could be enormous. A 1997 study by Pacific Northwest Laboratory found that developing and deploying advanced technologies over the next 15 to 30 years could substantially lower the cost to the U.S. and global economy of achieving major reductions in emissions of greenhouse gases.

*Clean Power Generation*

Natural gas technologies now set the benchmark for low cost, cleaner power generation. Further advances in natural gas turbines could yield overall energy conversion efficiencies of 60% or more in the next decade, double conventional plants. High temperature fuel-cells, such as molten carbonate and solid oxide, may have significant application in power generation with further R&D, promising high efficiency and low emissions. Molten carbonate fuel cells could eventually cut greenhouse gas emissions by as much as 50%. Continued advances in high efficiency coal power plants, such as integrated gasification combined cycle, could approach 50%, allowing some continued use of abundant U.S. coal even in a greenhouse gas constrained world while helping the U.S. realize domestic and global market opportunities for these superior technologies.

While electricity from fossil fuels continue to become cleaner and cheaper, expanded R&D and deployment could make a number of renewable technologies competitive on purely economic grounds in the next two decades: wind power, PV, biomass power, solar thermal, and geothermal. In a greenhouse-gas constrained world, these zero-carbon emitting sources of power would be even more competitive. Royal/Dutch Shell projects these technologies to be the dominant global source of energy by the middle of the next century.

Renewable technologies are becoming more economically competitive over time. Both wind and PV are experiencing a 20% cost reduction for every doubling of cumulative production. Photovoltaic (PV) cells, which convert sunlight into electricity, have dropped from 90 cents per kilowatt-hour in 1980 to under 20 cents today while wind power has dropped from 25 cents per kWh to 5 cents. These cost reductions will continue to occur not just because of R&D, such as advances in thin film

PV, but also through economies of scale and improvements in manufacturing that come with increased production. A number of different PV technologies are being pursued, providing multiple opportunities for breakthroughs. Accelerated RD&D for wind could potentially have an impact on $CO_2$ emissions in 2010.

Finally, life extension of nuclear power plants could provide substantial carbon reductions, so technology R&D to provide safe and economic extension of at least some nuclear plants is a vital component of the technology strategy.

*Energy Efficiency*

Technology R&D in transportation is essential because the sector produces one third of U.S. $CO_2$, and large reductions are unlikely without major regulatory changes or substantial technology advances. Also, two other major national problems — urban air pollution and dependence on foreign oil — stem largely from the transportation sector. The current federal strategy is to develop cars and trucks that are highly fuel-efficient as well as ones that run on fuels other than petroleum, including natural gas, electricity, and biofuels (ethanol). An aggressive RD&D strategy could result in significant penetration of much more efficient vehicles and biofuels in the next two decades.

The Partnership for a New Generation of Vehicle (PNGV) with the U.S. auto industry is pursuing multiple technology pathways for both advanced engines and energy storage. These vehicles could be commercially available just prior to 2010 and be 3 times more efficient than today's - providing large potential to reduce greenhouse gas emissions. In the slightly longer term, vehicles powered by proton exchange membrane (PEM) fuel cells have perhaps the greatest long-term potential for reducing transportation $CO_2$. To ensure that the R&D leads to commercially viable vehicles, a number of programs are needed to guarantee that the infrastructure is available to support vehicles that run on non-traditional fuels.

Federal RD&D into buildings technologies has been remarkably successful. Consider just five technologies developed or advanced by the national laboratories in the past two decades at a cost of roughly $40 million — building design software and advanced lighting, windows, oil burners, and refrigerator compressors. These have provided cumulative net savings of more than $28 billion to consumers and businesses, exceeding the $8 billion spent on all energy efficiency R&D since 1978. They now provide 16 million metric tons of annual $CO_2$ savings.

Continued RD&D in the buildings sector is likely to prove just as cost-effective. Key near-term technologies include improvements in lighting, superwindows, advanced design software, high-efficiency appliances, heat-pump water heaters, gas heat pumps, improved insulation and duct systems, more efficient cooling including gas cooling. Longer term R&D could result in electrochromic glazings for windows, building-integrated PV systems, and building fuel cells, all of which could see some market share before 2010 and make a large impact in the following decade.

