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**TESTIMONY OF DR. JANET YELLEN
CHAIR, COUNCIL OF ECONOMIC ADVISERS
BEFORE THE HOUSE COMMERCE COMMITTEE
ON THE ECONOMICS OF THE KYOTO PROTOCOL
MARCH 4, 1998**

Thank you, Mr. Chairman. The President has said that we can work to avert the grave dangers of climate change, while at the same time maintaining the strength of our economy. I agree and am pleased to have this opportunity to appear before the Committee to elaborate on the Administration's views on these issues.

The international agreement that was reached in Kyoto this past December is a crucial step forward in addressing global climate change. But it is only one step in a journey. Since the international effort to reduce greenhouse gas emissions is still in some respects a work-in-progress, it is not yet possible to provide a full authoritative analysis of it. Many of the specifics in several crucial areas are not completely resolved in the diplomatic arena, forcing analysts to make a variety of assumptions about the ultimate form of the international regime. In my testimony today, I will attempt to identify key elements of the agreement and the Administration's policy, such as international emissions trading, meaningful developing country participation, inclusion of land-use activities that absorb carbon ("sinks") and six categories of gases, as well as domestic initiatives, that together can ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will explain the reasoning underlying our conclusion that, under these conditions, economic impacts are likely to be modest.

The Administration is strongly committed to ensuring that these key elements are reflected in our domestic and international climate change policies. We are firmly committed to

meaningful developing country participation, the use of sinks to offset emissions requirements, and emissions trading both domestically and internationally. And as you know, the President's FY 1999 budget includes a \$6.3 billion package of tax cuts and R&D investments over the next 5 years; this package makes good sense in terms of energy policy and will jumpstart our efforts. A final component of the President's climate change policy is his support for electricity restructuring in a manner that will offer approximately \$20 billion in cost savings to electricity consumers, while reducing greenhouse gas emissions.

I. Basic Economic Rationale of the Kyoto Treaty

To begin our analysis, it may be worth stepping back and examining the larger question of the basic rationale, from an economist's perspective, for the Kyoto Protocol.

The earth's surface appears to be warming from the accumulation of greenhouse gases from myriad sources worldwide. None of these emitters presently pays the cost to others of warming's adverse effects -- a classic externality in the language of economists. As a result of these distorted incentives, disruption of the Earth's climate is likely to proceed at an excessive pace and if left uncontrolled may pose substantial costs in terms of harm to commerce and the environment alike. The fundamental economic logic of the Kyoto Protocol is thus that without such an international agreement, individual nations will not have the proper incentives to address the threats from global climate change.

II. Costs of Climate Change

In evaluating efforts to mitigate global warming, the first step is to consider the costs

of inaction. These costs --and they are significant-- provide the primary motivation for actions to reduce greenhouse gas emissions.

The Intergovernmental Panel on Climate Change (IPCC) jointly established by the World Meteorological Organization and the United Nations Environment Programme, concluded in 1995 that "the balance of evidence suggests that there is a discernible human influence on global climate." Current concentrations of carbon dioxide, methane, nitrous oxide, and the other so-called greenhouse gases have reached levels well above those of preindustrial times. Of these, carbon dioxide (CO₂) is the most important: net cumulative CO₂ emissions resulting from the burning of fossil fuels and deforestation account for about two-thirds of potential warming from changes in greenhouse gas concentrations related to human activity.

Climatic Impact

If growth in global emissions continues unabated, the atmospheric concentration of CO₂ will likely double relative to its preindustrial level by midway through the next century and continue to rise thereafter. As a result of the increased concentration of CO₂, the IPCC estimates that global temperatures will increase by between 2 to 6 degrees Fahrenheit in the next 100 years, with a best guess of about 3.5 degrees Fahrenheit. While scientists believe that human activities are leading to a gradual warming of the *average* temperature of the earth, the change in temperature in a given region at a given time may differ substantially from this average. Indeed, models predict warming will be greater in high latitudes than in the tropics, and greater over land than ocean.

Potential consequences associated with this shift in climate include a rise in sea levels, greater frequency of severe weather events, shifts in agricultural growing conditions from

changing weather patterns, threats to human health from increased range and incidence of diseases, changes in availability of freshwater supplies, and damage to ecosystems and biodiversity.

Economic and Monetary Damages

The derivation of quantitative or monetary estimates of the damages from such a change in the climate is extremely difficult given the capacity of today's models. Estimates of the economic damages from climate change fall into the following broad areas: agriculture, sea-level rise, air conditioning and heating, water supply, human life and health, air pollution, and other costs (hurricanes, relocation costs, human amenity, construction, leisure activities, urban infrastructure, and ecological damages such as forest loss and species loss). Although the quantification of these effects is quite demanding, researchers have developed estimates that prompt substantial concern. The IPCC reports that a doubling of carbon dioxide levels would lead to approximately 10,000 estimated additional deaths per year for the current U.S. population from higher summer temperatures, even after netting out the effects of warmer winters and assuming acclimatization. Other researchers have predicted sea level increases of about 20 inches by 2100, with greater increases in subsequent years.

Despite the difficulties, respected researchers have developed estimates of the monetary damages expected from an average worldwide temperature increase. For example, William Cline, then of the Institute for International Economics, estimated that a temperature change of 4.5 degrees Fahrenheit would impose annual damages of about 1.1 percent of GDP per year on the U.S. economy. That amounts to \$89 billion in today's terms. (Cline's original estimate is quoted in 1990 dollars. The figure given above translates this number into 1997

terms by scaling it to current GDP.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of greenhouse gas concentrations. Although he uses methods that differ from Cline's in several respects, Nordhaus estimates that a slightly larger temperature change of 5.4 degrees Fahrenheit would impose losses equal to about 1 percent of GDP. A third independent estimate reported by Nordhaus is close to Cline's. It must be noted, however, that this similarity among aggregated estimates masks the true uncertainty associated with forecasts of the damages from given increases in global warming -- the estimates are all fundamentally based on extrapolations from current and past experience, and may not fully incorporate effects that will unfortunately become apparent only with future experience.

One key difficulty in interpreting and monetizing these estimates of damages is uncertainty over the extent that they should be discounted because they occur in the distant future. Since the benefits of stemming future climate change accrue over not only decades but centuries, small changes in the discount rate can produce substantial changes in the results. But the precise discount rate that should be used to evaluate questions as important as the future climate of the planet remains a subject of intense debate. It is safe to say that there is, as yet, no professional consensus on the issue. Indeed there can be no technical answer to the ethical question how we should value the welfare of future generations.

A similar difficulty with such estimates is that they do not include potential nonlinearities in the relationships between greenhouse gas concentrations and temperature, between temperature and economic damages, or in the various other complicated relationships governing interactions between greenhouse gas emissions, the climate, and the economy. Current estimates

of damages do not, and cannot, accurately reflect the value of reducing the unknown risk of large-scale and potentially irreversible discrete events with potentially catastrophic consequences.

Two such possibilities serve as illustrations. Warming of Northern tundra may release huge amounts of methane from the permafrost, thereby leading to accelerated warming. We do not know at what point, if any, such potentially unstable activity would be triggered. Second, evidence from climate models suggests that some types of climate change may lead to changes in ocean currents, including weakening of the Gulf Stream that warms Western Europe. Scientific evidence suggests that abrupt seawater temperature shifts have occurred over periods as short as decades.

To what extent are we willing to take such chances with our planet? There is a strong argument for the Kyoto Protocol as a form of planet insurance. But what numerical weight should one assign to these catastrophic risks? In other words, what is the value of the insurance policy? Although it is difficult for an economist, or anyone, to know, reductions in the risk of such catastrophic outcomes must be considered in addition to the costs and benefits that can be reasonably quantified. Since human beings are typically averse to risk, such catastrophic risks are especially important in evaluating whether the benefits of a particular climate control policy justify the costs. One must have at least some sympathy with those who criticize economists on the grounds that the effects of climate change are extremely difficult to quantify in a single monetary number.

III. Addressing Global Climate Change in an Efficient Manner

The costs of unabated climate change may thus be difficult to quantify, but they are nonetheless real and provide the motivation for reducing greenhouse gas emissions. In taking action to reduce those emissions, economic analysis suggests that two elements are absolutely essential:

- The effort must be global, to address the global externality inherent in the nature of the problem.
- The effort must be flexible and market-based, to ensure that we achieve our objectives in the most efficient manner possible.

Need for Global Action

Climate change is a global problem requiring a global solution. As I mentioned earlier, no single country has an incentive to reduce emissions sufficiently to protect the global environment against climate change. Each has an economic incentive to “free ride” on the efforts of others. Even if the United States sharply reduced its emissions unilaterally without an international agreement limiting emissions abroad, greenhouse gas emissions from all other countries would continue to grow, and the risks posed by climate change would not be significantly reduced. It is important to emphasize that emissions of different gases anywhere in the world have very similar effects on global climate.

The threat of disruptive climate change has led to coordinated international efforts to reduce the risks of global warming by reducing emissions of greenhouse gases. A landmark international agreement to address global warming was the Framework Convention on Climate

Change signed during the Earth Summit in Rio de Janeiro in 1992. This convention established an objective of limiting greenhouse gas concentrations and called upon industrial countries to return their emissions to 1990 levels by 2000. Since then, it has become clear that the United States and many other participating countries will not meet this voluntary goal; quite the contrary, emission levels have continued to rise not fall among both developed and developing countries.

To address the lack of progress among many industrialized countries toward meeting the Rio objective, the United States and approximately 160 other nations agreed in negotiations held in Kyoto, Japan, last December, to reduce emissions of greenhouse gases. The Kyoto Protocol, which requires the advice and consent of the Senate, would place binding limits on each industrial country's combined emissions of the six principal categories of greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. These limits apply to the 38 so-called Annex I countries, which are the industrialized countries, defined to include Russia, Ukraine, and most Eastern European countries.

Under the Kyoto Protocol, each industrial country's baseline is its 1990 emissions of CO₂, methane, and N₂O and its choice of 1990 or 1995 levels of the other three categories of gases. The United States agreed to a target of 7 percent below this baseline by the period between 2008 and 2012. Given the changes in the definition of the baseline for the three long-lived chemical compounds (HFCs, PFCs and SF₆) from 1990 to 1995 combined with a change in the way sinks are accounted for in the baseline, the actual reduction required in the U.S. is no more than 2-3% more than the President originally proposed as the U.S. negotiating

position. The targets for the European Union and Japan are 8 percent and 6 percent below 1990 levels, respectively. Australia, New Zealand, Norway, Russia, and Ukraine all have limits somewhat less ambitious when phrased as cuts relative to their 1990 levels. In sum, over the period from 2008 to 2012, the industrial countries are expected to reduce their average emissions of greenhouse gases to about 5 percent below their 1990 levels.

The President has made clear that he will not submit the Kyoto Protocol to the Senate without meaningful participation from key developing countries (who are not included in Annex I).

There are several reasons why meaningful participation from developing countries is essential. First, developing countries are projected to contribute a majority of world emissions around 2030 under a continuation of business-as-usual. Without the participation of developing economies, efforts by the industrialized countries to limit emissions will therefore not provide adequate protection from climate change.

Second, developing country participation is crucial because it would permit relatively low-cost emissions reductions to be internationally recognized as a substitute for more expensive emissions reductions that might otherwise be achieved domestically by U.S. companies and those in other industrialized countries. Since greenhouse gas emissions have the same basic impact on the climate regardless of where they occur, emission reductions in developing countries have the same environmental benefit as reductions in the U.S. But these reductions are much less costly than reductions in the U.S. or in other developed nations, because of the very inefficient and carbon-intensive uses of energy in these countries today. It thus makes sense, from both an environmental and an economic perspective, to incorporate emissions reductions in

developing countries into the international system.

Third, principles of basic fairness suggest all countries should do their part, depending, in part, on their ability to contribute to the solution. Thus even poor countries should participate, although the lack of resources in such countries may limit the extent of their participation.

Some have expressed fears that the Kyoto Protocol might adversely affect the competitive position of American industry. Evaluating how the Kyoto Protocol could affect competitiveness of a few specific manufacturing industries -- especially those that are especially energy-intensive, such as aluminum and chemicals -- is complex. The answer depends, in part, on the impact of the agreement on energy prices, which we will shortly address. In general it is difficult to undergo a structural change in the economy without having the effect of expanding some sectors and contracting others. But to provide some perspective on this issue, consider the following facts. First, on average, energy constitutes only 2.2 percent of total costs to U.S. industry. Second, energy prices already vary significantly across countries. According to the *1997 Statistical Abstract*, for example, in 1996 premium gasoline cost \$1.28 per gallon in the United States -- but only 8 cents per gallon in Venezuela. Similarly, gas prices were \$3.71 per gallon in Switzerland and \$4.41 per gallon in France. Electricity prices also vary significantly: in the U.S. they were 5 cents per kilowatt hour in 1995, a fraction of prices in Switzerland of 13 cents per kilowatt hour. Yet U.S. industry is not moving en masse to Venezuela, nor is Swiss industry moving to the United States. Third, roughly two-thirds of all emissions are not in manufacturing at all, but in transportation and buildings, sectors which, by their very nature, are severely limited in their ability to relocate to other countries. We therefore believe we need

developing country participation because the problem is global and cost-effective solutions are essential, than to avoid adverse effects on competitiveness.

Flexibility and Market Mechanisms

A global solution is thus critical to the global problem of climate change. Globalizing the solution is not, however, enough by itself. We must also ensure that our efforts to reduce global greenhouse gas emissions reductions in the most efficient manner possible. The nature of the climate change problem suggests three basic methods to lower costs of achieving given levels of environmental protection. They can be characterized in terms of three categories of flexibility: (1) "when" flexibility; (2) "what" flexibility; and (3) "where" flexibility, which may be the most important of all. Such methods have long been championed by economists interested in increasing the efficiency of protection. Indeed, over 2,500 economists from academia, industry, and government alike urged such approaches in a letter they signed last year advocating action on climate change:

"Economic studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs...The most efficient approach to slowing climate change is through market-based policies."

1. "When flexibility" (timing)

First is "when flexibility" or timing. Since climate change is a long-term problem, the exact timing of emissions reductions is, within some range, not of primary importance. Thus the freedom to delay or accelerate reductions within an agreed upon time frame -- while ensuring credibility of emissions reductions -- lowers costs.

As a result of U.S. leadership, the Kyoto Protocol incorporates this principle of "when

flexibility” in four ways:

- First, the initial emissions reductions are less severe, and the period over which they occur ends much later than what had been proposed by many other countries. By adopting a gradual and credible path of reductions in the early years, we can greatly reduce costs such as those from prematurely scrapping coal-fired electricity plants, while attaining the same ultimate environmental goals.
- Second, under the Kyoto Protocol, the emissions target is not specified in terms of a specific year, but rather in terms of an average over a five-year period (2008-2012). Averaging over five years, instead of requiring countries to meet a specific target each year, can lower costs, especially given an uncertain future. The averaging can smooth out the effects of short-term events such as fluctuations in the business cycle and energy demand, or hard winters and hot summers that would increase energy use and emissions.
- Third, there is allowance for “banking” emission reductions within the 2008-2012 commitment period, for use in a subsequent commitment period [although the emission targets of the subsequent periods have not yet been specified].
- Fourth, CDM credits achieved between 2000 and 2008 may be banked until 2008 to 2012.

2. “What flexibility” (gases and sinks)

The second type of flexibility is “what flexibility”, along two dimensions. The first is the inclusion in the agreement of all six greenhouse gases. Emissions of different kinds of gases, not just carbon dioxide, contribute to the greenhouse effect. Since the IPCC has developed

conversion factors for all greenhouse gases by estimating their global warming potentials, reductions in emissions of one gas can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects. Again at U.S. urging, all six gases are included, while Japan and the EU had insisted until the end on covering only three. Thus the U.S. succeeded in having the Kyoto Protocol stipulate that countries with binding targets are to reduce their *total* greenhouse gas emissions by certain percentages, but does not require specific reductions for specific gases. Since a molecule of sulfur hexafluoride is 23,900 times more potent over 100 years than a molecule of CO₂, it may be cheaper to achieve the same environmental benefit by eliminating one molecular unit of SF₆ than nearly 24,000 units of CO₂.

Some initial analysis indicates that a strategy of reducing non-CO₂ greenhouse gas emissions by a greater percent than CO₂ emissions could lower prices by as much as 10 percent. Thus allowing countries flexibility in what gases they reduce -- essentially trading emissions reductions across gases -- can help lower significantly the costs of meeting their targets.

The second source of "what flexibility" is the treatment of sinks, i.e., land use activities that promote the removal of carbon from the atmosphere through the growth of plants. At the urging of the U.S. delegation, sinks can be used to offset emissions targets. Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO₂ at much lower costs than reducing emissions of greenhouse gases.

3. "Where flexibility" (international)

The third type of flexibility, and perhaps the most important, is "where flexibility" (international). As I have already emphasized, emissions have the same environmental consequences regardless of where in the world they occur. Therefore, the least-cost approach to

controlling climate change is to reduce emissions wherever such reductions are cheapest. The Kyoto Protocol, because of U.S. insistence and persistence, includes three important cost-saving provisions of this nature.

- First, it provides the opportunity for countries that take on binding targets to trade rights to emit greenhouse gases with each other. This market in emissions permits could ensure that emissions reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emissions reductions in other participating countries when doing so would reduce their costs -- thus lowering costs without affecting the level of environmental protection. While currently only industrialized countries have emissions caps, this mechanism also offers an incentive for developing countries to take on emissions targets.
- Second, the agreement provides for Joint Implementation by Annex I countries. Thus if some countries do not develop programs to trade permits internationally, U.S. firms could nonetheless implement projects in those countries for which they could receive emissions reductions credits in the U.S.
- Third, the agreement allows industrial countries to invest in "clean development" projects in the developing world and use these projects' certified emissions reductions toward meeting their targets. Many such clean development projects may be quite cheap in terms of the cost per ton of emissions avoided, as has been illustrated by the Joint Implementation pilot program that is already in place in the U.S.

Details of how these provisions will operate will be discussed in future negotiations such as the one in Buenos Aires later this year. Nonetheless, effective international trading of

emission credits, Joint Implementation, and the Clean Development Mechanism can lead to substantial reductions in costs relative to alternative policies that do not exploit the power of market incentives. To illustrate briefly the ability of U.S. industry to perform beyond expectations when given appropriate economic incentives, consider further EPA's highly acclaimed sulfur dioxide (SO₂) program, which relies, among other things, on a system of tradeable permits to reduce emissions of SO₂ from electric utilities. The SO₂ program has been successful in several ways: a large number of utilities participate, SO₂ emissions and ambient concentrations have fallen and the costs of reducing emissions are considerably lower than originally forecast.

As has been frequently noted, the average cost of SO₂ emissions reductions has recently been significantly lower than was originally forecast, in part due to the role of incentives in fostering innovation. Emission permit prices, currently at approximately \$100 per ton of SO₂, are well below earlier estimates of around \$250 to \$400 per ton.

Trading programs may not always bring cost savings as large as those achieved by the SO₂ program; trading programs will not always be accompanied by the discovery of much cheaper control strategies. However, the SO₂ experience demonstrates clearly how programs like international permit trading, Joint Implementation, and the Clean Development Mechanism will lead firms to find cheaper ways of reducing emissions that can lead to unexpectedly low costs.

IV. Difficulties of Economic Analysis of the Kyoto Protocol

Now that we have a Protocol -- even if it is not yet fully complete nor ready for the President's submission to the Senate -- it is possible to examine it in somewhat more detail from

an economic perspective. But, once again the inherent limitations of any such estimates deserve emphasis. Such limitations should not be surprising to you: economists have a difficult enough time projecting the behavior of the economy over the next quarter or year, let alone over the next two decades. The scale of the forecasting exercise is therefore daunting, and any specific results should be treated with substantial caution.

The difficulties associated with economic analysis of climate change fall into three broad categories. First are the uncertainties that still remain over the terms of the ultimate treaty, necessitating assumptions on which the analysis is predicated. Second are the inherent limitations of available models to analyze even short-term costs and benefits. And finally is a topic discussed earlier: the impossibility of putting a single monetary number on the long-term benefits of climate change mitigation, although there will clearly be economic benefits of emission reductions.