The Industries of the Future visions and technology roadmaps identify the best R&D opportunities for increasing energy efficiency and reducing emissions in the industrial sector while increasing productivity. These include advanced materials development, separation technology, catalysis,

bioprocessing, renewable feedstocks, sensors and controls, and industrial cogeneration. All of these industries hope to dramatically improve their environmental performance while increasing their competitiveness. The pulp and paper industry, for example, sees the possibility of becoming a no-net-$CO_2$ industry, through a combination of efficient use of energy and biomass cogeneration.

*Carbon Sequestration*

In addition to the portfolio of R&D options related to less $CO_2$ intensive technologies for energy supply and use, capture and disposal of $CO_2$ offers an additional a
lternative for reducing atmospheric concentrations of $CO_2$. If major reductions in $CO_2$ emissions are necessary, and global reliance on fossil fuels continues beyond the middle of the next century, then some form of $CO_2$ sequestration will almost certainly be needed. A long-term R&D strategy would include demonstration of a number of sequestration options and research into their possible environmental impacts; converting $CO_2$ into an industrial chemical feedstocks; other novel sequestration options, such as $CO_2$ fixation by micro-algae; selectively permeable membranes for $CO_2$ capture; processes for converting fossil fuels and biomass into $CO_2$ and hydrogen; development of hydrogen infrastructure technology, including transportation and storage; and PEM fuel cells.

*Basic and Advanced Research*

A number of areas of basic research could prove crucial to responding to climate change, including biotechnology, fermentation microbiology, combustion research, polymer and ceramic science, process engineering, supercritical $CO_2$, new materials synthesis, and nanotechnology. We need to better understand the underlying biochemistry of the bioconversion of carbon dioxide to methane or to other potential fuels and feedstocks. This new research includes the ability to sequence the genetic material of microorganisms and plants, to develop new molecular genetic engineering techniques, and to understand biophysical and biochemical pathways of photosynthesis.

**New and Expanded Efforts to Accelerate Diffusion and the Development of Clean Technologies**

New initiatives are currently being designed to take advantage of the many areas of opportunity. All initiatives described are very preliminary.

Residential/Commercial Sectors

- *Split Incentives* — An initiative to overcome the unique split incentive barriers of landlord/tenant and builder/buyer relationships. In these cases, the people who make investment decisions (i.e., the builder of new buildings, or the landlord) do not pay the energy bills.
- *Energy Information* — An initiative to empower consumers and businesses by providing better information is their monthly energy bills, including benchmark comparisons to efficient homes.
- *Advanced Buildings Technology Development* -- Accelerated development of a portfolio of buildings technologies - such as fuel cells in buildings, reflective surfaces and materials, and advanced windows.

Industrial Sector

- *Acceleration of Industries of the Future* -- The Industries of the Future process for the seven most energy intnsive industries will be accelerated, resulting in successful development of new technologies sooner. These investments will be targeted on those elements of industry's Technology Road Maps which will have the greatest potential to reduce emissions.

- *Cogeneration and Biomass Gasification* -- The development of advanced industrial turbines and biomass gasification technologies will be accelerated to provide many industries with not only inexpensive electricity, but also a means to reduce fossil-based electricity generation.

- *Industrial Partnerships* -- The federal government will work more aggressively with other major industries to achieve significant emissions reductions by 2010.

Transportation

- *Accelerated PNGV Initiative* -- The PNGV initiative will be expanded to accelerate the vehicle development and decrease the costs -making these vehicles even more attractive to consumers.

- *Light Truck Diesel R&D* -- The light truck diesel R&D initiative will increase light truck fuel economy by 40% - cutting emissions from the fast-growing sport-utility vehicles, light truck and minivans market.

- *Increased Ethanol Fuel R&D* -- Increased ethanol R&D will accelerate commercial competitiveness of biofuels by supporting greater feedstock work and accelerating completion of production facilities - bringing ethanol costs down faster than anticipated.

Cross-Cutting Opportunities

- *Financing for Energy Efficiency Investments* — Programs to improve access to financing for energy efficiency investments.

- *"Set Aside" for Clean and Efficient Technologies* — A new U.S. climate change policy would provide unique opportunities to provide further incentives to improve the penetration and innovation of energy efficiency and renewable technologies. For example, under a domestic trading system with a cap on greenhouse gas emissions, a reserve of allowances or a portion of auction revenues could be set aside to spur new R&D investment and production and use of energy efficiency and low-to-zero carbon technologies.

- *Business Accounting Practices* — An initiative to work with businesses to develop new practices that more accurately reflect energy liabilities.

- *Government Procurement* — An initiative to harness the combined purchasing power of all levels of government and provide large markets for efficient and clean technologies. efficient

Electric Utility Sector

- *Biomass Co-firing with Coal* -- Biomass, particularly waste biomass, has been co-fired with coal for over 10 years. This initiative will continue technology development to allow greater fractions of biomass to be co-fired and sponsor technology demonstrations at coal plants and offer technical assistance to plant operators, suppliers, farmers and others.

- *Expanded Renewable Energy Technology Development and Deployment* -- This initiative will expand technology development efforts on key renewable energy technologies such as photovoltiacs, wind and biomass while aggressively working with power companies, States and communities to accelerate their use.

- *$CO_2$ Sequestration and Hydrogen Production* -- This initiative would include demonstration of a number of sequestration options and research into their possible environmental impacts: converting $CO_2$ into an industrial chemical feedstocks; and other other novel sequestration options - such as converting fossil fuels and biomass into $CO_2$ and hydrogen.

cc: JAF
7/10/97 JS
JR

TO: David Sandalow
David Gardiner
David Doniger
Alicia Munnell
Steve Seidel

FROM: Jim Simon

Based on our discussion this morning and later discussions with all of you except David S., I think that there is a consensus about the story that we want to tell and the framework for releasing the economic analysis. I told you that I would put my perception of the consensus on a piece of paper and fax it back.

1. As he said at the U.N., the President believes there should be public discussion about the problem of global warming. We have been assembling the best sources of information as a basis for this discussion.

2. a. It is clear that the globe is warming.

   b. The best judgment of scientists is that mankind has had a hand in the warming.

   [release version of paper on science]

3. a. Global warming will have serious effects.

   b. Quick action by the world is necessary if we are to have any hope of avoiding the most draconian effects that would occur from uncontrolled continued release of GHGs.

   [release version of paper on effects]

4. a. We have done an economic analysis, based on existing models and a review of the literature. We have subjected the analysis to peer review. We have incorporated comments and diverging views.

   b. The clear answer from all the models run by us or anyone else is that, for targets of the type that so

far have been discussed by the international community there need not be a negative effect on the GDP if we accomplish reductions in sensible ways, including:

- accelerating technology diffusion
- using market mechanisms
- reinvesting any revenue wisely
- [others]

[release economic analysis including Reppetto]

5. We are planning regional and national meetings to discuss how the country can contribute to a world-wide solution to this problem.

[release any information about meeting plans?]

* * *

We would thus accomplish several goals:

- get the economic analysis out, in the context of information about the problem

- get out the range of possible economic results, but put forward reasons to hope that the low-cost scenarios can be achieved

- focus debate on the problem and the policy solutions that appear promising for reducing cost

- at the request of the economic agencies, not suggest a position at this time on which international target we adopt.

I hope this is helpful.

**U.S. Department of Justice**

Environment and Natural Resources Division

Office of the Assistant Attorney General — *Washington, D.C. 20530*

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DATE: 7/10/97

TO: D. Sandalow, D. Gardiner, D. Doniger,

TELEPHONE NO.: A. Munnell, S. Seidel

FAX NO.:

FROM: Jim Simon

MESSAGE:

PLEASE NOTIFY SENDER IMMEDIATELY IF YOU HAVE ANY PROBLEMS RECEIVING THESE PAGES.

# FAX

Copy to M Mogus g Shapiro

**Date:** Thursday, July 10, 1997 **Time:** 4:09:01 PM 3 **Pages**

**To:** Alicia Munnell
CEA

**Fax:** 3956958
**Voice:**

**From:** White House Climate Change
Task Force

**Fax:** 202 343 1163
**Voice:** 202 343 1060

**Comments:**

*Predecisional draft -- do not quote or cite*

ISSUE FOR DECISION: How should the Administration proceed in making public its analysis of the economic impact of possible actions on climate change?

BACKGROUND

For some time, the Administration has been under pressure from other nations, Congress, industry and environmental groups to state its position on targets and timetables for the on-going climate negotiations. The Administration has repeatedly stated that a position on a target and timetable would only follow the completion of an exhaustive analytical process including an opportunity for peer review and public input. Most recently in his speech at the United Nations, President Clinton stated his intent to work to convince the American people that climate change is a real and imminent problem and to lay out both the scientific and economic facts "so that they understand the benefits and the costs."