Uncertainties in the International Effort to Combat Climate Change

The Kyoto Protocol was an historic accomplishment, delineating the broad terms of the international effort to address climate change. But although we know a lot more than we did before Kyoto about how that international system can work, and that informs our analysis, there is still much that we do not know.

First, some provisions raise complex implementation issues. At issue here is the treatment of so-called sinks -- activities that affect the rate at which carbon is removed from the atmosphere and "sequestered," e.g., by the planting of trees.

Second, the details of a number of items -- primarily concerning international trading, the Clean Development Mechanism, and developing countries -- are the subject of further

discussions including future negotiations in Buenos Aires next fall, because they had not been definitively settled by the end of the Kyoto talks.

Finally, and most importantly, we have not yet negotiated international agreements to limit emissions beyond the 2012 window. The emission cuts agreed upon at Kyoto are only a first step on a long journey. The first step that we propose to take over the next 15 years is critical. But the reason it is critical is *not* that, by itself, it will solve the climate change problem -- emissions during any given decade are small compared to the cumulative concentrations in the atmosphere. Rather, the first step is critical because we can not take the second and third steps until we have taken the first. At the same time, any analysis is complicated by the lack of knowledge over what the subsequent steps will be.

Inherent Limitations of Models

In addition to these uncertainties about the details of the international effort to address climate change, are the inherent limitations of the models used to evaluate that effort. Even within a given model, answers depend critically on the precise nature of the question asked. For example, the costs of emissions reductions depend critically on the extent of global participation and international trading that a treaty is assumed to feature. But in addition to the dependence of the results from a given model on the precise assumptions, different models can give different answers even when all the assumptions are specified to be the same -- a concrete illustration of the range of uncertainty to which we must assign the predictions of any one individual model.

One area in which the uncertainty is particularly large is the pace of technological progress --especially the diffusion of existing energy-efficient technologies, but also the development of new technologies -- and the extent to which the pace will accelerate in response

to government programs. Models and experts on climate change policy tend to have a wider range of disagreement on the scope for speeding the diffusion of existing energy-efficient technologies than on any other single issue.

Furthermore, each model has strengths and weaknesses; each has questions to which it is better or worse suited to answer. Some, for example, model the energy sector in detail. Some allow for the fact that a coal-fired power plant cannot costlessly be converted to one that runs on natural gas. Some show the effects of hypothetical tax cuts made possible by the new revenues earned through the auction of emissions permits. Some are capable of showing recessions and booms. Others include a long-term “carbon cycle” model that can keep track of the accumulation of greenhouse gas concentrations in the atmosphere and their climatological effects. Some break down the rest of the world into regions and so can model international trade. No one model does everything, and therefore we must not rely blindly on the results of any one model or set of models. Professional judgement and economic intuition, along with diplomatic assessments, are also crucial.

Benefits of Averting Climate Change

As discussed above, it is evident that the benefits of averting climate change are potentially immense. But we have chosen not to try to quantify them in monetary terms, in light of the difficulties we have enumerated. These include the uncertainty of these benefits, their timing and therefore the extreme sensitivity of the results to the chosen discount rate, and the dependence of benefits on emissions paths after the 2008 to 2012 budget period specified in Kyoto.

V. Assessing the Kyoto Protocol

In order to evaluate the likely net economic impact of the Kyoto Protocol, *excluding the benefits of mitigating climate change itself*, we have drawn upon a variety of tools to assess the various possible costs and non-climate benefits of the Administration's emissions reduction policy. To give away the punch line, our conclusion is as follows: the net costs of our policies to reduce emissions are likely to be small, assuming those reductions are undertaken in an efficient manner and we are successful in securing meaningful developing country participation as well as effective international trading, and the Clean Development Mechanism in future negotiations. That potential small net premium, even excluding the benefits of mitigating climate change, in effect, purchases a partial insurance policy against a serious environmental threat.

Because the results from any model must be treated with caution, the Administration has employed a broad set of economic tools to assess the Kyoto Protocol. We have drawn on the insights of a wide range of models of the energy sector and economy over the next 25 years, including but not limited to the results of the Stanford Energy Modeling Forum exercises, the IPCC's review of the economic and social dimensions of climate change, the work of the OECD on Economic Dimensions and Policy Responses to Global Warming, and the staff-level Interagency Analytical Team analysis produced last year. Other tools include simple relevant statistics, "meta-analyses" such as work by the World Resources Institute, models, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives.

To our knowledge, no model -- whether used inside the government or not -- has yet been set up to analyze the implications of the Kyoto Protocol, since this agreement is only a few

months old and remains unfinished. In particular, no model is currently designed to assess Kyoto's treatment of sinks, or all six greenhouse gases. Some model-builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models.

Our thinking has been informed, however, by simulations conducted with the Second Generation Model of Battelle Laboratories, one of the leading models in the field. The SGM is one of the models best positioned to analyze the role of international trade in emission permits, which we consider to be a critical element of the Kyoto Treaty. However, the SGM does not cover all six gases included in the Kyoto Protocol or include a role for sinks. We have used the SGM model as one input into our overall assessment of the Kyoto treaty, but have attempted to supplement its results with additional analysis to account for such special features of the agreement as the inclusion of six gases, a possible trading arrangement that could include a subset of the Annex I countries and the Clean Development Mechanism. We will share with you today some preliminary results of this analysis. To the extent possible, we have compared results obtained with the SGM model with those of other modelling efforts.

Mindful of the limitations of any single model, we are eager to see features of the Kyoto Protocol assessed by other models to obtain a better feel for the range of possible effects. This work is just beginning and much of it will continue to go on outside the government. For example, the Energy Modeling Forum, based at Stanford University, is a long-running model comparison exercise involving many of the leading climate models. EMF is currently studying

how features of the Kyoto legal language can be translated into terms recognizable to economic modelers. We expect that the group will conduct a full scale analysis of the Kyoto Protocol. The Energy Modeling Forum believes that its members will need at least until mid-year to update their results.

VI. Assessing the Potential Costs of Emissions Reductions

I said in Congressional testimony last July that we can do this smart or we can do this dumb. I was referring to the point that the costs of cutting emissions can be much reduced if flexible, market-based mechanisms are used. Our economic analysis highlighted the importance of such flexible, market-based mechanisms -- which are therefore reflected, at the President's insistence, in the Kyoto Protocol and our ongoing diplomatic strategy.

Within the Kyoto Protocol, this means an insistence on international trading, Joint Implementation, the Clean Development Mechanism, and, ultimately, on meaningful developing country participation. Domestically, this means that we implement any emissions reductions through a market-based system of *tradeable* emissions permits, which ensures that we achieve reductions wherever they are least expensive. But this also means taking serious and responsible steps in the short run to prepare us to meet our obligations in the longer term.

The first such step is the inclusion in this year's budget of an aggressive, \$6.3 billion program of tax cuts and R&D investments -- \$1.3 billion more than the \$5 billion package the President promised in his October 22 speech on this issue. The goal is both to stimulate the development of new energy-saving and carbon-saving technologies and to encourage the dissemination of those that exist already. The proposed package contains \$3.6 billion over the

next 5 years in tax cuts for energy efficient purchases and renewable energy, including tax credits of \$3,000 to \$4,000 for consumers who purchase highly fuel efficient vehicles, a 15 percent credit (up to \$2,000) for purchases of rooftop solar equipment, a 20 percent credit (subject to a cap) for purchasing energy-efficient building equipment, a credit up to \$2,000 for purchasing energy-efficient new homes, an extension of the wind and biomass tax credit, and a 10 percent investment credit for the purchase of combined heat and power systems. The package also contains \$2.7 billion over the next 5 years in additional research and development investments -- covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and cross-cutting analyses and research. One example of the R&D effort is the Partnership for a New Generation of Vehicles (PNGV). PNGV is a government-industry effort to develop attractive, affordable cars that meet all applicable safety and environmental standards and get up to three times the fuel efficiency of today's cars. In FY99, the combined proposal for PNGV is \$277 million, up from \$227 million appropriated in FY98. Similar government-industry efforts are proposed to develop more efficient diesel engines for both light trucks and heavy trucks.

A second responsible step entails industry-by-industry consultations to prepare emission reduction plans in key industrial sectors. The Administration will work in partnership with industry to identify ways in which the Federal government might remove regulatory hurdles that discourage energy efficiency. In addition, DOE will spearhead a comprehensive effort to improve the energy efficiency of the Federal government's own operations and purchases.

The third step is the promotion of an environmentally-responsible electricity restructuring bill, which the President identified as part of his domestic climate change package

in his address to the National Geographic Society on October 22. An electricity sector freed from government regulation would be a more efficient energy sector. Costs to consumers would fall. In addition, stronger incentives for improved generation efficiency in conjunction with appropriate market based provisions could achieve modest reductions in emissions. A reasonable overall estimate of the contribution of federal electricity restructuring to the rest of the President's program to address climate change is that it would make further progress to the same emission reduction goals at a cost saving of roughly \$20 billion per year. These steps should be taken regardless of Kyoto, because they make sense in terms of energy efficiency. But they have the added benefit of preparing us for Kyoto.

Estimated Reduction in Costs from Annex I Trading

In the language of the treaty, "Annex I," is the set of countries that have agreed to take on binding limitations in emissions of greenhouse gases. Even without meaningful developing country participation -- which, again, the President has emphasized is essential before the treaty would be submitted for ratification -- costs could be reduced substantially by emission trading among the Annex I countries. To provide some indication of the possible efficiency improvements, Russia and Ukraine consume six times as much energy per dollar of output as does the United States. Such large international differences in energy efficiency suggest that adoption of existing U.S. technology would yield very large emissions reductions in these countries.

Estimates derived from the SGM model confirm that emissions trading among Annex I countries can reduce the cost to the United States of achieving its targets for 2008-2012 emissions by about half relative to a situation in which such trading was not available. This

concept of costs is meant to capture aggregate resource costs to the US economy, including the cost to domestic firms of purchasing emission permits from other countries where emission reductions may be cheaper than in the United States. Although these estimates reflect idealized international trading in efficient markets, the overall conclusion is clear. The dramatic reduction in costs potentially available from Annex I trading within the SGM model -- cutting the costs involved by half -- highlights why the President insisted that international trading be part of the Kyoto Protocol; and why its achievement by our negotiators in Kyoto was such an important accomplishment.

Estimated reduction in costs from umbrella trading

One possibility that emerged in Kyoto, which none of us foresaw, was the idea developed there by the U.S. delegation, that the United States might undertake trading with a subset of Annex I countries, dubbed the "umbrella". Countries that have expressed interest in the umbrella include the United States, Australia, Canada, New Zealand and Russia, with strong indications of interest from some others. This subset of Annex I countries shares a common interest in promoting market-based mechanisms, most specifically, fully flexible rules for international trading of emissions permits.

It is too early to state the precise form the umbrella will take. But we can envision a number of potential benefits. The umbrella could, for example greatly reduce costs to the U.S. Results that we have derived from various SGM simulations of efficient international trading suggest that, relative to the situation in which there is no trading at all, the umbrella can reduce costs by an estimated 60-75 percent, depending on whether the former Warsaw Pact countries fall within the umbrella. The Kyoto Protocol classifies these countries outside of the EU bubble

for the first budget period 2008-2012.

Estimated reduction in costs from developing country participation

The next consideration is participation by developing countries. The President has said that he will not submit the treaty for ratification without meaningful participation by key developing countries. Such participation would further reduce the costs involved.

The substantial potential gains from meaningful developing country participation are highlighted by the significant benefits that will likely accrue from the limited role that the developing countries have already agreed to: the Clean Development Mechanism (CDM), modeled after the U.S. joint implementation concept. The CDM cannot realistically be expected to yield all the gains of binding targets for developing countries, but it might shave costs by roughly another 20 to 25 percent from the reduced costs that result from trading among Annex I countries.

Another possibility is that we persuade some of the key developing countries that are the largest emitters to commit to targets, and allow us to buy emission reductions from those paths. Simulations with the SGM model suggest that full participation by non Annex I countries could cut roughly 55 percent off the reduced costs that result from Annex I trading. The actual cost reduction would depend on the extent of developing country participation that is ultimately obtained, as well as the effectiveness of international trading arrangements. The more developing countries that take on modest binding targets and trade in international permit markets, the lower will be costs.

These cost-saving opportunities are fundamental tenets of the U.S. position. The promise of Kyoto cannot be achieved without effective emissions trading. Moreover, if we do

not get meaningful participation by key developing countries, we won't submit the treaty for ratification to the Senate. So, while our analysis may be predicated on some ambitious conditions concerning trading and developing country participation, it is exactly those conditions that form the foundation of the U.S. position in international negotiations including those at Buenos Aires.

Accounting for Carbon Sinks

The preceding discussion has emphasized the importance of trading arrangements and the CDM. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. Again, the U.S. delegation obtained a novel concept, that carbon absorbing activities called sinks could be used to offset emissions. The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. The Kyoto Protocol specifies that removals of CO₂ by sinks count toward meeting the target. The Kyoto Protocol counts the net emissions effects of three sink activities --afforestation, reforestation, and deforestation. Very preliminary estimates of the implications for the United States of the Kyoto provision on sinks indicate that carbon sinks could comprise a significant portion of the total required emissions reductions. Moreover, decreasing the required emissions reduction by, for example, 10% would likely result in cost-savings greater than 10%.

Even this estimate of the effect of sinks is conservative in one respect: it is based on an assumption for sink activity in the U.S. over the 2008-2012 period, and no assumed benefits from sinks elsewhere in the world. Very preliminary estimates suggest that incorporating the gains from sinks *throughout the world* can substantially reduce the costs of meeting the Kyoto target, on top of the gains from trading among Annex I countries. (Furthermore, no model has yet

even tried to take into account that government policies can help increase the activities qualifying as allowable sinks, like some tree-planting.) Because the quantitative uncertainty is so large, we do not yet have an estimate with which we are comfortable. But we expect that complete modelling of the Kyoto provision pertaining to sinks will likely have favorable and potentially large effects on projected costs.

Accounting for the role of improvements in energy efficiency

Another issue in analyzing the Kyoto protocol concerns future improvements in energy efficiency due to innovation and diffusion of existing technology. The parameter that figures most prominently in analysis of energy efficiency is the rate of improvement in the so-called Autonomous Energy Efficiency Index (AEEI), that is the rate at which the total use of energy falls relative to GDP. A plausible assumption on the AEEI is an improvement of 1.0 percent per year. Reflecting a conservative interpretation of the 15-year impact of various climate change initiatives, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is not the most optimistic outcome that might occur. Some authorities in the field of energy policy forecast more rapid technological progress. Experts at five national laboratories managed by the Department of Energy, using an engineering approach rather than an economic paradigm, found that a third of the emissions reductions necessary to return to 1990 levels by 2010 could be achieved through the adoption of existing energy-efficient technologies at no net resource cost, or even some savings. The National Academy of Sciences reached qualitatively similar conclusions in a 1992 report.

The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of

tax cuts and R&D investments intended to spur the discovery and adoption of new technologies. If the Administration is successful in this effort, the rate of improvement in energy efficiency could rise and such improvements would lower the cost of meeting our Kyoto target. For example, published results based on SGM model simulations with different assumed rates of AEEI suggest that an increase in the AEEI of 25 percent could lead to declines in the permit price of approximately 40 percent.

Our justification for incorporating into our assessment a small assumed impact of Administration technology policies is somewhat analogous to the Administration's rationale for employing mainstream economic assumptions in our budget forecasts: in the presence of uncertainty, we are conservative in our estimates of the speed with which the economy will grow, tax receipts will rise, and the budget will improve. That way, any revisions or surprises that occur are likely to be in the pleasant direction. In this instance, we prudently and conservatively assume that there will be substantial delays between investments in new technology or the diffusion of existing technology, and the returns to such investments.

Moreover, at the recent automobile show in Detroit, General Motors announced that it has developed a hybrid-based vehicle that can achieve fuel efficiency of 80 miles per gallon, and that this car could be in commercial production within a few years. Ford also exhibited a prototype of a light-weight highly fuel efficient sedan that could be in commercial production by the middle of the next decade. These announcements followed an earlier breakthrough announced by DOE and its partners of a fuel cell that could run on gasoline and double current fuel economy while reducing conventional air pollution emissions by 90 percent. These technological advances have been made possible through the efforts of the Partnership for a New

Generation of Vehicles between the Administration and the U.S. auto companies and their suppliers.

Such progress may be replicated in other sectors. VCRs and TVs, while switched off, consume about \$1 billion worth of electricity annually. EPA has established a partnership with major manufacturers that has a goal of achieving up to a 70 percent reduction in energy use by VCRs and TVs while they are switched off, without sacrificing product quality, usefulness, or increasing costs. This partnership offers promise of substantial improvements in energy efficiency.

Non-Climate Benefits

A final factor that should be included in any comprehensive assessment of the economic implications of the Kyoto protocol are the benefits of the agreement. The literature has emphasized that any relative price shifts that prove necessary to reduce emissions should produce non-climate benefits in three areas: traffic congestion, highway accidents, and air pollution unrelated to climate change. These benefits are hard to quantify precisely but are potentially significant: our rough estimates suggest that these three benefits could offset approximately a quarter of the resource cost of the climate change policy.

Synthesis

A comprehensive evaluation of the economic impact of the Kyoto Protocol must integrate all of the factors described above: reliance on flexible market-based mechanisms domestically; international trading and Joint Implementation among Annex I countries; the Clean Development Mechanism; meaningful developing country participation; the potential cost-mitigating role of including six gases and carbon sinks; the benefits of electricity restructuring;

and emissions reductions achieved as a consequence of other proposed Administration climate change initiatives. Assuming that effective mechanisms for international trading, Joint Implementation and the Clean Development Mechanism are established, and assuming also that the U.S. achieves meaningful developing country participation, our overall assessment is that the economic cost to the United States in aggregate and to typical households of attaining the targets and timetables specified in the Kyoto Protocol, will be modest.

This conclusion that the impact will be modest is not entirely dependent upon, but is fully consistent with, formal model results. I have previously emphasized the limitations of relying on any single model in assessing the economic impact of the Kyoto Protocol, and continue to view any such results as just one input into an overall analysis. But it is worth emphasizing that model results reflecting the details of the Kyoto Protocol are consistent with our conclusion. For example, under the assumptions of either trading under the umbrella or within Annex I, the CDM and permit trading with developing countries, estimates derived using the SGM model, which adjust for the inclusion of six gases and assume little banking of credits beyond 2012, suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to \$7 to \$12 billion per year in 2008 to 2012. This implies that overall costs, excluding not only climate and non-climate benefits, but also such cost mitigating factors as sinks and payoffs from the President's electricity restructuring and climate change initiatives, would reach roughly one tenth of one percent of projected GDP in 2010.

A more tangible measure of costs is the estimated effects on energy prices. Excluding the impact of electricity restructuring and the ancillary benefits of mitigation and better forest management, the SGM-based estimate, corresponding to the gross resource cost estimate cited

above, is an emissions price in the range of \$14 to \$23 per ton of carbon equivalent. This translates into an increase in energy prices between 2008 and 2012 at the household level of between 3 and 5 percent, an increase in fuel oil prices of about 5 to 9 percent, natural gas prices of 3 to 5 percent, gasoline prices of 3 to 4 percent (or around 4 to 6 cents per gallon), and electricity prices of 3 to 4 percent. This increase in energy prices at the household level would raise the average household's energy bill in ten years by between \$70 and \$110 per year, although such predictions may not be observable because they would be small relative to typical energy price changes, and nearly fully offset by electricity price declines from Federal electricity restructuring. In particular, this increase in energy prices is small relative to the average of *year to year* real energy price changes experienced by U.S. consumers since 1960: such *annual* changes have averaged 3.8 percent. In addition, by 2008-2012, the anticipated 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda is projected to lead to expenditure reductions of about \$90 per year for the average household.

As highlighted earlier, there are substantial but unavoidable uncertainties surrounding estimates like these. For example, the estimate just discussed is predicated, among other things, on the developing country participation that we are insisting upon as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol, and on effective international trading. Moreover, other models will yield other answers and much work remains to be done by the modeling community to test the robustness of these results. Preliminary comparisons of the SGM model to the few other models that have attempted to evaluate the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto Protocol on carbon permit prices are neither the most conservative nor the most optimistic of the models that have been developed.

The predictions of the SGM model are robust in the sense that virtually all energy models reveal the potency of effective, flexible, domestic and international trading mechanisms to reduce substantially the cost and energy price impact of meeting the Kyoto targets.

Of course, the most important factor that has been left out of the above assessment is the benefit of mitigating climate change itself. A full cost-benefit analysis would include mitigation in the benefits column. The only reason we have not done so, explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But nobody should lose sight of our ultimate objective -- keeping our planet the hospitable home that we enjoy today.

Effects on employment and aggregate output

So far we have said nothing about job losses resulting from climate change policy. Although there may be job gains in some sectors and job losses in others, we do not anticipate any significant aggregate employment effect if we achieve the conditions we have discussed. The effects on energy prices described above will occur only 10 to 14 years in the future. Not only are these effects small relative to historical variations in energy prices, and offset by other policies like electricity restructuring, they would occur sufficiently far in the future to enable monetary policy to keep the economy operating at its potential. In energy-intensive sectors some employment reduction could occur, although given the very small predicted change in energy prices, impacts in most such sectors are apt to be minimal. Furthermore, a large number of jobs will be created in other sectors -- many of them high-tech jobs paying high wages. The President is firmly committed to assisting any workers who are adversely affected during the transition to a climate-friendly economy.

VII. Conclusion

In conclusion, the Kyoto Protocol and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Protocol includes key provisions on international trading and Clean Development projects. The President's approach relies on market incentives -- first, with a system of tax cuts and R&D investments, and then later with a market-based system of tradeable permits -- to ensure that our objectives are achieved as efficiently as possible.

Our overall conclusion is that the economic impact of the Protocol will be modest under the conditions we have identified. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which draws insights from not only the forecasts of individual models, any one of which has its own strengths and limitations, but also a broad variety of additional analyses.

I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Protocol and evaluating the net effects of reducing greenhouse gas emissions. It is my hope that economic analysis will continue to play a key role in designing policies in this area.

I welcome your questions.

**ORAL TESTIMONY OF DR. JANET YELLEN
CHAIR, COUNCIL OF ECONOMIC ADVISERS
BEFORE THE HOUSE SUBCOMMITTEE ON NATIONAL ECONOMIC GROWTH,
NATURAL RESOURCES AND REGULATORY AFFAIRS
ON THE ECONOMICS OF THE KYOTO PROTOCOL
MAY 19, 1998**

Thank you, Mr. Chairman. The President has said that we can work to avert the grave dangers of climate change, while at the same time maintaining the strength of our economy. I agree and am pleased to have this opportunity to appear before the Committee to elaborate on the Administration's views on these issues.

Effects of Climate Change

Before discussing the likely cost of U.S. efforts to avert climate change, it is important to recognize the costs and risks facing our nation should we fail to act. Current concentrations of greenhouse gases have reached levels well above those of preindustrial times. As a consequence, the Intergovernmental Panel on Climate Change estimates that global temperatures will increase by between 2 to 6 degrees Fahrenheit in the next 100 years, with a best guess of about 3.5 degrees Fahrenheit. The IPCC reports that a doubling of carbon dioxide levels would lead to approximately 10,000 additional deaths per year for the current U.S. population from higher summer temperatures, even after netting out the effects of warmer winters and acclimatization. The IPCC also predicts sea level increases of about 20 inches by 2100, with greater increases in subsequent years. Despite the difficulties of deriving quantitative assessments of the damages from climate change, researchers have nonetheless developed monetary estimates of damages that prompt substantial concern, and range in the tens of billions of dollars per year for temperature changes projected to occur in the next century. If left uncontrolled, disruption of the Earth's climate may thus pose substantial costs in

terms of harm to commerce and the environment alike. These costs--and they are significant--provide the primary motivation for actions to reduce greenhouse gas emissions. Moreover, these estimates do not, and cannot, accurately reflect the value of reducing the unknown risk of large-scale and potentially irreversible events with potentially catastrophic consequences. There is a strong argument for the Kyoto Protocol as a form of insurance against a serious environmental threat.

The Economic Costs

In taking action to reduce emissions, economic analysis suggests that two elements are absolutely essential: the effort must be flexible and market-based, to ensure that we reduce emissions in the most efficient way; and the effort must be global, for without global emissions reductions the effort would be ineffective. The nature of the climate change problem--that greenhouse gas emissions have the same effect on the climate regardless of how, where, and, within limits, when they occur--suggests three basic approaches to lower the cost of achieving given levels of environmental protection. We term these "when", "what", and "where" flexibility.

As a result of U.S. diplomatic efforts, all three forms of flexibility are broadly reflected in the Kyoto Protocol. The choice of a multi-year budget period, ending later than many countries proposed, with allowance for "banking" of emissions reductions, constitute key elements of "when flexibility." These provisions mitigate costs by permitting reductions at times when they are less rather than more costly. The inclusion of all six greenhouse gases and certain sink activities that promote removal of carbon from the atmosphere provide substantial "what flexibility". The U.S. succeeded in having the Kyoto Protocol stipulate that countries with binding targets are to reduce total greenhouse gas emissions by certain percentages, but the Protocol does not require specific reductions for specific gases. Moreover,

sinks can be used to offset emissions targets. The inclusion of international emissions trading among countries that take on binding targets, coupled with an agreement allowing industrial countries to receive emissions reduction credit for certified investments in "clean development" projects in the developing world, are the critical forms of "where" flexibility incorporated in the Kyoto Protocol.

Although details of these provisions need to be finalized in negotiations in Buenos Aires later this year, we believe that these mechanisms can produce substantial reductions in the costs of attaining our environmental objectives.

Economic analysis also points to the need for a global solution to a problem which is global. Around 2015, under a continuation of business as usual, a majority of world emissions are projected to come from developing countries. Without developing country participation we cannot achieve adequate climate protection. In addition, developing country participation would permit relatively low-cost emissions reductions to be internationally recognized as a substitute for more expensive reductions in many industrial countries. The President has made clear that he will not submit the Kyoto Protocol to the Senate without meaningful participation from key developing countries (who are not included in Annex I).

Economic Effects

An economic analysis of climate change faces three broad categories of difficulties. First are the uncertainties that still remain over the terms of the ultimate treaty. Second are the inherent limitations of available models to analyze even short-term costs and benefits. And finally is the impossibility of putting a single monetary figure on the long-term benefits of climate change mitigation.

Mindful of the limitations of any single model as a tool for evaluating the economic impact of the Kyoto Protocol, we have employed a broad array of techniques to assess the various possible costs and non-climate benefits of the

Administration's emissions reduction policy. Ignoring the benefits of mitigating climate change itself, our conclusion is that the net costs of our policies to reduce emissions are likely to be small if those reductions are undertaken in an efficient manner and we are successful in securing meaningful developing country participation as well as effective international trading and clean-development mechanisms in future negotiations. As I explain in my written testimony, this conclusion is not entirely dependent on, but is fully consistent with, formal model results. For example, given the factors, such as trading, just delineated, but excluding the benefits of acting and the impact of electricity restructuring, estimates derived using Battelle's Second Generation Model suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to just \$7 to \$12 billion per year in 2008 to 2012 -- or just 0.1 percent of projected GDP. That small net premium, in effect, purchases a partial insurance policy against a serious environmental threat.

A comprehensive economic evaluation of the Administration's climate change policies must also take into account the potential payoffs from the full package of proposed Administration climate change initiatives. As you know, the President's FY 1999 budget includes a \$6.3 billion package of tax cuts and R&D over the next 5 years; this package makes good sense in terms of energy policy even ignoring any payoff for climate change. A second responsible step entails industry-by-industry consultations to prepare emission reduction plans in key industrial sectors. A final component of the President's climate change policy is his support for electricity restructuring in a manner that will offer approximately \$20 billion in cost savings to electricity consumers, while offering modest reductions in greenhouse gas emissions.

I look forward to continuing to work with members of this Committee, as

well as other interested parties, in further analyzing the Kyoto Protocol and evaluating the effects of reducing greenhouse gas emissions.

I welcome your questions.

SPECIAL ANALYSIS

Opportunities for Mutually Beneficial Trade in Emissions Permits with Developing Countries

Many observers worry that it will be difficult to entice developing countries to accept binding targets for greenhouse gas emissions under the Kyoto agreement. But evidence on compliance cost differences between industrialized and developing countries suggests that, with the right emissions targets for developing countries, both they and industrialized countries can gain from trade in international permit markets.

Gains from targets and trade. An analysis conducted prior to Kyoto found that developing countries would gain if they adopted greenhouse gas emissions targets slightly below their business-as-usual (BAU) levels. The gains come about because developing countries have per-ton reduction costs substantially below those of industrialized countries. This difference allows them to sell tradable permits to industrialized countries and thereby earn billions of dollars over and above their emissions reduction costs. Industrialized countries would also gain, because the permits let them avoid more costly domestic emissions reductions.

A CEA analysis of the Kyoto agreement finds results similar to this earlier work. During the initial 2008-2012 commitment period, for example, estimates of annual gains from trade are roughly \$900 million for Mexico, \$1.6 billion for India, or \$3.6 billion for China, if each alone were to adopt a target set at its BAU emissions level and trade permits with industrialized countries. The cost to the United States of meeting the Kyoto commitments would fall with such participation; for example, Chinese participation alone would reduce U.S. compliance costs by an estimated \$12 billion (see box on next page).

Environmental benefits. These estimates of gains from trade reflect binding emissions targets for developing countries at the BAU level. Targets slightly below BAU would provide climate benefits from reduced carbon emissions and preserve most of the gains from trade. Reducing carbon emissions through this "target and trade" approach has the additional environmental benefit of reducing emissions of local air pollutants in developing countries.

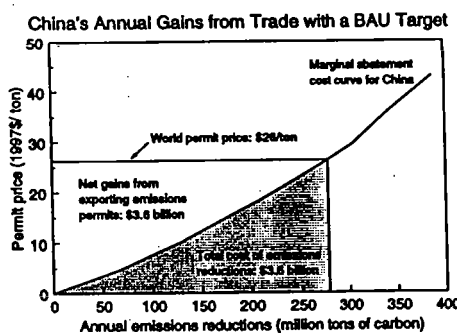
Allaying competitiveness concerns. Adoption of targets even at BAU levels by developing countries would result in carbon permit prices and energy price increases that are the same in these countries as in the United States. With comparable energy price changes, the Kyoto agreement would leave the competitive playing field level among all countries with targets, alleviating concern that energy-intensive industries would flee to developing countries.

Uncertainty about BAU emissions levels. Uncertainty about future economic growth and technological improvements implies that a developing country's emissions in the absence of a binding target may exceed or fall short of a BAU forecast. For example, if economic growth is unexpectedly high, the target would turn out to be inadvertently stringent. The costs of such stringency may underlie developing countries' concern that targets may hinder economic growth and may explain their reluctance to adopt targets. Similarly, if economic growth is unexpectedly low, developing country targets could turn out to be too lax. Developing countries could then sell emissions permits abroad without achieving real reductions, thereby increasing global emissions. One way to reduce the risks of inadvertent stringency or increases in global emissions would be to make targets contingent on economic growth between now and 2007.

Conclusion. Differences in the costs of controlling carbon emissions between developed and developing countries make it possible for developing countries to gain from accepting emissions targets and participating in international permit markets. Such participation could generate cost savings for the United States and address concerns about competitiveness. These gains are similar to those realized through international agreements to liberalize trade in goods and services such as NAFTA and the Uruguay Round.

Chinese Participation: An Illustration

Analysis suggests that if China adopts an emissions target set at its business-as-usual (BAU) level and participates in international permit markets, the world permit price would fall by about half, to \$26 per ton. At this permit price, the Chinese could profitably reduce their carbon emissions by approximately



275 million tons per year (see chart), selling unused emissions permits to industrialized countries and earning \$7.2 billion annually in revenue (the rectangle in the chart). Subtracting the cost of reducing emissions, approximately \$3.6 billion per year (the shaded area), leaves China with a net gain of about \$3.6 billion per year. The gains to the United States from the permit price decrease would amount to about \$12 billion per year.

BACKGROUND FOR TESTIMONY ON CLIMATE CHANGE

May 19, 1998

President Clinton is committed to addressing the problem of global climate change while maintaining a strong economy. President Clinton has said that we can take steps to avert the grave dangers of climate change, while keeping our economy healthy and strong.

The Kyoto Protocol is a form of insurance against a serious environmental threat. It is difficult to put a price tag on the cost of doing nothing to address the problem of climate change. But researchers have nonetheless developed troubling cost estimates of not acting -- ranging in the tens of billions of dollars per year for the United States. And, these estimates do not even fully reflect the value of the insurance against the unknown risk of large-scale and potentially irreversible catastrophic events, such as a weakening of the Gulf Stream.

Doing it smart: The Kyoto Protocol is based upon measures that reduce costs. The least-cost approach to controlling climate change is to reduce emissions where and when such reductions are cheapest. Dr. Yellen's testimony highlights the substantial cost reductions that are associated with international emissions permit trading, joint implementation by Annex I countries, the Clean Development Mechanism, and other aspects of the Kyoto Protocol. Because of U.S. insistence, the Kyoto Protocol includes many such cost-saving provisions -- and economic analyses that ignore these provisions do not accurately reflect the economic impact of the Kyoto Protocol. The Administration also supports federal electricity restructuring legislation that could achieve modest emissions reductions and will provide consumers with substantial savings on their energy bills.

Conclusion: Costs will be modest, even without accounting for benefits of electricity restructuring or the value of insurance against a serious environmental threat. With effective mechanisms for international emissions permit trading, joint implementation, and the Clean Development Mechanism, as well as meaningful developing country participation and flexible timetables, the Administration's overall assessment is that the economic cost to the United States will be modest.

This conclusion is not entirely dependent on, but fully consistent with, formal model results. Despite the limitations of any single model in assessing the economic impact of the Kyoto Protocol, economic model results are fully consistent with this conclusion. For example, given the factors, such as international permit trading, delineated above, but excluding the benefits of reducing emissions and the impact of electricity restructuring, estimates derived using the Second Generation Model (SGM) suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to just \$7 to \$12 billion per year in 2008 to 2012 -- or just 0.1 percent of projected GDP.

Modest impact on family energy costs. With a successful international trading regime, the SGM-based estimate suggests an emissions price in the range of \$14 to \$23 per ton of carbon equivalent. Not including the impact of Federal electricity restructuring, that would translate into an increase in the average family's energy bill of between \$70 - \$110 per year in 2010. But, the energy price declines from Federal electricity restructuring would likely be enough to offset the impact described above -- so that the net effect on family energy bills, of the Administration's policies, including the impact of electricity restructuring, would be negligible in 2010.

Cost estimates do not reflect \$6.3 billion package of insurance against the environmental threat. The figures cited in Dr. Yellen's testimony exclude not only climate and non-climate benefits, but also such cost-mitigating factors as carbon sinks and increases in energy efficiency from the President's \$6.3 billion climate change initiative.

**TESTIMONY OF DR. JANET YELLEN
CHAIR, COUNCIL OF ECONOMIC ADVISERS
BEFORE THE
U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON INTERNATIONAL RELATIONS**

MAY 13, 1998

Thank you, Mr. Chairman. The President has said that we can work to avert the grave dangers of climate change, while at the same time maintaining the strength of our economy. I agree and am pleased to have this opportunity to appear before the Committee to elaborate on the Administration's views on these issues.

The international agreement that was reached in Kyoto this past December is a crucial step forward in addressing global climate change. But it is only one step in a journey. Since the international effort to reduce greenhouse gas emissions is still in some respects a work-in-progress, it is not yet possible to provide a full authoritative analysis of it. Many of the specifics in several crucial areas are not completely resolved in the diplomatic arena, forcing analysts to make a variety of assumptions about the ultimate form of the international regime. In my testimony today, I will attempt to identify key elements of the agreement and the Administration's policy, such as international emissions trading, meaningful developing country participation, inclusion of land-use activities that absorb carbon ("sinks") and six categories of gases, as well as domestic initiatives, that together can ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will explain the reasoning underlying our conclusion that, under these conditions, economic impacts are likely to be modest.

The Administration is strongly committed to ensuring that these key elements are reflected in our domestic and international climate change policies. We are firmly committed to meaningful developing country participation, the use of sinks to offset emissions requirements, and emissions trading both domestically and internationally. And as you know, the President's FY 1999 budget includes a \$6.3 billion package of tax cuts and R&D investments over the next 5 years; this package makes good sense in terms of energy policy and will jumpstart our efforts. A final component of the President's climate change policy is his support for electricity restructuring in a manner that will offer approximately \$20 billion in cost savings to electricity consumers, while reducing greenhouse gas emissions.

I. Basic Economic Rationale of the Kyoto Treaty

To begin our analysis, it may be worth stepping back and examining the larger question of the basic rationale, from an economist's perspective, for the Kyoto Protocol.

The earth's surface appears to be warming from the accumulation of greenhouse gases from myriad sources worldwide. None of these emitters presently pays the cost to others of warming's adverse effects -- a classic externality in the language of economists. As a result of these distorted incentives, disruption of the Earth's climate is likely to proceed at an excessive pace and if left uncontrolled may pose substantial costs in terms of harm to commerce and the environment alike. The fundamental economic logic of the Kyoto Protocol is thus that without such an international agreement, individual nations will not have the proper incentives to address the threats from global climate change.

II. Costs of Climate Change

In evaluating efforts to mitigate global warming, the first step is to consider the costs of inaction. These costs --and they are significant-- provide the primary motivation for actions to reduce greenhouse gas emissions.

The Intergovernmental Panel on Climate Change (IPCC) jointly established by the World Meteorological Organization and the United Nations Environment Programme, concluded in 1995 that "the balance of evidence suggests that there is a discernible human influence on global climate." Current concentrations of carbon dioxide, methane, nitrous oxide, and the other so-called greenhouse gases have reached levels well above those of preindustrial times. Of these, carbon dioxide (CO₂) is the most important: net cumulative CO₂ emissions resulting from the burning of fossil fuels and deforestation account for about two-thirds of potential warming from changes in greenhouse gas concentrations related to human activity.

Climatic Impact

If growth in global emissions continues unabated, the atmospheric concentration of CO₂ will likely double relative to its preindustrial level by midway through the next century and continue to rise thereafter. As a result of the increased concentration of CO₂, the IPCC estimates that global temperatures will increase by between 2 to 6 degrees Fahrenheit in the next 100 years, with a best guess of about 3.5 degrees Fahrenheit. While scientists believe that human activities are leading to a gradual warming of the *average* temperature of the earth, the change in temperature in a given region at a given time may differ substantially from this average. Indeed, models predict warming will be greater in high latitudes than in the tropics, and greater over land than ocean.

Potential consequences associated with this shift in climate include a rise in sea levels, greater frequency of severe weather events, shifts in agricultural growing conditions from changing weather patterns, threats to human health from increased range and incidence of diseases, changes in availability of freshwater supplies, and damage to ecosystems and biodiversity.

Economic and Monetary Damages

The derivation of quantitative or monetary estimates of the damages from such a change in the climate is extremely difficult given the capacity of today's models. Estimates of the economic damages from climate change fall into the following broad areas: agriculture, sea-level rise, air conditioning and heating, water supply, human life and health, air pollution, and other costs (hurricanes, relocation costs, human amenity, construction, leisure activities, urban infrastructure, and ecological damages such as forest loss and species loss). Although the quantification of these effects is quite demanding, researchers have developed estimates that prompt substantial concern. The IPCC reports that a doubling of carbon dioxide levels would lead to approximately 10,000 estimated additional deaths per year for the current U.S. population from higher summer temperatures, even after netting out the effects of warmer winters and assuming acclimatization. Other researchers have predicted sea level increases of about 20 inches by 2100, with greater increases in subsequent years.