The Interagency Analytical Group (IAT) completed a draft report that was sent to peer reviewers in May. The peer review comments highlighted a number of key areas that needed to be addressed including: the need to put our analysis in the context of the existing literature on this subject; concerns that we had inappropriately dealt with the issue of technological change; concerns that the report relied too heavily on a macroeconomic model instead of a general equilibrium model; and that none of the current models adequately analyzed international trade impacts.

This draft report has found its way to the public, and has now been widely circulated.

Over the coming days and weeks, the Administration faces several upcoming Congressional hearings and numerous meetings with industry leaders where the issue of the status of our economic analysis will be center stage.

OPTIONS

Option 1: Substantially revise the IAT report to focus primarily on the existing literature. Include a brief review of IAT results demonstrating that our analysis was within the range of the literature. Include qualitative "lessons learned" from the analysis.

PROs: Recognizes the difficulty inherent in analyzing long term economic impacts of climate change actions;

Avoids putting out Administration-sanctioned numbers for key economic impacts;

Responds to concerns of peer reviewers by focusing on broad range of possible results from the literature.

CONs: Provides little to show for 2 year Administration analytical effort and little basis for making future policy decisions.

Leaves largely unaddressed the detailed numbers in contained in the draft IAT report and in industry studies.

Undercuts Administration's efforts to work openly with the public, Congress and business community.

OPTION 2: Revise IAT paper to include extensive discussion of WRI study (Repetto), but also to respond to peer review comments and to focus more on current Administration proposals based on market-based trading mechanisms and technology policies. Reduce current emphasis on macroeconomic model (DRI). Focus more on international trading cases. Expand to include G-Cubed model as suggested by several peer reviewers.

PROs: Shifts IAT report from high-cost case in leaked draft (e.g., DRI model, no-trading) to much lower cost cases that more closely reflect current Administration positions.

Satisfies demands by industry and Congress for credible, peer reviewed analysis as basis for on-going and future dialogue and decisions.

Contains multiple models, scenarios and assumptions thereby avoiding focus on any one set of numbers.

CONs:Puts out authorized Administration numbers on economic impacts.

Further emphasizes potential cost savings associated with emissions trading and technology programs.

RELATED ANALYSIS:

1. Under Option 2, a paper providing a closer look at specific sectors has also been prepared and could be used as the basis for discussions with specific industry groups. This paper would not provide any more detail from models than contained in the IAT report, but would include sector specific general background information not contained in the IAT report and would address in more detail issues related to impacts on U.S. industrial competitiveness (e.g., raised in the Byrd Resolution).

2. Paper being prepared that look in detail at potential changes in key energy sectors would be completed under either option for use as guiding future internal decisions.

CC: AHM
SR
JS

# Fax Cover Page

**To:** **Alice Williams**

**Subject:**
**Date:** 07/10/97 05:27 PM
**Pages:** 9 , including cover page

**From:** Melissa Green
**Agency:**
**Organization:**

**Office Phone:**
**Fax Phone:**

Please deliver the following agenda and dicussion paper to your principal for tomorrow's 2:00pm Climate Change Meeting. If there are any problems with the transmission please call Melissa Green at 456-5804. Thank you.


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# Agenda
# NEC/CEQ Principals Meeting
# Climate Change
# July 11, 1997

I. Interagency Decision Process

II. Domestic Emissions Trading

# CLIMATE CHANGE POLICY WORKGROUPS

1. **Domestic Policies**
    - A. Domestic Emissions Trading
    - B. Technology Policy
    - C. Transition Assistance
    - D. Regulations and Standards
2. **International Policies**
    - A. International Emissions Trading & Joint Implementation
    - B. Developing Country Issues
    - C. Enforcement/Compliance

# DISCUSSION PAPER:

# DOMESTIC EMISSIONS TRADING PROGRAMS FOR GREENHOUSE GASES

## 1. Introduction

Under emissions trading programs, emissions allowances are first allocated or auctioned. These allowances may then be traded. Allowances can have substantial value, so distributional issues are an important component of program design.

Emission trading programs offer both static and dynamic efficiency advantages over more traditional forms of regulation. Trading allows those with higher abatement costs to purchase allowances from those whose costs are lower. Total costs will therefore be lower than under traditional regulation, which require all polluters to comply with a specific standard. Nevertheless, emissions trading may often involve people and firms adjusting to higher prices.