Despite the difficulties, respected researchers have developed estimates of the monetary damages expected from an average worldwide temperature increase. For example, William Cline, then of the Institute for International Economics, estimated that a temperature change of 4.5 degrees Fahrenheit would impose annual damages of about 1.1 percent of GDP per year on the U.S. economy. That amounts to \$89 billion in today's terms. (Cline's original estimate is quoted in 1990 dollars. The figure given above translates this number into 1997 terms by scaling it to current GDP.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of greenhouse gas concentrations. Although he uses methods that differ from Cline's in several respects, Nordhaus estimates that a slightly larger temperature change of 5.4 degrees Fahrenheit would impose losses equal to about 1 percent of GDP. A third independent estimate reported by Nordhaus is close to Cline's. It must be noted, however, that this similarity among aggregated estimates masks the true uncertainty associated with forecasts of the damages from given increases in global warming -- the estimates are all fundamentally based on extrapolations from current and past experience, and may not fully incorporate effects that will unfortunately become apparent only with future experience.

One key difficulty in interpreting and monetizing these estimates of damages is uncertainty over the extent that they should be discounted because they occur in the distant future. Since the benefits of stemming future climate change accrue over not only decades but centuries, small changes in the discount rate can produce substantial changes in the results. But the precise discount rate that should be used to evaluate questions as important as the future climate of the planet remains a subject of intense debate. It is safe to say that there is, as yet, no professional consensus on the issue. Indeed there can be no technical answer to the ethical question how we should value the welfare of future generations.

A similar difficulty with such estimates is that they do not include potential non-linearities in the relationships between greenhouse gas concentrations and temperature, between temperature and economic damages, or in the various other complicated relationships governing interactions between greenhouse gas emissions, the climate, and the economy. Current estimates of damages do not, and cannot, accurately reflect the value of reducing the unknown risk of large-scale and potentially irreversible discrete events with potentially catastrophic consequences.

Two such possibilities serve as illustrations. Warming of Northern tundra may release huge amounts of methane from the permafrost, thereby leading to accelerated warming. We do not know at what point, if any, such potentially unstable activity would be triggered. Second, evidence from climate models suggests that some types of climate change may lead to changes in ocean currents, including weakening of the Gulf Stream that warms Western Europe. Scientific evidence suggests that abrupt seawater temperature shifts have occurred over periods as short as decades.

To what extent are we willing to take such chances with our planet? There is a strong argument for the Kyoto Protocol as a form of planet insurance. But what numerical weight should one assign to these catastrophic risks? In other words, what is the value of the insurance policy? Although it is difficult for an economist, or anyone, to know, reductions in the risk of such catastrophic outcomes must be considered in addition to the costs and benefits that can be reasonably quantified. Since human beings are typically averse to risk, such catastrophic risks are especially important in evaluating whether the benefits of a particular climate control policy justify the costs. One must have at least some sympathy with those who criticize economists on the grounds that the effects of climate change are extremely difficult to quantify in a single monetary number.

III. Addressing Global Climate Change in an Efficient Manner

The costs of unabated climate change may thus be difficult to quantify, but they are nonetheless real and provide the motivation for reducing greenhouse gas emissions. In taking action to reduce those emissions, economic analysis suggests that two elements are absolutely essential:

- The effort must be global, to address the global externality inherent in the nature of the problem.
- The effort must be flexible and market-based, to ensure that we achieve our objectives in the most efficient manner possible.

Need for Global Action

Climate change is a global problem requiring a global solution. As I mentioned earlier, no single country has an incentive to reduce emissions sufficiently to protect the global environment against climate change. Each has an economic incentive to “free ride” on the efforts of others. Even if the United States sharply reduced its emissions unilaterally without an international agreement limiting emissions abroad, greenhouse gas emissions from all other countries would continue to grow, and the risks posed by climate change would not be significantly reduced. It is important to emphasize that emissions of different gases anywhere in the world have very similar effects on global climate.

The threat of disruptive climate change has led to coordinated international efforts to reduce the risks of global warming by reducing emissions of greenhouse gases. A landmark international agreement to address global warming was the Framework Convention on Climate Change signed during the Earth Summit in Rio de Janeiro in 1992. This convention established an objective of limiting greenhouse gas concentrations and called upon industrial countries to return their emissions to 1990 levels by 2000. Since then, it has become clear that the United States and many other participating countries will not meet this voluntary goal; quite the contrary, emission levels have continued to rise not fall among both developed and developing countries.

To address the lack of progress among many industrialized countries toward meeting the Rio objective, the United States and approximately 160 other nations agreed in negotiations held in Kyoto, Japan, last December, to reduce emissions of greenhouse gases. The Kyoto Protocol, which requires the advice and consent of the Senate, would place binding limits on each industrial country's combined emissions of the six principal categories of greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. These limits apply to the 38 so-called Annex I countries, which are the industrialized countries, defined to include Russia, Ukraine, and most Eastern European countries.

Under the Kyoto Protocol, each industrial country's baseline is its 1990 emissions of CO₂, methane, and N₂O and its choice of 1990 or 1995 levels of the other three categories of gases. The United States agreed to a target of 7 percent below this baseline by the period between 2008 and 2012. Given the changes in the definition of the baseline for the three long-lived chemical compounds (HFCs, PFCs and SF₆) from 1990 to 1995 combined with a change in the way sinks are accounted for in the baseline, the actual reduction required in the U.S. is no more than 2-3% more than the President originally proposed as the U.S. negotiating position. The targets for the European Union and Japan are 8 percent and 6 percent below 1990 levels, respectively. Australia, New Zealand, Norway, Russia, and Ukraine all have limits somewhat less ambitious when phrased as cuts relative to their 1990 levels. In sum, over the period from 2008 to 2012, the industrial countries are expected to reduce their average emissions of greenhouse gases to about 5 percent below their 1990 levels.

The President has made clear that he will not submit the Kyoto Protocol to the Senate without meaningful participation from key developing countries (who are not included in Annex I).

There are several reasons why meaningful participation from developing countries is essential. First, developing countries are projected to contribute a majority of world emissions around 2030 under a continuation of business-as-usual. Without the participation of developing economies, efforts by the industrialized countries to limit emissions will therefore not provide adequate protection from climate change.

Second, developing country participation is crucial because it would permit relatively low-cost emissions reductions to be internationally recognized as a substitute for more expensive emissions reductions that might otherwise be achieved domestically by U.S. companies and those in other industrialized countries. Since greenhouse gas emissions have the same basic impact on the climate regardless of where they occur, emission reductions in developing countries have the same environmental benefit as reductions in the U.S. But these reductions are much less costly than reductions in the U.S. or in other developed nations, because of the very inefficient and carbon-intensive uses of energy in these countries today. It thus makes sense, from both an environmental and an economic perspective, to incorporate emissions reductions in developing countries into the international system.

Third, principles of basic fairness suggest all countries should do their part, depending, in part, on their ability to contribute to the solution. Thus even poor countries should participate, although the lack of resources in such countries may limit the extent of their participation.

Some have expressed fears that the Kyoto Protocol might adversely affect the competitive position of American industry. Evaluating how the Kyoto Protocol could affect competitiveness of a few specific manufacturing industries -- especially those that are especially energy-intensive, such as aluminum and chemicals -- is complex. The answer depends, in part, on the impact of the agreement on energy prices, which we will shortly address. In general it is difficult to undergo a structural change in the economy without having the effect of expanding some sectors and contracting others. But to provide some perspective on this issue, consider the following facts. First, on average, energy constitutes only 2.2 percent of total costs to U.S. industry. Second, energy prices already vary significantly across countries. According to the *1997 Statistical Abstract*, for example, in 1996 premium gasoline cost \$1.28 per gallon in the United States -- but only 8 cents per gallon in Venezuela. Similarly, gas prices were \$3.71 per gallon in Switzerland and \$4.41 per gallon in France. Electricity prices also vary significantly: in the U.S., for industry, they were 5 cents per kilowatt hour in 1995, a fraction of prices in Switzerland of 13 cents per kilowatt hour. Yet U.S. industry is not moving en masse to Venezuela, nor is Swiss industry moving to the United States. Third, roughly two-thirds of all emissions are not in manufacturing at all, but in transportation and buildings, sectors which, by their very nature, are severely limited in their ability to relocate to other countries. We therefore believe we need developing country participation because the problem is global and cost-effective solutions are essential, than to avoid adverse effects on competitiveness.

Flexibility and Market Mechanisms

A global solution is thus critical to the global problem of climate change. Globalizing the solution is not, however, enough by itself. We must also ensure that our reductions in global greenhouse gas emissions are attained in the most efficient manner possible. The nature of the climate change problem suggests three basic methods to lower costs of achieving given levels of environmental protection. They can be characterized in terms of three categories of flexibility: (1) “when” flexibility; (2) “what” flexibility; and (3) “where” flexibility, which may be the most important of all. Such methods have long been championed by economists interested in increasing the efficiency of protection. Indeed, over 2,500 economists from academia, industry, and government alike urged such approaches in a letter they signed last year advocating action on climate change:

“Economic studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs...The most efficient approach to slowing climate change is through market-based policies.”

1. “When flexibility” (timing)

First is “when flexibility” or timing. Since climate change is a long-term problem, the exact timing of emissions reductions is, within some range, not of primary importance. Thus the freedom to delay or accelerate reductions within an agreed upon time frame -- while ensuring credibility of emissions reductions -- lowers costs.

As a result of U.S. leadership, the Kyoto Protocol incorporates this principle of “when flexibility” in four ways:

- First, the initial emissions reductions are less severe, and the period over which they occur ends much later than what had been proposed by many other countries. By adopting a gradual and credible path of reductions in the early years, we can greatly reduce costs such as those from prematurely scrapping coal-fired electricity plants, while attaining the same ultimate environmental goals.
- Second, under the Kyoto Protocol, the emissions target is not specified in terms of a specific year, but rather in terms of an average over a five-year period (2008-2012). Averaging over five years, instead of requiring countries to meet a specific target each year, can lower costs, especially given an uncertain future. The averaging can smooth out the effects of short-term events such as fluctuations in the business cycle and energy demand, or hard winters and hot summers that would increase energy use and emissions.

- Third, there is allowance for “banking” emission reductions within the 2008-2012 commitment period, for use in a subsequent commitment period [although the emission targets of the subsequent periods have not yet been specified].
- Fourth, CDM credits achieved between 2000 and 2008 may be banked until 2008 to 2012.

2. “What flexibility” (gases and sinks)

The second type of flexibility is “what flexibility”, along two dimensions. The first is the inclusion in the agreement of all six greenhouse gases. Emissions of different kinds of gases, not just carbon dioxide, contribute to the greenhouse effect. Since the IPCC has developed conversion factors for all greenhouse gases by estimating their global warming potentials, reductions in emissions of one gas can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects. Again at U.S. urging, all six gases are included, while Japan and the EU had insisted until the end on covering only three. Thus the U.S. succeeded in having the Kyoto Protocol stipulate that countries with binding targets are to reduce their *total* greenhouse gas emissions by certain percentages, but does not require specific reductions for specific gases. Since a molecule of sulfur hexafluoride is 23,900 times more potent over 100 years than a molecule of CO₂, it may be cheaper to achieve the same environmental benefit by eliminating one molecular unit of SF₆ than nearly 24,000 units of CO₂.

Some initial analysis indicates that a strategy of reducing non-CO₂ greenhouse gas emissions by a greater percent than CO₂ emissions could lower emissions permit prices by as much as 10 percent. Thus allowing countries flexibility in what gases they reduce -- essentially trading emissions reductions across gases -- can help lower significantly the costs of meeting their targets.

The second source of “what flexibility” is the treatment of sinks, i.e., land use activities that promote the removal of carbon from the atmosphere through the growth of plants. At the urging of the U.S. delegation, sinks can be used to offset emissions targets. Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO₂ at much lower costs than reducing emissions of greenhouse gases.

3. “Where flexibility” (international)

The third type of flexibility, and perhaps the most important, is “where flexibility” (international). As I have already emphasized, emissions have the same environmental consequences regardless of where in the world they occur. Therefore, the least-cost approach to controlling climate change is to reduce emissions wherever such reductions are cheapest. The Kyoto Protocol, because of U.S. insistence and persistence, includes three important cost-saving provisions of this nature.

- First, it provides the opportunity for countries that take on binding targets to trade rights to emit greenhouse gases with each other. This market in emissions permits could ensure that emissions reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emissions reductions in other participating countries when doing so would reduce their costs -- thus lowering costs without affecting the level of environmental protection. While currently only industrialized countries have emissions caps, this mechanism also offers an incentive for developing countries to take on emissions targets.
- Second, the agreement provides for Joint Implementation by Annex I countries. Thus if some countries do not develop programs to trade permits internationally, U.S. firms could nonetheless implement projects in those countries for which they could receive emissions reductions credits in the U.S.
- Third, the agreement allows industrial countries to invest in "clean development" projects in the developing world and use these projects' certified emissions reductions toward meeting their targets. Many such clean development projects may be quite cheap in terms of the cost per ton of emissions avoided, as has been illustrated by the Joint Implementation pilot program that is already in place in the U.S.

Details of how these provisions will operate will be discussed in future negotiations such as the one in Buenos Aires later this year. Nonetheless, effective international trading of emission credits, Joint Implementation, and the Clean Development Mechanism can lead to substantial reductions in costs relative to alternative policies that do not exploit the power of market incentives. To illustrate briefly the ability of U.S. industry to perform beyond expectations when given appropriate economic incentives, consider further EPA's highly acclaimed sulfur dioxide (SO₂) program, which relies, among other things, on a system of tradeable permits to reduce emissions of SO₂ from electric utilities. The SO₂ program has been successful in several ways: a large number of utilities participate, SO₂ emissions and ambient concentrations have fallen and the costs of reducing emissions are considerably lower than originally forecast.

As has been frequently noted, the average cost of SO₂ emissions reductions has recently been significantly lower than was originally forecast, in part due to the role of incentives in fostering innovation. Emission permit prices, currently at approximately \$100 per ton of SO₂, are well below earlier estimates of around \$250 to \$400 per ton.

Trading programs may not always bring cost savings as large as those achieved by the SO₂ program; trading programs will not always be accompanied by the discovery of much cheaper control strategies. However, the SO₂ experience demonstrates clearly how programs like international permit trading, Joint Implementation, and the Clean Development Mechanism will lead firms to find cheaper ways of reducing emissions that can lead to unexpectedly low costs.

IV. Difficulties of Economic Analysis of the Kyoto Protocol

Now that we have a Protocol -- even if it is not yet fully complete nor ready for the President's submission to the Senate -- it is possible to examine it in somewhat more detail from an economic perspective. But, once again the inherent limitations of any such estimates deserve emphasis. Such limitations should not be surprising to you: economists have a difficult enough time projecting the behavior of the economy over the next quarter or year, let alone over the next two decades. The scale of the forecasting exercise is therefore daunting, and any specific results should be treated with substantial caution.

The difficulties associated with economic analysis of climate change fall into three broad categories. First are the uncertainties that still remain over the terms of the ultimate treaty, necessitating assumptions on which the analysis is predicated. Second are the inherent limitations of available models to analyze even short-term costs and benefits. And finally is a topic discussed earlier: the impossibility of putting a single monetary number on the long-term benefits of climate change mitigation, although there will clearly be economic benefits of emission reductions.

Uncertainties in the International Effort to Combat Climate Change

The Kyoto Protocol was an historic accomplishment, delineating the broad terms of the international effort to address climate change. But although we know a lot more than we did before Kyoto about how that international system can work, and that informs our analysis, there is still much that we do not know.

First, some provisions raise complex implementation issues. At issue here is the treatment of so-called sinks -- activities that affect the rate at which carbon is removed from the atmosphere and "sequestered," e.g., by the planting of trees.

Second, the details of a number of items -- primarily concerning international trading, the Clean Development Mechanism, and developing countries -- are the subject of further discussions including future negotiations in Buenos Aires next fall, because they had not been definitively settled by the end of the Kyoto talks.

Finally, and most importantly, we have not yet negotiated international agreements to limit emissions beyond the 2012 window. The emission cuts agreed upon at Kyoto are only a first step on a long journey. The first step that we propose to take over the next 15 years is critical. But the reason it is critical is *not* that, by itself, it will solve the climate change problem -- emissions during any given decade are small compared to the cumulative concentrations in the atmosphere. Rather, the first step is critical because we can not take the second and third steps until we have taken the first. At the same time, any analysis is complicated by the lack of knowledge over what the subsequent steps will be.

Inherent Limitations of Models

In addition to these uncertainties about the details of the international effort to address climate change, are the inherent limitations of the models used to evaluate that effort. Even within a given model, answers depend critically on the precise nature of the question asked. For example, the costs of emissions reductions depend critically on the extent of global participation and international trading that a treaty is assumed to feature. But in addition to the dependence of the results from a given model on the precise assumptions, different models can give different answers even when all the assumptions are specified to be the same -- a concrete illustration of the range of uncertainty to which we must assign the predictions of any one individual model.

One area in which the uncertainty is particularly large is the pace of technological progress --especially the diffusion of existing energy-efficient technologies, but also the development of new technologies -- and the extent to which the pace will accelerate in response to government programs. Models and experts on climate change policy tend to have a wider range of disagreement on the scope for speeding the diffusion of existing energy-efficient technologies than on any other single issue.

Furthermore, each model has strengths and weaknesses; each has questions to which it is better or worse suited to answer. Some, for example, model the energy sector in detail. Some allow for the fact that a coal-fired power plant cannot costlessly be converted to one that runs on natural gas. Some show the effects of hypothetical tax cuts made possible by the new revenues earned through the auction of emissions permits. Some are capable of showing recessions and booms. Others include a long-term "carbon cycle" model that can keep track of the accumulation of greenhouse gas concentrations in the atmosphere and their climatological effects. Some break down the rest of the world into regions and so can model international trade. No one model does everything, and therefore we must not rely blindly on the results of any one model or set of models. Professional judgement and economic intuition, along with diplomatic assessments, are also crucial.

Benefits of Averting Climate Change

As discussed above, it is evident that the benefits of averting climate change are potentially immense. But we have chosen not to try to quantify them in monetary terms, in light of the difficulties we have enumerated. These include the uncertainty of these benefits, their timing and therefore the extreme sensitivity of the results to the chosen discount rate, and the dependence of benefits on emissions paths after the 2008 to 2012 budget period specified in Kyoto.

V. Assessing the Kyoto Protocol

In order to evaluate the likely net economic impact of the Kyoto Protocol, *excluding the benefits of mitigating climate change itself*, we have drawn upon a variety of tools to assess the various possible costs and non-climate benefits of the Administration's emissions reduction policy. To give away the punch line, our conclusion is as follows: the net costs of our policies to reduce emissions are likely to be small, assuming those reductions are undertaken in an efficient manner and we are successful in securing meaningful developing country participation as well as effective international trading, and the Clean Development Mechanism in future negotiations. That potential small net premium, even excluding the benefits of mitigating climate change, in effect, purchases a partial insurance policy against a serious environmental threat.

Because the results from any model must be treated with caution, the Administration has employed a broad set of economic tools to assess the Kyoto Protocol. We have drawn on the insights of a wide range of models of the energy sector and economy over the next 25 years, including but not limited to the results of the Stanford Energy Modeling Forum exercises, the IPCC's review of the economic and social dimensions of climate change, the work of the OECD on Economic Dimensions and Policy Responses to Global Warming, and the staff-level Interagency Analytical Team analysis produced last year. Other tools include simple relevant statistics, "meta-analyses" such as work by the World Resources Institute, models, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives.

To our knowledge, no model -- whether used inside the government or not -- has yet been set up to analyze the implications of the Kyoto Protocol, since this agreement is only a few months old and remains unfinished. In particular, no model is currently designed to assess Kyoto's treatment of sinks, or all six greenhouse gases. Some model-builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models.

Our thinking has been informed, however, by simulations conducted with the Second Generation Model of Battelle Laboratories, one of the leading models in the field. The SGM is one of the models best positioned to analyze the role of international trade in emission permits, which we consider to be a critical element of the Kyoto Treaty. However, the SGM does not cover all six gases included in the Kyoto Protocol or include a role for sinks. We have used the SGM model as one input into our overall assessment of the Kyoto treaty, but have attempted to supplement its results with additional analysis to account for such special features of the agreement as the inclusion of six gases, a possible trading arrangement that could include a subset of the Annex I countries and the Clean Development Mechanism. We will share with you today some preliminary results of this analysis. To the extent possible, we have compared results obtained with the SGM model with those of other modelling efforts.

Mindful of the limitations of any single model, we are eager to see features of the Kyoto Protocol assessed by other models to obtain a better feel for the range of possible effects. This work is just beginning and much of it will continue to go on outside the government. For example, the Energy Modeling Forum, based at Stanford University, is a long-running model comparison exercise involving many of the leading climate models. EMF is currently studying how features of the Kyoto legal language can be translated into terms recognizable to economic modelers. We expect that the group will conduct a full scale analysis of the Kyoto Protocol. The Energy Modeling Forum believes that its members will need at least until mid-year to update their results.

VI. Assessing the Potential Costs of Emissions Reductions

I said in Congressional testimony last July that we can do this smart or we can do this dumb. I was referring to the point that the costs of cutting emissions can be much reduced if flexible, market-based mechanisms are used. Our economic analysis highlighted the importance of such flexible, market-based mechanisms -- which are therefore reflected, at the President's insistence, in the Kyoto Protocol and our ongoing diplomatic strategy.

Within the Kyoto Protocol, this means an insistence on international trading, Joint Implementation, the Clean Development Mechanism, and, ultimately, on meaningful developing country participation. Domestically, this means that we implement any emissions reductions through a market-based system of *tradeable* emissions permits, which ensures that we achieve reductions wherever they are least expensive. But this also means taking serious and responsible steps in the short run to prepare us to meet our obligations in the longer term.

The first such step is the inclusion in this year's budget of an aggressive, \$6.3 billion program of tax cuts and R&D investments -- \$1.3 billion more than the \$5 billion package the President promised in his October 22 speech on this issue. The goal is both to stimulate the development of new energy-saving and carbon-saving technologies and to encourage the dissemination of those that exist already. The proposed package contains \$3.6 billion over the next 5 years in tax cuts for energy efficient purchases and renewable energy, including tax credits of \$3,000 to \$4,000 for consumers who purchase highly fuel efficient vehicles, a 15 percent credit (up to \$2,000) for purchases of rooftop solar equipment, a 20 percent credit (subject to a cap) for purchasing energy-efficient building equipment, a credit up to \$2,000 for purchasing energy-efficient new homes, an extension of the wind and biomass tax credit, and a 10 percent investment credit for the purchase of combined heat and power systems. The package also contains \$2.7 billion over the next 5 years in additional research and development investments -- covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and cross-cutting analyses and research. One example of the R&D effort is the Partnership for a New Generation of Vehicles (PNGV). PNGV is a government-industry effort to develop attractive, affordable cars that meet all applicable safety and environmental standards and get up to three times the fuel efficiency of today's cars. In FY99, the combined proposal for PNGV is \$277 million, up from \$227 million appropriated in FY98. Similar government-industry efforts are proposed to develop more efficient diesel engines for both light trucks and heavy trucks.

A second responsible step entails industry-by-industry consultations to prepare emission reduction plans in key industrial sectors. The Administration will work in partnership with industry to identify ways in which the Federal government might remove regulatory hurdles that discourage energy efficiency. In addition, DOE will spearhead a comprehensive effort to improve the energy efficiency of the Federal government's own operations and purchases.

The third step is the promotion of an environmentally-responsible electricity restructuring bill, which the President identified as part of his domestic climate change package in his address to the National Geographic Society on October 22. An electricity sector freed from government regulation would be a more efficient energy sector. Costs to consumers would fall. In addition, stronger incentives for improved generation efficiency in conjunction with appropriate market based provisions could achieve modest reductions in emissions. A reasonable overall estimate of the contribution of federal electricity restructuring to the rest of the President's program to address climate change is that it would make further progress to the same emission reduction goals at a cost saving of roughly \$20 billion per year. These steps should be taken regardless of Kyoto, because they make sense in terms of energy efficiency. But they have the added benefit of preparing us for Kyoto.

Estimated Reduction in Costs from Annex I Trading

In the language of the treaty, "Annex I," is the set of countries that have agreed to take on binding limitations in emissions of greenhouse gases. Even without meaningful developing country participation -- which, again, the President has emphasized is essential before the treaty would be submitted for ratification -- costs could be reduced substantially by emission trading among the Annex I countries. To provide some indication of the possible efficiency improvements, Russia and Ukraine consume six times as much energy per dollar of output as does the United States. Such large international differences in energy efficiency suggest that adoption of existing U.S. technology would yield very large emissions reductions in these countries.

Estimates derived from the SGM model confirm that emissions trading among Annex I countries can reduce the cost to the United States of achieving its targets for 2008-2012 emissions by about half relative to a situation in which such trading was not available. This concept of costs is meant to capture aggregate resource costs to the US economy, including the cost to domestic firms of purchasing emission permits from other countries where emission reductions may be cheaper than in the United States. Although these estimates reflect idealized international trading in efficient markets, the overall conclusion is clear. The dramatic reduction in costs potentially available from Annex I trading within the SGM model -- cutting the costs involved by half -- highlights why the President insisted that international trading be part of the Kyoto Protocol; and why its achievement by our negotiators in Kyoto was such an important accomplishment.

Estimated reduction in costs from umbrella trading

One possibility that emerged in Kyoto, which none of us foresaw, was the idea developed there by the U.S. delegation, that the United States might undertake trading with a subset of Annex I countries, dubbed the “umbrella”. Countries that have expressed interest in the umbrella include the United States, Australia, Canada, New Zealand and Russia, with strong indications of interest from some others. This subset of Annex I countries shares a common interest in promoting market-based mechanisms, most specifically, fully flexible rules for international trading of emissions permits.

It is too early to state the precise form the umbrella will take. But we can envision a number of potential benefits. The umbrella could, for example greatly reduce costs to the U.S. Results that we have derived from various SGM simulations of efficient international trading suggest that, relative to the situation in which there is no trading at all, the umbrella can reduce costs by an estimated 60-75 percent, depending on whether the former Warsaw Pact countries fall within the umbrella. The Kyoto Protocol classifies these countries outside of the EU bubble for the first budget period 2008-2012.

Estimated reduction in costs from developing country participation

The next consideration is participation by developing countries. The President has said that he will not submit the treaty for ratification without meaningful participation by key developing countries. Such participation would further reduce the costs involved.

The substantial potential gains from meaningful developing country participation are highlighted by the significant benefits that will likely accrue from the limited role that the developing countries have already agreed to: the Clean Development Mechanism (CDM), modeled after the U.S. joint implementation concept. The CDM cannot realistically be expected to yield all the gains of binding targets for developing countries, but it might shave costs by roughly another 20 to 25 percent from the reduced costs that result from trading among Annex I countries.

Another possibility is that we persuade some of the key developing countries that are the largest emitters to commit to targets, and allow us to buy emission reductions from those paths. Simulations with the SGM model suggest that full participation by non Annex I countries could cut roughly 55 percent off the reduced costs that result from Annex I trading. The actual cost reduction would depend on the extent of developing country participation that is ultimately obtained, as well as the effectiveness of international trading arrangements. The more developing countries that take on modest binding targets and trade in international permit markets, the lower will be costs.

These cost-saving opportunities are fundamental tenets of the U.S. position. The promise of Kyoto cannot be achieved without effective emissions trading. Moreover, if we do not get meaningful participation by key developing countries, we won't submit the treaty for ratification to the Senate. So, while our analysis may be predicated on some ambitious conditions concerning trading and developing country participation, it is exactly those conditions that form the foundation of the U.S. position in international negotiations including those at Buenos Aires.

Accounting for Carbon Sinks

The preceding discussion has emphasized the importance of trading arrangements and the CDM. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. Again, the U.S. delegation obtained a novel concept, that carbon absorbing activities called sinks could be used to offset emissions. The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. The Kyoto Protocol specifies that removals of CO₂ by sinks count toward meeting the target. The Kyoto Protocol counts the net emissions effects of three sink activities --afforestation, reforestation, and deforestation. Very preliminary estimates of the implications for the United States of the Kyoto provision on sinks indicate that carbon sinks could comprise a significant portion of the total required emissions reductions. Moreover, decreasing the required emissions reduction by, for example, 10% would likely result in cost-savings greater than 10%.

Even this estimate of the effect of sinks is conservative in one respect: it is based on an assumption for sink activity in the U.S. over the 2008-2012 period, and no assumed benefits from sinks elsewhere in the world. Very preliminary estimates suggest that incorporating the gains from sinks *throughout the world* can substantially reduce the costs of meeting the Kyoto target, on top of the gains from trading among Annex I countries. (Furthermore, no model has yet even tried to take into account that government policies can help increase the activities qualifying as allowable sinks, like some tree-planting.) Because the quantitative uncertainty is so large, we do not yet have an estimate with which we are comfortable. But we expect that complete modelling of the Kyoto provision pertaining to sinks will likely have favorable and potentially large effects on projected costs.

Accounting for the role of improvements in energy efficiency

Another issue in analyzing the Kyoto protocol concerns future improvements in energy efficiency due to innovation and diffusion of existing technology. The parameter that figures most prominently in analysis of energy efficiency is the rate of improvement in the so-called Autonomous Energy Efficiency Index (AEEI), that is the rate at which the total use of energy falls relative to GDP. A plausible assumption on the AEEI is an improvement of 1.0 percent per year. Reflecting a conservative interpretation of the 15-year impact of various climate change initiatives, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is not the most

optimistic outcome that might occur. Some authorities in the field of energy policy forecast more rapid technological progress. Experts at five national laboratories managed by the Department of Energy, using an engineering approach rather than an economic paradigm, found that a third of the emissions reductions necessary to return to 1990 levels by 2010 could be achieved through the adoption of existing energy-efficient technologies at no net resource cost, or even some savings. The National Academy of Sciences reached qualitatively similar conclusions in a 1992 report.

The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of tax cuts and R&D investments intended to spur the discovery and adoption of new technologies. If the Administration is successful in this effort, the rate of improvement in energy efficiency could rise and such improvements would lower the cost of meeting our Kyoto target. For example, published results based on SGM model simulations with different assumed rates of AEEI suggest that an increase in the AEEI of 25 percent could lead to declines in the permit price of approximately 40 percent.

Our justification for incorporating into our assessment a small assumed impact of Administration technology policies is somewhat analogous to the Administration's rationale for employing mainstream economic assumptions in our budget forecasts: in the presence of uncertainty, we are conservative in our estimates of the speed with which the economy will grow, tax receipts will rise, and the budget will improve. That way, any revisions or surprises that occur are likely to be in the pleasant direction. In this instance, we prudently and conservatively assume that there will be substantial delays between investments in new technology or the diffusion of existing technology, and the returns to such investments.

Moreover, at the recent automobile show in Detroit, General Motors announced that it has developed a hybrid-based vehicle that can achieve fuel efficiency of 80 miles per gallon, and that this car could be in commercial production within a few years. Ford also exhibited a prototype of a light-weight highly fuel efficient sedan that could be in commercial production by the middle of the next decade. These announcements followed an earlier breakthrough announced by DOE and its partners of a fuel cell that could run on gasoline and double current fuel economy while reducing conventional air pollution emissions by 90 percent. These technological advances have been made possible through the efforts of the Partnership for a New Generation of Vehicles between the Administration and the U.S. auto companies and their suppliers.

Such progress may be replicated in other sectors. VCRs and TVs, while switched off, consume about \$1 billion worth of electricity annually. EPA has established a partnership with major manufacturers that has a goal of achieving up to a 70 percent reduction in energy use by VCRs and TVs while they are switched off, without sacrificing product quality, usefulness, or increasing costs. This partnership offers promise of substantial improvements in energy efficiency.

Non-Climate Benefits

A final factor that should be included in any comprehensive assessment of the economic implications of the Kyoto protocol are the benefits of the agreement. The literature has emphasized that any relative price shifts that prove necessary to reduce emissions should produce non-climate benefits in three areas: traffic congestion, highway accidents, and air pollution unrelated to climate change. These benefits are hard to quantify precisely but are potentially significant: our rough estimates suggest that these three benefits could offset approximately a quarter of the resource cost of the climate change policy.

Synthesis

A comprehensive evaluation of the economic impact of the Kyoto Protocol must integrate all of the factors described above: reliance on flexible market-based mechanisms domestically; international trading and Joint Implementation among Annex I countries; the Clean Development Mechanism; meaningful developing country participation; the potential cost-mitigating role of including six gases and carbon sinks; the benefits of electricity restructuring; and emissions reductions achieved as a consequence of other proposed Administration climate change initiatives. Assuming that effective mechanisms for international trading, Joint Implementation and the Clean Development Mechanism are established, and assuming also that the U.S. achieves meaningful developing country participation, our overall assessment is that the economic cost to the United States in aggregate and to typical households of attaining the targets and timetables specified in the Kyoto Protocol, will be modest.

This conclusion that the impact will be modest is not entirely dependent upon, but is fully consistent with, formal model results. I have previously emphasized the limitations of relying on any single model in assessing the economic impact of the Kyoto Protocol, and continue to view any such results as just one input into an overall analysis. But it is worth emphasizing that model results reflecting the details of the Kyoto Protocol are consistent with our conclusion. For example, under the assumptions of either trading under the umbrella or within Annex I, the CDM and permit trading with developing countries, estimates derived using the SGM model, which adjust for the inclusion of six gases and assume little banking of credits beyond 2012, suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to \$7 to \$12 billion per year in 2008 to 2012. This implies that overall costs, excluding not only climate and non-climate benefits, but also such cost mitigating factors as sinks and payoffs from the President's electricity restructuring and climate change initiatives, would reach roughly one tenth of one percent of projected GDP in 2010.

A more tangible measure of costs is the estimated effects on energy prices. Excluding the impact of electricity restructuring and the ancillary benefits of mitigation and better forest management, the SGM-based estimate, corresponding to the gross resource cost estimate cited above, is an emissions price in the range of \$14 to \$23 per ton of carbon equivalent. This translates into an increase in energy prices between 2008 and 2012 at the household level of

between 3 and 5 percent, an increase in fuel oil prices of about 5 to 9 percent, natural gas prices of 3 to 5 percent, gasoline prices of 3 to 4 percent (or around 4 to 6 cents per gallon), and electricity prices of 3 to 4 percent. This increase in energy prices at the household level would raise the average household's energy bill in ten years by between \$70 and \$110 per year, although such predictions may not be observable because they would be small relative to typical energy price changes, and nearly fully offset by electricity price declines from Federal electricity restructuring. In particular, this increase in energy prices is small relative to the average of *year to year* real energy price changes experienced by U.S. consumers since 1960: such *annual* changes have averaged 3.8 percent. In addition, by 2008-2012, the anticipated 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda is projected to lead to expenditure reductions of about \$90 per year for the average household.

As highlighted earlier, there are substantial but unavoidable uncertainties surrounding estimates like these. For example, the estimate just discussed is predicated, among other things, on the developing country participation that we are insisting upon as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol, and on effective international trading. Moreover, other models will yield other answers and much work remains to be done by the modeling community to test the robustness of these results. Preliminary comparisons of the SGM model to the few other models that have attempted to evaluate the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto Protocol on carbon permit prices are neither the most conservative nor the most optimistic of the models that have been developed. The predictions of the SGM model are robust in the sense that virtually all energy models reveal the potency of effective, flexible, domestic and international trading mechanisms to reduce substantially the cost and energy price impact of meeting the Kyoto targets.

Of course, the most important factor that has been left out of the above assessment is the benefit of mitigating climate change itself. A full cost-benefit analysis would include mitigation in the benefits column. The only reason we have not done so, explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But nobody should lose sight of our ultimate objective -- keeping our planet the hospitable home that we enjoy today.

Effects on employment and aggregate output

So far we have said nothing about job losses resulting from climate change policy. Although there may be job gains in some sectors and job losses in others, we do not anticipate any significant aggregate employment effect if we achieve the conditions we have discussed. The effects on energy prices described above will occur only 10 to 14 years in the future. Not only are these effects small relative to historical variations in energy prices, and offset by other policies like electricity restructuring, they would occur sufficiently far in the future to enable monetary policy to keep the economy operating at its potential. In energy-intensive sectors some employment reduction could occur, although given the very small predicted change in energy prices, impacts in most such sectors are apt to be minimal. Furthermore, a large number of jobs will be created in other sectors -- many of them high-tech jobs paying high wages. The President is firmly committed to assisting any workers who are adversely affected during the transition to a climate-friendly economy.

VII. Conclusion

In conclusion, the Kyoto Protocol and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Protocol includes key provisions on international trading and Clean Development projects. The President's approach relies on market incentives -- first, with a system of tax cuts and R&D investments, and then later with a market-based system of tradeable permits -- to ensure that our objectives are achieved as efficiently as possible.

Our overall conclusion is that the economic impact of the Protocol will be modest under the conditions we have identified. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which draws insights from not only the forecasts of individual models, any one of which has its own strengths and limitations, but also a broad variety of additional analyses.

I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Protocol and evaluating the net effects of reducing greenhouse gas emissions. It is my hope that economic analysis will continue to play a key role in designing policies in this area.

I welcome your questions.

**TESTIMONY OF DR. JANET YELLEN
CHAIR, COUNCIL OF ECONOMIC ADVISERS
BEFORE THE U.S. SENATE
COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY
ON THE ECONOMICS OF THE KYOTO PROTOCOL
MARCH 5, 1998**

Thank you, Mr. Chairman. The President has said that we can work to avert the grave dangers of climate change, while at the same time maintaining the strength of our economy. I agree and am pleased to have this opportunity to appear before the Committee to elaborate on the Administration's views on these issues.

The international agreement that was reached in Kyoto this past December is a crucial step forward in addressing global climate change. But it is only one step in a journey. Since the international effort to reduce greenhouse gas emissions is still in some respects a work-in-progress, it is not yet possible to provide a full authoritative analysis of it. Many of the specifics in several crucial areas are not completely resolved in the diplomatic arena, forcing analysts to make a variety of assumptions about the ultimate form of the international regime. In my testimony today, I will attempt to identify key elements of the agreement and the Administration's policy, such as international emissions trading, meaningful developing country participation, inclusion of land-use activities that absorb carbon ("sinks") and six categories of gases, as well as domestic initiatives, that together can ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will explain the reasoning underlying our conclusion that, under these conditions, economic impacts are likely to be modest.

The Administration is strongly committed to ensuring that these key elements are reflected in our domestic and international climate change policies. We are firmly committed to meaningful developing country participation, the use of sinks to offset emissions requirements, and emissions trading both domestically and internationally. And as you know, the President's FY 1999 budget includes a \$6.3 billion package of tax cuts and R&D investments over the next 5 years; this package makes good sense in terms of energy policy and will jumpstart our efforts. A final component of the President's climate change policy is his support for electricity restructuring in a manner that will offer approximately \$20 billion in cost savings to electricity consumers, while reducing greenhouse gas emissions.

I. Basic Economic Rationale of the Kyoto Treaty

To begin our analysis, it may be worth stepping back and examining the larger question of the basic rationale, from an economist's perspective, for the Kyoto Protocol.

The earth's surface appears to be warming from the accumulation of greenhouse gases from myriad sources worldwide. None of these emitters presently pays the cost to others of warming's adverse effects -- a classic externality in the language of economists. As a result of these distorted incentives, disruption of the Earth's climate is likely to proceed at an excessive pace and if left uncontrolled may pose substantial costs in terms of harm to commerce and the environment alike. The fundamental economic logic of the Kyoto Protocol is thus that without such an international agreement, individual nations will not have the proper incentives to address the threats from global climate change.

II. Costs of Climate Change

In evaluating efforts to mitigate global warming, the first step is to consider the costs of inaction. These costs --and they are significant-- provide the primary motivation for actions to reduce greenhouse gas emissions.