Under traditional regulation, firms have little incentive to abate pollution by more than the minimum required. As a result, firms under-invest in pollution control R&D. Emissions trading offers dynamic efficiency gains by creating incentives to continuously improve pollution abatement technologies in order to generate surplus allowances for sale.

## 2. US Experience with Emissions Trading

The US has had more experience with emissions trading than any other country. Examples include:

*Sulfur Dioxide ($SO_2$) Allowance Trading:* The Clean Air Act Amendments of 1990 required a 50% reduction in $SO_2$ emissions from electric utility boilers. To accomplish this goal, a fixed number of emission allowances were allocated to electric utilities based on a formula reflecting historical emissions. In addition, a small portion of allowances are auctioned every year to facilitate price discovery and new entrants. Allowances are specifically excluded from being defined as rights to pollute, may be traded to any party anywhere, and may be banked for use in future years. Participants need to conduct regular monitoring of emissions and make an annual accounting of their emissions. Penalties are imposed if emissions exceed the number of allowances held by a source.

A functioning market in $SO_2$ allowances now exists, involving both bilateral exchanges between companies, and brokered exchanges through third parties. This market, along with other factors. These include the fact that the target that was actually adopted was not as onerous as many in industry had feared, the low price and widespread availability of low sulfur coal, the awarding of bonus allowances,[illegible] the postponement of investments, and lower than expected transportation costs has helped to dramatically reduce the cost of the abatement program. Initially, forecasters claimed that a 50% reduction (10 million tons) in SO2 would correspond to allowance prices in the range of $400 to $1000. Hahn, Robert W., and Carol Mey, "The Behavior of the Allowance Market: Theory and Evidence," The Electricity Journal, March, 1994. However, prices for allowances that would be needed in the next decade to achieve this level of emission reduction currently range between $100 to $120. In addition, 1995 emissions were actually 40% below the legally required levels for that year.

*Water Effluent Trading:* The US generally has regulated surface water quality through a system of discharge limits for large sources of water pollution. In addition, states have standards for ambient water quality which are often not attained even after large dischargers apply best technology. The reason is that small (nonpoint) sources (such as runoff from farms) contribute significantly to water pollution. A number of state and local governments are employing trading systems for watersheds that either permit trading among large dischargers, or allow large dischargers to fulfill their requirements by controlling nonpoint sources. These include the Fox River in Wisconsin, the Dillon Reservoir in Colorado, and the Tar-Pamlico River in North Carolina. The latter two programs are designed to manage future economic growth. Thus, the quantity of effluent

allowances allocated exceeds current discharge levels. Once growth consumes this excess, trading is expected to reduce compliance costs.

*Inter-refinery Lead Trading.* EPA operated a lead trading program from 1983 to 1987 as it phased out lead from gasoline. Lead trading allowed refiners and importers to trade lead reduction credits in order to meet limits for the lead content of gasoline. The quantity of allowances to which a firm was entitled was determined by the amount of leaded fuel produced by the firm and the contemporaneous EPA standard. Those who bettered the standard could sell their credits to others. Some 10 billion grams of lead were traded during the course of the program at prices ranging from 0.75 to 5 cents per gram. Allowing the trading of lead credits reduced the costs of the program by approximately 20 percent.

*Criteria Air Pollutant Trading:* EPA first began incorporating aspects of emissions trading in its air program in 1974, when it allowed a modified source to use credits earned by another source within the same plant to avoid additional regulatory requirements. Since then, emission trading has substantially expanded. Trades have numbered in the thousands and have been estimated by Hahn and Hester (1986) to have achieved savings between $525 million and $12 billion.

*Market Mechanisms for Chlorofluorocarbon (CFC) Phaseout:* Under the 1987 Montreal Protocol to limit stratospheric ozone depletion, the U.S. required the phase out of the production of CFCs by 1996. As part of its program, the U.S. adopted a tradeable permit regime covering CFC manufacturers and importers. These allowances were allocated based on each firms 1986 market share. As the market for CFCs declined, the system allowed firms to allocate production among different facilities according to the least-cost pattern of supply. It also gave CFC users the flexibility to switch between different CFC compounds, within the overall limit on allowances. This program helped reduce the costs of the phaseout. In 1988, EPA estimated that the cost to *halve* CFC use would be $3.55 per kilogram. By 1993, it became clear that all uses could be *eliminated* by 1996 at a cost of $2.45 per kilogram.