The Intergovernmental Panel on Climate Change (IPCC) jointly established by the World Meteorological Organization and the United Nations Environment Programme, concluded in 1995 that "the balance of evidence suggests that there is a discernible human influence on global climate." Current concentrations of carbon dioxide, methane, nitrous oxide, and the other so-called greenhouse gases have reached levels well above those of preindustrial times. Of these, carbon dioxide (CO₂) is the most important: net cumulative CO₂ emissions resulting from the burning of fossil fuels and deforestation account for about two-thirds of potential warming from changes in greenhouse gas concentrations related to human activity.

Climatic Impact

If growth in global emissions continues unabated, the atmospheric concentration of CO₂ will likely double relative to its preindustrial level by midway through the next century and continue to rise thereafter. As a result of the increased concentration of CO₂, the IPCC estimates that global temperatures will increase by between 2 to 6 degrees Fahrenheit in the next 100 years, with a best guess of about 3.5 degrees Fahrenheit. While scientists believe that human activities are leading to a gradual warming of the *average* temperature of the earth, the change in temperature in a given region at a given time may differ substantially from this average. Indeed, models predict warming will be greater in high latitudes than in the tropics, and greater over land than ocean.

Potential consequences associated with this shift in climate include a rise in sea levels, greater frequency of severe weather events, shifts in agricultural growing conditions from changing weather patterns, threats to human health from increased range and incidence of diseases, changes in availability of freshwater supplies, and damage to ecosystems and biodiversity.

Economic and Monetary Damages

The derivation of quantitative or monetary estimates of the damages from such a change in the climate is extremely difficult given the capacity of today's models. Estimates of the economic damages from climate change fall into the following broad areas: agriculture, sea-level rise, air conditioning and heating, water supply, human life and health, air pollution, and other costs (hurricanes, relocation costs, human amenity, construction, leisure activities, urban infrastructure, and ecological damages such as forest loss and species loss). Although the quantification of these effects is quite demanding, researchers have developed estimates that prompt substantial concern. The IPCC reports that a doubling of carbon dioxide levels would lead to approximately 10,000 estimated additional deaths per year for the current U.S. population from higher summer temperatures, even after netting out the effects of warmer winters and assuming acclimatization. Other researchers have predicted sea level increases of about 20 inches by 2100, with greater increases in subsequent years.

Despite the difficulties, respected researchers have developed estimates of the monetary damages expected from an average worldwide temperature increase. For example, William Cline, then of the Institute for International Economics, estimated that a temperature change of 4.5 degrees Fahrenheit would impose annual damages of about 1.1 percent of GDP per year on the U.S. economy. That amounts to \$89 billion in today's terms. (Cline's original estimate is quoted in 1990 dollars. The figure given above translates this number into 1997 terms by scaling it to current GDP.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of greenhouse gas concentrations. Although he uses methods that differ from Cline's in several respects, Nordhaus estimates that a slightly larger temperature change of 5.4 degrees Fahrenheit would impose losses equal to about 1 percent of GDP. A third independent estimate reported by Nordhaus is close to Cline's. It must be noted, however, that this similarity among aggregated estimates masks the true uncertainty associated with forecasts of the damages from given increases in global warming -- the estimates are all fundamentally based on extrapolations from current and past experience, and may not fully incorporate effects that will unfortunately become apparent only with future experience.

One key difficulty in interpreting and monetizing these estimates of damages is uncertainty over the extent that they should be discounted because they occur in the distant future. Since the benefits of stemming future climate change accrue over not only decades but centuries, small changes in the discount rate can produce substantial changes in the results. But the precise discount rate that should be used to evaluate questions as important as the future climate of the planet remains a subject of intense debate. It is safe to say that there is, as yet, no professional consensus on the issue. Indeed there can be no technical answer to the ethical question how we should value the welfare of future generations.

A similar difficulty with such estimates is that they do not include potential non-linearities in the relationships between greenhouse gas concentrations and temperature, between temperature and economic damages, or in the various other complicated relationships governing interactions between greenhouse gas emissions, the climate, and the economy. Current estimates of damages do not, and cannot, accurately reflect the value of reducing the unknown risk of large-scale and potentially irreversible discrete events with potentially catastrophic consequences.

- Two such possibilities serve as illustrations. Warming of Northern tundra may release huge amounts of methane from the permafrost, thereby leading to accelerated warming. We do not know at what point, if any, such potentially unstable activity would be triggered. Second, evidence from climate models suggests that some types of climate change may lead to changes in ocean currents, including weakening of the Gulf Stream that warms Western Europe. Scientific evidence suggests that abrupt seawater temperature shifts have occurred over periods as short as decades.

To what extent are we willing to take such chances with our planet? There is a strong argument for the Kyoto Protocol as a form of planet insurance. But what numerical weight should one assign to these catastrophic risks? In other words, what is the value of the insurance policy? Although it is difficult for an economist, or anyone, to know, reductions in the risk of such catastrophic outcomes must be considered in addition to the costs and benefits that can be reasonably quantified. Since human beings are typically averse to risk, such catastrophic risks are especially important in evaluating whether the benefits of a particular climate control policy justify the costs. One must have at least some sympathy with those who criticize economists on the grounds that the effects of climate change are extremely difficult to quantify in a single monetary number.

III. Addressing Global Climate Change in an Efficient Manner

The costs of unabated climate change may thus be difficult to quantify, but they are nonetheless real and provide the motivation for reducing greenhouse gas emissions. In taking action to reduce those emissions, economic analysis suggests that two elements are absolutely essential:

- The effort must be global, to address the global externality inherent in the nature of the problem.
- The effort must be flexible and market-based, to ensure that we achieve our objectives in the most efficient manner possible.

Need for Global Action

Climate change is a global problem requiring a global solution. As I mentioned earlier, no single country has an incentive to reduce emissions sufficiently to protect the global environment against climate change. Each has an economic incentive to “free ride” on the efforts of others. Even if the United States sharply reduced its emissions unilaterally without an international agreement limiting emissions abroad, greenhouse gas emissions from all other countries would continue to grow, and the risks posed by climate change would not be significantly reduced. It is important to emphasize that emissions of different gases anywhere in the world have very similar effects on global climate.

The threat of disruptive climate change has led to coordinated international efforts to reduce the risks of global warming by reducing emissions of greenhouse gases. A landmark international agreement to address global warming was the Framework Convention on Climate Change signed during the Earth Summit in Rio de Janeiro in 1992. This convention established an objective of limiting greenhouse gas concentrations and called upon industrial countries to return their emissions to 1990 levels by 2000. Since then, it has become clear that the United States and many other participating countries will not meet this voluntary goal; quite the contrary, emission levels have continued to rise not fall among both developed and developing countries.

To address the lack of progress among many industrialized countries toward meeting the Rio objective, the United States and approximately 160 other nations agreed in negotiations held in Kyoto, Japan, last December, to reduce emissions of greenhouse gases. The Kyoto Protocol, which requires the advice and consent of the Senate, would place binding limits on each industrial country's combined emissions of the six principal categories of greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. These limits apply to the 38 so-called Annex I countries, which are the industrialized countries, defined to include Russia, Ukraine, and most Eastern European countries.

Under the Kyoto Protocol, each industrial country's baseline is its 1990 emissions of CO₂, methane, and N₂O and its choice of 1990 or 1995 levels of the other three categories of gases. The United States agreed to a target of 7 percent below this baseline by the period between 2008 and 2012. Given the changes in the definition of the baseline for the three long-lived chemical compounds (HFCs, PFCs and SF₆) from 1990 to 1995 combined with a change in the way sinks are accounted for in the baseline, the actual reduction required in the U.S. is no more than 2-3% more than the President originally proposed as the U.S. negotiating position. The targets for the European Union and Japan are 8 percent and 6 percent below 1990 levels, respectively. Australia, New Zealand, Norway, Russia, and Ukraine all have limits somewhat less ambitious when phrased as cuts relative to their 1990 levels. In sum, over the period from 2008 to 2012, the industrial countries are expected to reduce their average emissions of greenhouse gases to about 5 percent below their 1990 levels.

The President has made clear that he will not submit the Kyoto Protocol to the Senate without meaningful participation from key developing countries (who are not included in Annex I).

There are several reasons why meaningful participation from developing countries is essential. First, developing countries are projected to contribute a majority of world emissions around 2030 under a continuation of business-as-usual. Without the participation of developing economies, efforts by the industrialized countries to limit emissions will therefore not provide adequate protection from climate change.

Second, developing country participation is crucial because it would permit relatively low-cost emissions reductions to be internationally recognized as a substitute for more expensive emissions reductions that might otherwise be achieved domestically by U.S. companies and those in other industrialized countries. Since greenhouse gas emissions have the same basic impact on the climate regardless of where they occur, emission reductions in developing countries have the same environmental benefit as reductions in the U.S. But these reductions are much less costly than reductions in the U.S. or in other developed nations, because of the very inefficient and carbon-intensive uses of energy in these countries today. It thus makes sense, from both an environmental and an economic perspective, to incorporate emissions reductions in developing countries into the international system.

Third, principles of basic fairness suggest all countries should do their part, depending, in part, on their ability to contribute to the solution. Thus even poor countries should participate, although the lack of resources in such countries may limit the extent of their participation.

Some have expressed fears that the Kyoto Protocol might adversely affect the competitive position of American industry. Evaluating how the Kyoto Protocol could affect competitiveness of a few specific manufacturing industries -- especially those that are especially energy-intensive, such as aluminum and chemicals -- is complex. The answer depends, in part, on the impact of the agreement on energy prices, which we will shortly address. In general it is difficult to undergo a structural change in the economy without having the effect of expanding some sectors and contracting others. But to provide some perspective on this issue, consider the following facts. First, on average, energy constitutes only 2.2 percent of total costs to U.S. industry. Second, energy prices already vary significantly across countries. According to the *1997 Statistical Abstract*, for example, in 1996 premium gasoline cost \$1.28 per gallon in the United States -- but only 8 cents per gallon in Venezuela. Similarly, gas prices were \$3.71 per gallon in Switzerland and \$4.41 per gallon in France. Electricity prices also vary significantly: in the U.S., for industry, they were 5 cents per kilowatt hour in 1995, a fraction of prices in Switzerland of 13 cents per kilowatt hour. Yet U.S. industry is not moving en masse to Venezuela, nor is Swiss industry moving to the United States. Third, roughly two-thirds of all emissions are not in manufacturing at all, but in transportation and buildings, sectors which, by their very nature, are severely limited in their ability to relocate to other countries. We therefore believe we need developing country participation because the problem is global and cost-effective solutions are essential, than to avoid adverse effects on competitiveness.

Flexibility and Market Mechanisms

A global solution is thus critical to the global problem of climate change. Globalizing the solution is not, however, enough by itself. We must also ensure that our reductions in global greenhouse gas emissions are attained in the most efficient manner possible. The nature of the climate change problem suggests three basic methods to lower costs of achieving given levels of environmental protection. They can be characterized in terms of three categories of flexibility: (1) "when" flexibility; (2) "what" flexibility; and (3) "where" flexibility, which may be the most important of all. Such methods have long been championed by economists interested in increasing the efficiency of protection. Indeed, over 2,500 economists from academia, industry, and government alike urged such approaches in a letter they signed last year advocating action on climate change:

"Economic studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs...The most efficient approach to slowing climate change is through market-based policies."

1. "When flexibility" (timing)

First is "when flexibility" or timing. Since climate change is a long-term problem, the exact timing of emissions reductions is, within some range, not of primary importance. Thus the freedom to delay or accelerate reductions within an agreed upon time frame -- while ensuring credibility of emissions reductions -- lowers costs.

As a result of U.S. leadership, the Kyoto Protocol incorporates this principle of "when flexibility" in four ways:

- First, the initial emissions reductions are less severe, and the period over which they occur ends much later than what had been proposed by many other countries. By adopting a gradual and credible path of reductions in the early years, we can greatly reduce costs such as those from prematurely scrapping coal-fired electricity plants, while attaining the same ultimate environmental goals.
- Second, under the Kyoto Protocol, the emissions target is not specified in terms of a specific year, but rather in terms of an average over a five-year period (2008-2012). Averaging over five years, instead of requiring countries to meet a specific target each year, can lower costs, especially given an uncertain future. The averaging can smooth out the effects of short-term events such as fluctuations in the business cycle and energy demand, or hard winters and hot summers that would increase energy use and emissions.

- Third, there is allowance for “banking” emission reductions within the 2008-2012 commitment period, for use in a subsequent commitment period [although the emission targets of the subsequent periods have not yet been specified].
- Fourth, CDM credits achieved between 2000 and 2008 may be banked until 2008 to 2012.

2. “What flexibility” (gases and sinks)

The second type of flexibility is “what flexibility”, along two dimensions. The first is the inclusion in the agreement of all six greenhouse gases. Emissions of different kinds of gases, not just carbon dioxide, contribute to the greenhouse effect. Since the IPCC has developed conversion factors for all greenhouse gases by estimating their global warming potentials, reductions in emissions of one gas can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects. Again at U.S. urging, all six gases are included, while Japan and the EU had insisted until the end on covering only three. Thus the U.S. succeeded in having the Kyoto Protocol stipulate that countries with binding targets are to reduce their *total* greenhouse gas emissions by certain percentages, but does not require specific reductions for specific gases. Since a molecule of sulfur hexafluoride is 23,900 times more potent over 100 years than a molecule of CO₂, it may be cheaper to achieve the same environmental benefit by eliminating one molecular unit of SF₆ than nearly 24,000 units of CO₂.

Some initial analysis indicates that a strategy of reducing non-CO₂ greenhouse gas emissions by a greater percent than CO₂ emissions could lower emissions permit prices by as much as 10 percent. Thus allowing countries flexibility in what gases they reduce -- essentially trading emissions reductions across gases -- can help lower significantly the costs of meeting their targets.

The second source of “what flexibility” is the treatment of sinks, i.e., land use activities that promote the removal of carbon from the atmosphere through the growth of plants. At the urging of the U.S. delegation, sinks can be used to offset emissions targets. Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO₂ at much lower costs than reducing emissions of greenhouse gases.

3. “Where flexibility” (international)

The third type of flexibility, and perhaps the most important, is “where flexibility” (international). As I have already emphasized, emissions have the same environmental consequences regardless of where in the world they occur. Therefore, the least-cost approach to controlling climate change is to reduce emissions wherever such reductions are cheapest. The Kyoto Protocol, because of U.S. insistence and persistence, includes three important cost-saving provisions of this nature.

- First, it provides the opportunity for countries that take on binding targets to trade rights to emit greenhouse gases with each other. This market in emissions permits could ensure that emissions reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emissions reductions in other participating countries when doing so would reduce their costs -- thus lowering costs without affecting the level of environmental protection. While currently only industrialized countries have emissions caps, this mechanism also offers an incentive for developing countries to take on emissions targets.
- Second, the agreement provides for Joint Implementation by Annex I countries. Thus if some countries do not develop programs to trade permits internationally, U.S. firms could nonetheless implement projects in those countries for which they could receive emissions reductions credits in the U.S.
- Third, the agreement allows industrial countries to invest in "clean development" projects in the developing world and use these projects' certified emissions reductions toward meeting their targets. Many such clean development projects may be quite cheap in terms of the cost per ton of emissions avoided, as has been illustrated by the Joint Implementation pilot program that is already in place in the U.S.

Details of how these provisions will operate will be discussed in future negotiations such as the one in Buenos Aires later this year. Nonetheless, effective international trading of emission credits, Joint Implementation, and the Clean Development Mechanism can lead to substantial reductions in costs relative to alternative policies that do not exploit the power of market incentives. To illustrate briefly the ability of U.S. industry to perform beyond expectations when given appropriate economic incentives, consider further EPA's highly acclaimed sulfur dioxide (SO₂) program, which relies, among other things, on a system of tradeable permits to reduce emissions of SO₂ from electric utilities. The SO₂ program has been successful in several ways: a large number of utilities participate, SO₂ emissions and ambient concentrations have fallen and the costs of reducing emissions are considerably lower than originally forecast.

As has been frequently noted, the average cost of SO₂ emissions reductions has recently been significantly lower than was originally forecast, in part due to the role of incentives in fostering innovation. Emission permit prices, currently at approximately \$100 per ton of SO₂, are well below earlier estimates of around \$250 to \$400 per ton.

Trading programs may not always bring cost savings as large as those achieved by the SO₂ program; trading programs will not always be accompanied by the discovery of much cheaper control strategies. However, the SO₂ experience demonstrates clearly how programs like international permit trading, Joint Implementation, and the Clean Development Mechanism will lead firms to find cheaper ways of reducing emissions that can lead to unexpectedly low costs.

IV. Difficulties of Economic Analysis of the Kyoto Protocol

Now that we have a Protocol -- even if it is not yet fully complete nor ready for the President's submission to the Senate -- it is possible to examine it in somewhat more detail from an economic perspective. But, once again the inherent limitations of any such estimates deserve emphasis. Such limitations should not be surprising to you: economists have a difficult enough time projecting the behavior of the economy over the next quarter or year, let alone over the next two decades. The scale of the forecasting exercise is therefore daunting, and any specific results should be treated with substantial caution.

The difficulties associated with economic analysis of climate change fall into three broad categories. First are the uncertainties that still remain over the terms of the ultimate treaty, necessitating assumptions on which the analysis is predicated. Second are the inherent limitations of available models to analyze even short-term costs and benefits. And finally is a topic discussed earlier: the impossibility of putting a single monetary number on the long-term benefits of climate change mitigation, although there will clearly be economic benefits of emission reductions.

Uncertainties in the International Effort to Combat Climate Change

The Kyoto Protocol was an historic accomplishment, delineating the broad terms of the international effort to address climate change. But although we know a lot more than we did before Kyoto about how that international system can work, and that informs our analysis, there is still much that we do not know.

First, some provisions raise complex implementation issues. At issue here is the treatment of so-called sinks -- activities that affect the rate at which carbon is removed from the atmosphere and "sequestered," e.g., by the planting of trees.

Second, the details of a number of items -- primarily concerning international trading, the Clean Development Mechanism, and developing countries -- are the subject of further discussions including future negotiations in Buenos Aires next fall, because they had not been definitively settled by the end of the Kyoto talks.

Finally, and most importantly, we have not yet negotiated international agreements to limit emissions beyond the 2012 window. The emission cuts agreed upon at Kyoto are only a first step on a long journey. The first step that we propose to take over the next 15 years is critical. But the reason it is critical is *not* that, by itself, it will solve the climate change problem -- emissions during any given decade are small compared to the cumulative concentrations in the atmosphere. Rather, the first step is critical because we can not take the second and third steps until we have taken the first. At the same time, any analysis is complicated by the lack of knowledge over what the subsequent steps will be.

Inherent Limitations of Models

In addition to these uncertainties about the details of the international effort to address climate change, are the inherent limitations of the models used to evaluate that effort. Even within a given model, answers depend critically on the precise nature of the question asked. For example, the costs of emissions reductions depend critically on the extent of global participation and international trading that a treaty is assumed to feature. But in addition to the dependence of the results from a given model on the precise assumptions, different models can give different answers even when all the assumptions are specified to be the same -- a concrete illustration of the range of uncertainty to which we must assign the predictions of any one individual model.

One area in which the uncertainty is particularly large is the pace of technological progress --especially the diffusion of existing energy-efficient technologies, but also the development of new technologies -- and the extent to which the pace will accelerate in response to government programs. Models and experts on climate change policy tend to have a wider range of disagreement on the scope for speeding the diffusion of existing energy-efficient technologies than on any other single issue.

Furthermore, each model has strengths and weaknesses; each has questions to which it is better or worse suited to answer. Some, for example, model the energy sector in detail. Some allow for the fact that a coal-fired power plant cannot costlessly be converted to one that runs on natural gas. Some show the effects of hypothetical tax cuts made possible by the new revenues earned through the auction of emissions permits. Some are capable of showing recessions and booms. Others include a long-term "carbon cycle" model that can keep track of the accumulation of greenhouse gas concentrations in the atmosphere and their climatological effects. Some break down the rest of the world into regions and so can model international trade. No one model does everything, and therefore we must not rely blindly on the results of any one model or set of models. Professional judgement and economic intuition, along with diplomatic assessments, are also crucial.