### 3. Emissions Trading of Greenhouse Gases

A greenhouse gas emissions trading program would likely contain several elements. First, emissions budgets would be established. Some entity or entities would be given responsibility for verifying compliance and the integrity of allowances. Noncompliance with allowance limitations or reporting requirements would result in penalties. The program would establish permit lifetimes, monitoring and enforcement provisions, and rules for permit banking, borrowing, and trading.

Among the important issues to be addressed in designing a domestic emissions trading program are:

--Where the constraint is imposed. A primary fuel trading program would limit the production or import of fossil fuels. A sectoral trading program would limit emissions from one or more key sectors (e.g. utilities, transport or heavy manufacturing).

--How permits are distributed. Permits could be given to existing emitters, given to others (who could then sell them back to existing emitters), auctioned, or some combination of the foregoing. If permits are auctioned, substantial revenues could be raised. (Options for using these revenues include tax cuts, deficit reduction and support for transitional or technology programs). If permits are given away, recipients would potentially receive a windfall.

These and related issues are discussed below.

**A. Where the constraint is imposed.**

Carbon dioxide from fossil fuel combustion currently accounts for about 85% of U.S. greenhouse gas emissions. A trading program could be implemented at various points in the energy market, including fuel import, fuel extraction, processing, refining, distribution, and secondary conversion (e.g., coal to electricity). These points could vary by sector. For example, an emissions trading program could focus on the point of final combustion for coal, but on refining for oil, or distribution for natural gas.

Possible programs are described below:

*Primary Fuel Emissions Trading*

The primary fuel producing sector extraction, processing, refining, and distribution has many levels where a permit program could be implemented. One option would be to require permits at the point of first sale (a permit is surrendered with the first inter- or intra- company transaction). Such a system would include transactions between a coal company and an electric utility, between a natural gas producer and its marketing arm, between a natural gas producer and a broker, or between an oil extraction company and its refinery operations. Fuel importers would also require permits to import fuel. This would capture the carbon from fuel consumed in the refining process. The number of market actors under this program design would be under 5000 and virtually all carbon in the energy sector would be included in the program.

*Sectoral Emission Trading*

An emissions trading program could also be applied at the point of combustion, allowing trading among affected sources. This system would be most comparable to the current $SO_2$ emissions allowance trading system.

Including the six largest industrial $CO_2$-emitting sectors (electric utilities, cement, primary metals, pulp and paper, petroleum refining and chemicals) in a trading program could encompass as many as 20,000 market participants and 90 percent of industrial $CO_2$ emissions. Mobile source emissions could be indirectly included in the system by allocating transportation equipment manufacturers permits for emissions associated with their automobile fleets or by including refiners in the program. Residential and commercial emissions could be similarly addressed by focusing upstream in the energy system. The electric generating sector could use existing monitoring and reporting infrastructure.

In determining where constraints would best be imposed, the following factors may be relevant:

*Administrative and compliance feasibility:* The number of sources involved in the trading program should be small enough to be administratively feasible and large enough to ensure market competition. In addition, monitoring and verification of permit compliance must be possible for those included in the program.

*Public Acceptance:* The program must consider the ease or difficulty with which various allocation approaches would be accepted by the public.

*Potential to Diffuse Low Greenhouse Gas Technologies:* Alternative points of intervention should be evaluated for their ability to provide incentives for research, development, adoption and diffusion of low greenhouse gas technologies.

*Market Impacts:* The permit program will have economic impacts on firms that vary depending on program design. For example, exempting certain sizes or categories of sources from permit

requirements because of administrative or equity concerns (e.g., small boilers or home heating oil) has competitive implications within the energy market.

*Consistency with the international trading system:* The domestic program should be consistent with any international prescriptions concerning the coverage of sources and gases.

**2. Who gets permits**

In an emissions trading system, permits can be given to existing emitters on the basis of baseline/historical emissions or other formulae, given to others (who can then sell them to emitters), auctioned (where revenues accrue to the government), or some combination of the foregoing.

Permit allocation formulae could take into account the market impacts of the mitigation program. Set asides could be made available to those industries, workers or consumers who experience a disproportionate share of the costs of control. A set aside could also be auctioned, with the revenues used for the same purpose.