Benefits of Averting Climate Change

As discussed above, it is evident that the benefits of averting climate change are potentially immense. But we have chosen not to try to quantify them in monetary terms, in light of the difficulties we have enumerated. These include the uncertainty of these benefits, their timing and therefore the extreme sensitivity of the results to the chosen discount rate, and the dependence of benefits on emissions paths after the 2008 to 2012 budget period specified in Kyoto.

V. Assessing the Kyoto Protocol

In order to evaluate the likely net economic impact of the Kyoto Protocol, *excluding the benefits of mitigating climate change itself*, we have drawn upon a variety of tools to assess the various possible costs and non-climate benefits of the Administration's emissions reduction policy. To give away the punch line, our conclusion is as follows: the net costs of our policies to reduce emissions are likely to be small, assuming those reductions are undertaken in an efficient manner and we are successful in securing meaningful developing country participation as well as effective international trading, and the Clean Development Mechanism in future negotiations. That potential small net premium, even excluding the benefits of mitigating climate change, in effect, purchases a partial insurance policy against a serious environmental threat.

Because the results from any model must be treated with caution, the Administration has employed a broad set of economic tools to assess the Kyoto Protocol. We have drawn on the insights of a wide range of models of the energy sector and economy over the next 25 years, including but not limited to the results of the Stanford Energy Modeling Forum exercises, the IPCC's review of the economic and social dimensions of climate change, the work of the OECD on Economic Dimensions and Policy Responses to Global Warming, and the staff-level Interagency Analytical Team analysis produced last year. Other tools include simple relevant statistics, "meta-analyses" such as work by the World Resources Institute, models, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives.

To our knowledge, no model -- whether used inside the government or not -- has yet been set up to analyze the implications of the Kyoto Protocol, since this agreement is only a few months old and remains unfinished. In particular, no model is currently designed to assess Kyoto's treatment of sinks, or all six greenhouse gases. Some model-builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models.

Our thinking has been informed, however, by simulations conducted with the Second Generation Model of Battelle Laboratories, one of the leading models in the field. The SGM is one of the models best positioned to analyze the role of international trade in emission permits, which we consider to be a critical element of the Kyoto Treaty. However, the SGM does not cover all six gases included in the Kyoto Protocol or include a role for sinks. We have used the SGM model as one input into our overall assessment of the Kyoto treaty, but have attempted to supplement its results with additional analysis to account for such special features of the agreement as the inclusion of six gases, a possible trading arrangement that could include a subset of the Annex I countries and the Clean Development Mechanism. We will share with you today some preliminary results of this analysis. To the extent possible, we have compared results obtained with the SGM model with those of other modelling efforts.

Mindful of the limitations of any single model, we are eager to see features of the Kyoto Protocol assessed by other models to obtain a better feel for the range of possible effects. This work is just beginning and much of it will continue to go on outside the government. For example, the Energy Modeling Forum, based at Stanford University, is a long-running model comparison exercise involving many of the leading climate models. EMF is currently studying how features of the Kyoto legal language can be translated into terms recognizable to economic modelers. We expect that the group will conduct a full scale analysis of the Kyoto Protocol. The Energy Modeling Forum believes that its members will need at least until mid-year to update their results.

VI. Assessing the Potential Costs of Emissions Reductions

I said in Congressional testimony last July that we can do this smart or we can do this dumb. I was referring to the point that the costs of cutting emissions can be much reduced if flexible, market-based mechanisms are used. Our economic analysis highlighted the importance of such flexible, market-based mechanisms -- which are therefore reflected, at the President's insistence, in the Kyoto Protocol and our ongoing diplomatic strategy.

Within the Kyoto Protocol, this means an insistence on international trading, Joint Implementation, the Clean Development Mechanism, and, ultimately, on meaningful developing country participation. Domestically, this means that we implement any emissions reductions through a market-based system of *tradeable* emissions permits, which ensures that we achieve reductions wherever they are least expensive. But this also means taking serious and responsible steps in the short run to prepare us to meet our obligations in the longer term.

The first such step is the inclusion in this year's budget of an aggressive, \$6.3 billion program of tax cuts and R&D investments -- \$1.3 billion more than the \$5 billion package the President promised in his October 22 speech on this issue. The goal is both to stimulate the development of new energy-saving and carbon-saving technologies and to encourage the dissemination of those that exist already. The proposed package contains \$3.6 billion over the next 5 years in tax cuts for energy efficient purchases and renewable energy, including tax credits of \$3,000 to \$4,000 for consumers who purchase highly fuel efficient vehicles, a 15 percent credit (up to \$2,000) for purchases of rooftop solar equipment, a 20 percent credit (subject to a cap) for purchasing energy-efficient building equipment, a credit up to \$2,000 for purchasing energy-efficient new homes, an extension of the wind and biomass tax credit, and a 10 percent investment credit for the purchase of combined heat and power systems. The package also contains \$2.7 billion over the next 5 years in additional research and development investments -- covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and cross-cutting analyses and research. One example of the R&D effort is the Partnership for a New Generation of Vehicles (PNGV). PNGV is a government-industry effort to develop attractive, affordable cars that meet all applicable safety and environmental standards and get up to three times the fuel efficiency of today's cars. In FY99, the combined proposal for PNGV is \$277 million, up from \$227 million appropriated in FY98. Similar government-industry efforts are proposed to develop more efficient diesel engines for both light trucks and heavy trucks.

A second responsible step entails industry-by-industry consultations to prepare emission reduction plans in key industrial sectors. The Administration will work in partnership with industry to identify ways in which the Federal government might remove regulatory hurdles that discourage energy efficiency. In addition, DOE will spearhead a comprehensive effort to improve the energy efficiency of the Federal government's own operations and purchases.

The third step is the promotion of an environmentally-responsible electricity restructuring bill, which the President identified as part of his domestic climate change package in his address to the National Geographic Society on October 22. An electricity sector freed from government regulation would be a more efficient energy sector. Costs to consumers would fall. In addition, stronger incentives for improved generation efficiency in conjunction with appropriate market based provisions could achieve modest reductions in emissions. A reasonable overall estimate of the contribution of federal electricity restructuring to the rest of the President's program to address climate change is that it would make further progress to the same emission reduction goals at a cost saving of roughly \$20 billion per year. These steps should be taken regardless of Kyoto, because they make sense in terms of energy efficiency. But they have the added benefit of preparing us for Kyoto.

Estimated Reduction in Costs from Annex I Trading

In the language of the treaty, "Annex I," is the set of countries that have agreed to take on binding limitations in emissions of greenhouse gases. Even without meaningful developing country participation -- which, again, the President has emphasized is essential before the treaty would be submitted for ratification -- costs could be reduced substantially by emission trading among the Annex I countries. To provide some indication of the possible efficiency improvements, Russia and Ukraine consume six times as much energy per dollar of output as does the United States. Such large international differences in energy efficiency suggest that adoption of existing U.S. technology would yield very large emissions reductions in these countries.

Estimates derived from the SGM model confirm that emissions trading among Annex I countries can reduce the cost to the United States of achieving its targets for 2008-2012 emissions by about half relative to a situation in which such trading was not available. This concept of costs is meant to capture aggregate resource costs to the US economy, including the cost to domestic firms of purchasing emission permits from other countries where emission reductions may be cheaper than in the United States. Although these estimates reflect idealized international trading in efficient markets, the overall conclusion is clear. The dramatic reduction in costs potentially available from Annex I trading within the SGM model -- cutting the costs involved by half -- highlights why the President insisted that international trading be part of the Kyoto Protocol; and why its achievement by our negotiators in Kyoto was such an important accomplishment.

Estimated reduction in costs from umbrella trading

One possibility that emerged in Kyoto, which none of us foresaw, was the idea developed there by the U.S. delegation, that the United States might undertake trading with a subset of Annex I countries, dubbed the "umbrella". Countries that have expressed interest in the umbrella include the United States, Australia, Canada, New Zealand and Russia, with strong indications of interest from some others. This subset of Annex I countries shares a common interest in promoting market-based mechanisms, most specifically, fully flexible rules for international trading of emissions permits.

It is too early to state the precise form the umbrella will take. But we can envision a number of potential benefits. The umbrella could, for example greatly reduce costs to the U.S. Results that we have derived from various SGM simulations of efficient international trading suggest that, relative to the situation in which there is no trading at all, the umbrella can reduce costs by an estimated 60-75 percent, depending on whether the former Warsaw Pact countries fall within the umbrella. The Kyoto Protocol classifies these countries outside of the EU bubble for the first budget period 2008-2012.

Estimated reduction in costs from developing country participation

The next consideration is participation by developing countries. The President has said that he will not submit the treaty for ratification without meaningful participation by key developing countries. Such participation would further reduce the costs involved.

The substantial potential gains from meaningful developing country participation are highlighted by the significant benefits that will likely accrue from the limited role that the developing countries have already agreed to: the Clean Development Mechanism (CDM), modeled after the U.S. joint implementation concept. The CDM cannot realistically be expected to yield all the gains of binding targets for developing countries, but it might shave costs by roughly another 20 to 25 percent from the reduced costs that result from trading among Annex I countries.

Another possibility is that we persuade some of the key developing countries that are the largest emitters to commit to targets, and allow us to buy emission reductions from those paths. Simulations with the SGM model suggest that full participation by non Annex I countries could cut roughly 55 percent off the reduced costs that result from Annex I trading. The actual cost reduction would depend on the extent of developing country participation that is ultimately obtained, as well as the effectiveness of international trading arrangements. The more developing countries that take on modest binding targets and trade in international permit markets, the lower will be costs.

These cost-saving opportunities are fundamental tenets of the U.S. position. The promise of Kyoto cannot be achieved without effective emissions trading. Moreover, if we do not get meaningful participation by key developing countries, we won't submit the treaty for ratification to the Senate. So, while our analysis may be predicated on some ambitious conditions concerning trading and developing country participation, it is exactly those conditions that form the foundation of the U.S. position in international negotiations including those at Buenos Aires.

Accounting for Carbon Sinks

The preceding discussion has emphasized the importance of trading arrangements and the CDM. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. Again, the U.S. delegation obtained a novel concept, that carbon absorbing activities called sinks could be used to offset emissions. The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. The Kyoto Protocol specifies that removals of CO₂ by sinks count toward meeting the target. The Kyoto Protocol counts the net emissions effects of three sink activities --afforestation, reforestation, and deforestation. Very preliminary estimates of the implications for the United States of the Kyoto provision on sinks indicate that carbon sinks could comprise a significant portion of the total required emissions reductions. Moreover, decreasing the required emissions reduction by, for example, 10% would likely result in cost-savings greater than 10%.

Even this estimate of the effect of sinks is conservative in one respect: it is based on an assumption for sink activity in the U.S. over the 2008-2012 period, and no assumed benefits from sinks elsewhere in the world. Very preliminary estimates suggest that incorporating the gains from sinks *throughout the world* can substantially reduce the costs of meeting the Kyoto target, on top of the gains from trading among Annex I countries. (Furthermore, no model has yet even tried to take into account that government policies can help increase the activities qualifying as allowable sinks, like some tree-planting.) Because the quantitative uncertainty is so large, we do not yet have an estimate with which we are comfortable. But we expect that complete modelling of the Kyoto provision pertaining to sinks will likely have favorable and potentially large effects on projected costs.

Accounting for the role of improvements in energy efficiency

Another issue in analyzing the Kyoto protocol concerns future improvements in energy efficiency due to innovation and diffusion of existing technology. The parameter that figures most prominently in analysis of energy efficiency is the rate of improvement in the so-called Autonomous Energy Efficiency Index (AEEI), that is the rate at which the total use of energy falls relative to GDP. A plausible assumption on the AEEI is an improvement of 1.0 percent per year. Reflecting a conservative interpretation of the 15-year impact of various climate change initiatives, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is not the most

optimistic outcome that might occur. Some authorities in the field of energy policy forecast more rapid technological progress. Experts at five national laboratories managed by the Department of Energy, using an engineering approach rather than an economic paradigm, found that a third of the emissions reductions necessary to return to 1990 levels by 2010 could be achieved through the adoption of existing energy-efficient technologies at no net resource cost, or even some savings. The National Academy of Sciences reached qualitatively similar conclusions in a 1992 report.

The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of tax cuts and R&D investments intended to spur the discovery and adoption of new technologies. If the Administration is successful in this effort, the rate of improvement in energy efficiency could rise and such improvements would lower the cost of meeting our Kyoto target. For example, published results based on SGM model simulations with different assumed rates of AEEI suggest that an increase in the AEEI of 25 percent could lead to declines in the permit price of approximately 40 percent.

Our justification for incorporating into our assessment a small assumed impact of Administration technology policies is somewhat analogous to the Administration's rationale for employing mainstream economic assumptions in our budget forecasts: in the presence of uncertainty, we are conservative in our estimates of the speed with which the economy will grow, tax receipts will rise, and the budget will improve. That way, any revisions or surprises that occur are likely to be in the pleasant direction. In this instance, we prudently and conservatively assume that there will be substantial delays between investments in new technology or the diffusion of existing technology, and the returns to such investments.

Moreover, at the recent automobile show in Detroit, General Motors announced that it has developed a hybrid-based vehicle that can achieve fuel efficiency of 80 miles per gallon, and that this car could be in commercial production within a few years. Ford also exhibited a prototype of a light-weight highly fuel efficient sedan that could be in commercial production by the middle of the next decade. These announcements followed an earlier breakthrough announced by DOE and its partners of a fuel cell that could run on gasoline and double current fuel economy while reducing conventional air pollution emissions by 90 percent. These technological advances have been made possible through the efforts of the Partnership for a New Generation of Vehicles between the Administration and the U.S. auto companies and their suppliers.

Such progress may be replicated in other sectors. VCRs and TVs, while switched off, consume about \$1 billion worth of electricity annually. EPA has established a partnership with major manufacturers that has a goal of achieving up to a 70 percent reduction in energy use by VCRs and TVs while they are switched off, without sacrificing product quality, usefulness, or increasing costs. This partnership offers promise of substantial improvements in energy efficiency.

Non-Climate Benefits

A final factor that should be included in any comprehensive assessment of the economic implications of the Kyoto protocol are the benefits of the agreement. The literature has emphasized that any relative price shifts that prove necessary to reduce emissions should produce non-climate benefits in three areas: traffic congestion, highway accidents, and air pollution unrelated to climate change. These benefits are hard to quantify precisely but are potentially significant: our rough estimates suggest that these three benefits could offset approximately a quarter of the resource cost of the climate change policy.

Synthesis

A comprehensive evaluation of the economic impact of the Kyoto Protocol must integrate all of the factors described above: reliance on flexible market-based mechanisms domestically; international trading and Joint Implementation among Annex I countries; the Clean Development Mechanism; meaningful developing country participation; the potential cost-mitigating role of including six gases and carbon sinks; the benefits of electricity restructuring; and emissions reductions achieved as a consequence of other proposed Administration climate change initiatives. Assuming that effective mechanisms for international trading, Joint Implementation and the Clean Development Mechanism are established, and assuming also that the U.S. achieves meaningful developing country participation, our overall assessment is that the economic cost to the United States in aggregate and to typical households of attaining the targets and timetables specified in the Kyoto Protocol, will be modest.

This conclusion that the impact will be modest is not entirely dependent upon, but is fully consistent with, formal model results. I have previously emphasized the limitations of relying on any single model in assessing the economic impact of the Kyoto Protocol, and continue to view any such results as just one input into an overall analysis. But it is worth emphasizing that model results reflecting the details of the Kyoto Protocol are consistent with our conclusion. For example, under the assumptions of either trading under the umbrella or within Annex I, the CDM and permit trading with developing countries, estimates derived using the SGM model, which adjust for the inclusion of six gases and assume little banking of credits beyond 2012, suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to \$7 to \$12 billion per year in 2008 to 2012. This implies that overall costs, excluding not only climate and non-climate benefits, but also such cost mitigating factors as sinks and payoffs from the President's electricity restructuring and climate change initiatives, would reach roughly one tenth of one percent of projected GDP in 2010.

A more tangible measure of costs is the estimated effects on energy prices. Excluding the impact of electricity restructuring and the ancillary benefits of mitigation and better forest management, the SGM-based estimate, corresponding to the gross resource cost estimate cited above, is an emissions price in the range of \$14 to \$23 per ton of carbon equivalent. This translates into an increase in energy prices between 2008 and 2012 at the household level of

between 3 and 5 percent, an increase in fuel oil prices of about 5 to 9 percent, natural gas prices of 3 to 5 percent, gasoline prices of 3 to 4 percent (or around 4 to 6 cents per gallon), and electricity prices of 3 to 4 percent. This increase in energy prices at the household level would raise the average household's energy bill in ten years by between \$70 and \$110 per year, although such predictions may not be observable because they would be small relative to typical energy price changes, and nearly fully offset by electricity price declines from Federal electricity restructuring. In particular, this increase in energy prices is small relative to the average of *year to year* real energy price changes experienced by U.S. consumers since 1960: such *annual* changes have averaged 3.8 percent. In addition, by 2008-2012, the anticipated 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda is projected to lead to expenditure reductions of about \$90 per year for the average household.

As highlighted earlier, there are substantial but unavoidable uncertainties surrounding estimates like these. For example, the estimate just discussed is predicated, among other things, on the developing country participation that we are insisting upon as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol, and on effective international trading. Moreover, other models will yield other answers and much work remains to be done by the modeling community to test the robustness of these results. Preliminary comparisons of the SGM model to the few other models that have attempted to evaluate the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto Protocol on carbon permit prices are neither the most conservative nor the most optimistic of the models that have been developed. The predictions of the SGM model are robust in the sense that virtually all energy models reveal the potency of effective, flexible, domestic and international trading mechanisms to reduce substantially the cost and energy price impact of meeting the Kyoto targets.

Of course, the most important factor that has been left out of the above assessment is the benefit of mitigating climate change itself. A full cost-benefit analysis would include mitigation in the benefits column. The only reason we have not done so, explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But nobody should lose sight of our ultimate objective -- keeping our planet the hospitable home that we enjoy today.

Effects on employment and aggregate output

So far we have said nothing about job losses resulting from climate change policy. Although there may be job gains in some sectors and job losses in others, we do not anticipate any significant aggregate employment effect if we achieve the conditions we have discussed. The effects on energy prices described above will occur only 10 to 14 years in the future. Not only are these effects small relative to historical variations in energy prices, and offset by other policies like electricity restructuring, they would occur sufficiently far in the future to enable monetary policy to keep the economy operating at its potential. In energy-intensive sectors some employment reduction could occur, although given the very small predicted change in energy prices, impacts in most such sectors are apt to be minimal. Furthermore, a large number of jobs will be created in other sectors -- many of them high-tech jobs paying high wages. The President is firmly committed to assisting any workers who are adversely affected during the transition to a climate-friendly economy.

VII. Conclusion

In conclusion, the Kyoto Protocol and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Protocol includes key provisions on international trading and Clean Development projects. The President's approach relies on market incentives -- first, with a system of tax cuts and R&D investments, and then later with a market-based system of tradeable permits -- to ensure that our objectives are achieved as efficiently as possible.

Our overall conclusion is that the economic impact of the Protocol will be modest under the conditions we have identified. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which draws insights from not only the forecasts of individual models, any one of which has its own strengths and limitations, but also a broad variety of additional analyses.

I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Protocol and evaluating the net effects of reducing greenhouse gas emissions. It is my hope that economic analysis will continue to play a key role in designing policies in this area.

I welcome your questions.

BACKGROUND FOR TESTIMONY ON CLIMATE CHANGE

March 4, 1998

President Clinton is committed to addressing the problem of global climate change while maintaining a strong economy. President Clinton has said that we can take steps to avert the grave dangers of climate change, while keeping our economy healthy and strong.

The Kyoto Protocol is a form of insurance against a serious environmental threat. It is difficult to put a price tag on the cost of doing nothing to address the problem of climate change. But researchers have nonetheless developed troubling cost estimates of not acting -- ranging in the tens of billions of dollars per year for the United States. And, these estimates do not even fully reflect the value of the insurance against the unknown risk of large-scale and potentially irreversible catastrophic events, such as a weakening of the Gulf Stream.