*Allocation Based On Baseline/Historical Emissions*

Under this approach, sources are given a number of permits based on baseline fuel production or emissions and an allocation formula. Various allocation formulae can be devised, weighted to greater or lesser degrees in favor of sources with high historical emissions. Emissions allowances are endowed to facility operators for no cost and would be transferable. Those receiving permits thus obtain assets of potentially large value from the government at no cost.

Such an allocation mechanism could create entry barriers. In a capital intensive sector like primary fuel production, where entry barriers are already substantial, new entrants would be further disadvantaged if they had to purchase permits especially if existing holders hoard permits. This problem could be mitigated by setting aside a number of permits for purchase by new entrants or by auctioning a portion on the open market. Such an auction would also facilitate price discovery in a new market. Although new firms will still be disadvantaged (as they will pay for all of their permits), they would be able to enter the market. The pool of permits would need to be withheld from existing sources to ensure compliance with budgeted national emission levels.

It may be desirable to design an allocation that would allow credit for early emissions reductions (those achieved prior to the start of the program, but after the baseline period) -- in particular for those that reduced greenhouse gas emissions as part of government sponsored voluntary programs. If credits for past actions are given, the total credits allowed would need to be deducted from the overall permit allocation for the first budget period in order not to exceed the national greenhouse gas emissions target. In addition, mechanisms may be necessary to ensure verification of these credits.

*Auction*

Alternatively, an auction could be used to allocate permits. The price permit holders pay would depend in part on the auction design or method used. Auctions ensure that permits cannot be hoarded (a concern often expressed regarding allocation approaches), are available for trade, and would serve to inform potential traders about current price levels. Auctions would put new entrants on the same footing as existing emitters. As discussed earlier, since an auction could produce substantial revenues, some decision would have to be made with respect to what to do with the proceeds.

Given that an auction could produce substantial revenues, some decision would have to be made with respect to what to do with the proceeds. They could be used exclusively to reduce taxes or the deficit. Alternatively, as discussed below, a portion of the revenues could be used to address inequities in the distribution of control costs and to fund R&D for less carbon intensive energy sources and end uses.

*Supporting Technological Progress and Transitions*

The allocation of permits, or the use of auction revenue, could be used to promote more rapid diffusion of existing climate-friendly technologies and accelerated R&D for new technologies. For example, a reserve of allowances could be set aside to encourage more rapid development and diffusion of low greenhouse gas emitting technologies. Manufacturers of energy consuming equipment could compete for the set aside based on the degree to which they produce equipment more efficient than the average in use or than required by current mandatory efficiency standards. Such a program

could yield reductions in energy demand and help buffer the consumer from the impact of higher energy costs. Similar results could be achieved with the use of auction revenue.

Permit allocation formulae could take into account the market impacts of the mitigation program. Set asides could be made available to those industries, workers, or consumers who experience a disproportionate share of the costs of control. Auction revenues could also used for this purpose.

**C. Non-carbon greenhouse gases**

Greenhouse gases include not only carbon dioxide, but also methane, nitrous oxides, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). Gases differ both in their atmospheric lifetimes and in their ability to trap heat in the atmosphere. In addition, carbon is not only emitted through the combustion of fossil fuels, but is also absorbed by sinks such as trees and soils.

Gases other than carbon dioxide account for the 15% of U.S. greenhouse gas emissions. Most important is methane, which accounts for 11% of national emissions. Since gases differ in their lifetimes and in their potential to trap heat in the atmosphere, an exchange rate or trading ratio must be established to convert all gases into common units for inclusion in a trading program. Such ratios have been developed by climate researchers and could be applied here. These should be consistent with the rules established in the international protocol.

Several, although not all, of the many sources of non-carbon greenhouse gases could likely be included in a trading system. For example, methane emitting coal mines, landfills, livestock manure management facilities and potentially natural gas distribution systems may meet the criteria described above for inclusion in a greenhouse gas trading program. These sources account for 7% of national greenhouse gas emissions. Similarly, emissions of some sources of other gases could potentially be included (e.g., magnesium production).

Forests in the United States currently remove an amount of carbon equal to 8% of national emissions from the atmosphere. Their inclusion in the trading program would enhance the systems flexibility, although there could be considerable methodological challenges with such an approach.