Doing it smart: The Kyoto Protocol is based upon measures that reduce costs. The least-cost approach to controlling climate change is to reduce emissions where and when such reductions are cheapest. Dr. Yellen's testimony highlights the substantial cost reductions that are associated with international emissions permit trading, joint implementation by Annex I countries, the Clean Development Mechanism, and other aspects of the Kyoto Protocol. Because of U.S. insistence, the Kyoto Protocol includes many such cost-saving provisions -- and economic analyses that ignore these provisions do not accurately reflect the economic impact of the Kyoto Protocol. The Administration also supports federal electricity restructuring legislation that could achieve modest emissions reductions and will provide consumers with substantial savings on their energy bills.

Conclusion: Costs will be modest, even without accounting for benefits of electricity restructuring or the value of insurance against a serious environmental threat. With effective mechanisms for international emissions permit trading, joint implementation, and the Clean Development Mechanism, as well as meaningful developing country participation and flexible timetables, the Administration's overall assessment is that the economic cost to the United States will be modest.

This conclusion is not entirely dependent on, but fully consistent with, formal model results. Despite the limitations of any single model in assessing the economic impact of the Kyoto Protocol, economic model results are fully consistent with this conclusion. For example, given the factors, such as international permit trading, delineated above, but excluding the benefits of reducing emissions and the impact of electricity restructuring, estimates derived using the Second Generation Model (SGM) suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to just \$7 to \$12 billion per year in 2008 to 2012 -- or just 0.1 percent of projected GDP.

Modest impact on family energy costs. With a successful international trading regime, the SGM-based estimate suggests an emissions price in the range of \$14 to \$23 per ton of carbon equivalent. Not including the impact of Federal electricity restructuring, that would translate into an increase in the average family's energy bill of between \$70 - \$110 per year in 2010. But, the energy price declines from Federal electricity restructuring would likely be enough to offset the impact described above -- so that the net effect on family energy bills, of the Administration's policies, including the impact of electricity restructuring, would be negligible in 2010.

Cost estimates do not reflect \$6.3 billion package of insurance against the environmental threat. The figures cited in Dr. Yellen's testimony exclude not only climate and non-climate benefits, but also such cost-mitigating factors as carbon sinks and increases in energy efficiency from the President's \$6.3 billion climate change initiative.

United Mine Workers of America

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March 16, 1998

Janet Yellen, Chair
Council of Economic Advisors
Old Executive Office Building
17th St. and Pennsylvania Ave., N.W.
Washington, D.C. 20500

Dear Dr. Yellen:

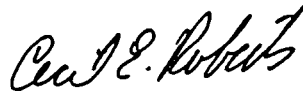
I am writing in response to your recent testimony on the economic effects of climate change policies before the House Commerce Committee. As the president of a union that has participated in the climate change debate quite extensively, I was struck by the discrepancy between your testimony and numerous other studies (including the Administration's IAT analysis) that have concluded that climate policies are likely to involve significant costs. As you are no doubt aware, the UMW is concerned that the Kyoto Protocol will result in lost jobs, lost economic activity and higher energy prices, but will accomplish virtually nothing in terms of stabilizing atmospheric concentrations of greenhouse gases. We have termed the proposed protocol "All Pain and No Gain" and have called for its rejection by the President and the Senate. Your testimony implies the reverse--that this is all gain and no pain.

I would be interested in receiving from you, in as much detail as possible, the analytical basis for your conclusions. For instance, we would very much appreciate the detailed results of all model runs on which your testimony relies, including any reports that analyze the underlying data. We are particularly interested in your analysis of the extent to which the U.S. could achieve its proposed targets through emissions trading and joint implementation, and at what cost. We note that many environmental organizations have called for limits on the amount of credits to be achieved from trading and JI. Your testimony appears to assume unfettered trading and JI. It is unclear from your testimony what prices are assumed for trading, particularly in the former Soviet Bloc states. While the U.S. appears not to be included in the European "bubble", it seems clear that the EU definitely wants to be included in the JUSCANZ "umbrella." If so, this would seem to put upward pressure on the price of available credits.

Janet Yellen, Chair
Council of Economic Advisors
March 16, 1998
Page Two

The UMWA is interested in learning as much as possible about the economic effects of the proposed protocol, because we believe that our members' jobs are at the greatest risk. I would appreciate your assistance in this matter, and look forward to your response.

Sincerely,

A handwritten signature in cursive script, reading "Cecil E. Roberts". The signature is written in dark ink and is positioned above the printed name.

Cecil E. Roberts

American Federation of Labor and Congress of Industrial Organizations



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March 30, 1998

Dr. Janet Yellen, Chair
Council of Economic Advisers
17th and Pennsylvania Avenue, NW
Room 314
Washington, DC 20502

Dear Dr. Yellen,

As you know from our early meetings on climate change, the AFL-CIO has been concerned for some time about how the Administration's plan to tackle this problem is developing. We have said in many fora that we support a program that will: (1) assure global environmental repair, by requiring firm commitments from every member of the world community; (2) provide no perverse incentives, but rather provide incentives and mechanisms that reduce pollution here and create higher global standards both environmentally and economically; and (3) explicitly protect against economic upheaval and loss to U.S. workers.

On first read, the plan you outlined in your testimony before the Commerce Committee on March 4 appears to address several important concerns. I want to thank you for being forthright in your presentation and for providing needed insight into the Administration's thinking on this difficult topic. We appreciate having additional information to consider, as well as a more clearly developed picture to react to.

On closer examination, we believe that there are problems with the analysis you presented. In short, your testimony constructs a rosy, low-cost scenario, based upon a series of optimistic — and frequently, poorly substantiated — assumptions about electricity deregulation, an international emissions permit trading regime linked to joint implementation agreements and Clean

Yellen letter, March 30, 1998

Development Mechanisms, incorporation of carbon sinks and non-CO₂ gases in emissions reduction accounting, and investments in new carbon-reducing technologies. We believe that this is only one of many plausible scenarios, many of which would not produce outcomes as positive as those you predict.

Specifically, there are four principal areas where we believe your presentation either provides incomplete data and explanations — therefore requiring greater clarification — or, more problematical, misleads the public by understating the difficulties, uncertainties and potential costs associated with implementing the President's climate change program. These problem areas can be summarized as follows:

- *The presentation lacks sufficient data and information to support key economic conclusions.* For example, where are the numbers to back up your assertions about the financial and environmental gains from electricity deregulation, or how reliance on carbon "sinks" and reduction of non-CO₂ gases will make it much easier for the U.S. meet its carbon reduction caps?
- *It understates the difficulties in implementing an efficient, global carbon trading system.* Although there is much evidence that a global trading system may be an effective strategy for achieving desired global emissions reductions with the least economic disruption here and abroad, the substantial diplomatic, political, institutional, cultural and economic difficulties of implementing such a system are not addressed. This misleads the public as to the actual likelihood — or unlikelihood — of successfully instituting a carbon trading system without substantial costs to U.S. consumers and taxpayers.
- *While noted in your testimony, the inherent uncertainties in the available economic models used in your analysis — as well as those associated with international efforts to address climate change — are not reflected in your conclusions.* Given the large uncertainties in both the econometric models and the carbon trading scenario we find it misleading to state that the costs of our carbon reduction policies will probably be small. We hope that they will be, but there is also a significant likelihood that the costs will be substantially greater than those the Administration projects. In addition, you provide no evaluation of the sensitivities of key parameters with respect to different potential outcomes achieved by applying different climate change strategies.
- *You underestimate the probable transition costs to climate change compliance in the United States, giving the impression that this will be almost "a walk in the park."* Most importantly, even in the best case scenario, certain industrial sectors and geographic regions will be badly hurt. The Administration continues to ignore these likely impacts, and therefore pays insufficient attention to policies that would help to mitigate them.

Yellen letter, March 30, 1998

I address each of these points in detail below.

1. Insufficient Data and Information.

We recognize the difficulties of presenting within the limited space of your testimony a comprehensive accounting of the data and analyses underlying your arguments. Nevertheless, in certain instances, you provide little or no explanation of the bases for your conclusions. We are being asked to take on faith numbers and inferences drawn from information sources and studies that, to the best of our knowledge, are not readily available to the public. The Administration needs to further clarify the sources of these data before we can fully consider its program.

In particular, we are baffled about how the President's plan for electricity restructuring will generate \$20 billion in cost savings to consumers while simultaneously reducing greenhouse emissions. This is stated without explanations or even references to how we can learn more about the Administration's restructuring plan. We are very skeptical about any potential gains to consumers, and even more so about whether — or how — restructuring will lead to carbon reductions. Indeed, we are very concerned about the potential impacts restructuring will have on the livelihoods of many of our members. We need the Administration to reveal its proposal, with projected impacts on different fuels (coal, nuclear power, natural gas, and renewables), and how it ties economic efficiencies derived from deregulation of the electrical utility sector to the reduction of carbon emissions. (Does your reference to "appropriate market-based provisions" (p. 14), in fact, imply the need for new regulations to make this connection work?)

Second, you base much of your argument on the belief that it will be relatively easy to meet as much as 4-5 percent of our nation's emissions reduction goals by a combination of reducing the three long-lived halocarbons and related compounds (HFCs, PFCs, and SF₆) with very high global warming potential and using allowable means to employ "carbon sinks." Our own estimates suggest that this goal *may* be plausible, but not necessarily easy to achieve. Using the 1995 baseline for emissions of halocarbons and related compounds provided by the Energy Information Administration, completely reducing these gases from the atmosphere (highly unlikely) would, at most, set an upper bound of 2 percent out of a total greenhouse gas reduction goal of 7 percent below the 1990 U.S. emissions level (1618 million metric tons of carbon or carbon equivalent). Carbon "sinks" in your scenario would have to account for a minimum of 2-3 percent — and perhaps 4 percent — of the total reduction goal. This does not sound realistic to us, but we are open to further explanation.

Unfortunately, your presentation sheds little light on either the projected quantities or the means by which the Administration expects to cut the non-CO₂ gases or increase the use of carbon sinks. Indeed, you admit in your testimony (p. 16) that the "quantitative uncertainty" in estimating the impacts of carbon sinks are very large, particularly on an international level. You also note that your conclusions here are based upon "very preliminary estimates." For example, you state (p. 8) that an "initial analysis indicates that a strategy of reducing non-CO₂ greenhouse gas emissions by

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a greater percent than CO₂ emissions could lower prices by as much as 10 percent.” But without more corroborative detail, this point seems highly speculative. The lack of data and the uncertainties in your own estimates therefore raises serious doubts about the validity of a fundamental assumption in your testimony, that the nation only needs to be concerned about reducing the three remaining greenhouse gas (CO₂, methane, NO₂) emissions by a total of 2-3 percent below the U.S. 1990 emissions baseline.

We also have concerns about the lack of specificity regarding the Administration’s plans and goals in implementing programs like Joint Implementation, the Clean Development Mechanism (CDM) and an international emissions trading system (see below). While these mechanisms may very well prove to be the most cost-effective strategies for reducing greenhouse emissions, they remain a “black box” for us. How will they be implemented and calibrated with respect to the trading of emissions permits? How do you account for their impacts on emissions levels and costs in your carbon trading models? What assurances do we have that Joint Implementation and CDM will not create incentives for U.S. investments in modernizing offshore producers at the expense of U.S. jobs, as well as increased investment at home? Without far more elaboration about these mechanisms, it is difficult to accept your testimony as anything but a highly optimistic guess.

2. Carbon Trading Difficulties.

The Administration’s climate change program hinges on the successful implementation of an international carbon emissions trading system. In principal, we do not have an argument with the notion of carbon trading. We are in full agreement that “climate change is a global problem requiring a global solution.” We also appreciate that the President has agreed not to submit the Kyoto Protocol to the Senate without “meaningful participation” from key developing countries, assuming that “meaningful participation” includes agreement to participate fully in any international carbon trading system that is ultimately established, as well as specific emissions targets and goals. Finally, we are aware of the evidence that suggests carbon trading may be the most effective, flexible mechanism for meeting the Protocol’s emission reduction goals, resulting in the least economic disruptions both here and around the world. Your models, and others that we are familiar with, all predict that carbon trading — *as long as it is implemented on a fully global basis* — would result in far less reduction in economic welfare than a system of rigid emissions regulations and controls.

Our primary concern is with obtaining greater certainty from the Administration as to how the carbon trading system (in conjunction with Joint Implementation and CDM) will be established, calibrated and enforced, to ensure the greatest impacts on carbon reduction with the least costs to U.S. taxpayers and workers. Your testimony glosses over the substantial difficulties of negotiating the necessary international agreements, especially with non-Annex I countries. Theoretically, such a system should be attractive to these nations, especially if we tie our agreements to appropriate incentives; it could mean substantial new sources of dollars for internal economic development. But there is far less certainty that we can make such a highly complex

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system work than suggested in your presentation, given the complicated international mechanisms that need to be defined, fleshed out and engaged in by the entire globe.

Moreover, you (and other proponents) base your optimistic assessments of the carbon trading system upon the much touted SO₂ emissions trading program within the United States. Other experts point out, however, that establishing, monitoring and enforcing appropriate emissions baselines on an international basis present far more formidable challenges than had to be faced by the geographically limited, domestic SO₂ trading program. From the perspective of emissions reduction and costs the SO₂ trading experience may appear encouraging, but it is still quite a leap to conclude that it "demonstrates how programs like international permit trading, Joint Implementation, and the Clean Development Mechanism will lead firms to find cheaper ways of reducing emissions that can lead to unexpectedly low costs." As you yourself indicate (p. 9), the costs savings from carbon trading may not be as large as in the SO₂ program, and may not always be accompanied by "cheaper control strategies."

First, the SO₂ trading system was only applied to a very small universe of heavily-regulated entities: the carbon system would need to be administered internationally, requiring the implementation of far more complex and difficult to enforce trading mechanisms. Second, the government's original high cost estimates for SO₂ allowances were based on unrealistic assumptions (i.e., the arbitrary assumption that western sub-bituminous coals would not be allowed to move east of the Mississippi River): hence, the alleged large gains derived from the trading system above the government's initial expectations are overstated. Finally, SO₂ reductions were not achieved without significant transition costs in the form of closed facilities and lost jobs as utilities switched from Midwestern and Northern Appalachian coal to western sources of coal. These dislocations may be even larger in the carbon trading system. While lower-cost, lower sulfur coal alternatives existed within the United States there is no lower-cost, lower-carbon coal alternative either here or abroad.

There are also dangers in the more easy to implement aspects of the carbon trading system. In all probability, the lowest-hanging fruit in the system will involve permit trading between high-cost emissions producers in the U.S. and large greenhouse industrial emission producers in Russia and other Eastern bloc nations, perhaps within the so-called "umbrella." Reductions in the latter countries may be much less costly because of the very inefficient and carbon-intensive uses of energy in their economies today. U.S. producers will be able to buy their way out of reductions by purchasing cheap permits from Russian or other Eastern bloc energy users which are able to meet their goals by modernizing and actually increasing their energy use, albeit if more efficiently than before. Hence, the United States may be able to meet its emissions caps with very little reduction in actual greenhouse emissions. This is especially attractive if your assumptions about needing only to reduce CO₂ emissions by 2-3 percent prove correct.

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Aside from our reservations concerning the last statement (expressed above), however, we may only be delaying the inevitable with this approach. The "umbrella" strategy may create a false impression of the actual extent greenhouse gases are reduced among the trading countries. There needs to be some consideration of how large a portion of the U.S. carbon reduction "budget" the emissions trading regime should allow to be allocated through such trading. Sooner or later real, substantial reductions in our emissions levels will be required if we are going to meet the climate change challenge. If this strategy buys us time to adopt more energy efficient technologies and minimize our economic and social costs, it may be worth pursuing. On the other hand, it means that we may be faced with descending a far steeper reduction curve (after 2012) to meet future emissions goals, which could result in substantially greater costs to our economy, than if we fail to prepare for the impacts of reductions now.

Secondly, adopting such a strategy, which appears to let us off the hook over the short-run, may undercut our long-term efforts to achieve buy-in from the developing countries outside of both the "umbrella" and Annex I, thereby undermining any serious effort to establish a fully global trading regime. Even putting aside the need for a global goal, it is unclear to us how the United States can take an easy way out on our own reductions, and then expect the developing world to follow the path that your testimony requires.

3. Uncertainties in the Models.

We are particularly disturbed that your conclusions do not reflect the large, inherent uncertainties in the models you draw upon in your statement. Even though you acknowledge the existence of uncertainties in the text, you appear to soft-peddle them in your assessments about the potential costs of emissions reductions. For example, you state that based on the SGM model, emissions prices are estimated to range from \$14 to \$23 per ton of carbon equivalent, translating into an increase in household energy prices between 2008-2012 of between 3 and 5 percent, and comparable increases in various fuel prices (oil, natural gas, gasoline, and electricity). The increase in energy prices would in turn raise the average household energy bill in ten years by between \$70 and \$100 per year, adding that "such predictions may not be observable because they would be small relative to typical energy price changes, and nearly fully offset by electricity price declines from Federal electricity deregulation."

These assertions are presented as if they are the most plausible outcomes, an impression that was reflected in newspaper articles about your testimony appearing *prior* to the Congressional hearing, that portrayed your conclusions as the "first official assessment" of the costs of the Kyoto agreement. But as you point out later, "other models will yield other answers and much work needs to be done by the modeling community to test the robustness of these results." Given the very large levels of uncertainty in the underlying assumptions, inputs and design of the models you use to draw upon, the best that can be said now is that, if certain favorable conditions are met, there is some possibility that the costs can be kept reasonably low. In fact, the probabilities

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are at least as high that the costs will be an order of magnitude or more greater than your projections.

I already noted a few of the major sources of uncertainty above: unsubstantiated assumptions about gains from electricity restructuring; the lack of information about the impacts of carbon sinks and reducing non-CO₂ gases; the difficulties of implementing a global carbon trading system. If any of your assumptions about these activities alone proves incorrect, the costs could be significantly larger. Indeed, the three areas (when, what, where) of "flexibility" that you portray as a strength in the Administration's approach, themselves are sources of great uncertainty, that do necessarily work in favor of reduced costs. Moreover, the models you refer to are very complex, highly aggregated, general equilibrium models that are not designed to address many of the inherent uncertainties that derive from human economic and political behaviors at a far more disaggregated level (variations in geographical regions, industry sectors, historical situation, etc.).

Your statement also does not address the sensitivity of your models' results to the uncertainties in key parameters. For example, the MIT Joint Program on the Science and Policy of Global Change has attempted to explore the sensitivity of its Emissions Prediction and Policy Analysis (EPPA) model, which is similar to the models you refer to, to key inputs. The MIT model identifies three parameter assumptions that have the greatest influence on future emissions trajectories, each of which is subject to significant uncertainty. These include rates of population and labor productivity growth, the rate of non-price induced improvements in energy efficiency, and the relative costs of carbon-free electric backstop technologies (e.g., renewables). We would feel more comfortable with your statement if these sources of uncertainty were acknowledged and factored into your analysis. In short, when trying to understand the behavior of highly complex systems, models like those you relied upon in your testimony can be very useful for assessing the direction of change for key variables given different starting points and assumptions, but we draw conclusions about actual magnitudes at our peril.

4. Underestimated Transition Costs.

Perhaps our greatest concern is that the Administration's projected "low-cost" scenario leads to a conclusion that there will be few if any adjustment costs for workers and communities. As already discussed, although you concede that this finding is predicated on whether "we achieve the conditions" described in your statement, there are very large uncertainties tied to this assumption. At the same time, without any qualification, you minimize the probable impacts on employment in energy-intensive sectors, based on your predictions of very small changes in energy prices, which, as we already noted, are inherently suspect.

By their nature, general equilibrium models tend to underestimate the costs of adjustment, and are especially ill-suited to generate meaningful insights about disaggregated costs at a regional or industry sector level. Even granting your contention about low aggregate welfare impacts (which

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we do not), we unfortunately do not have the luxury of ignoring profound impacts on particular industry sectors (or geographical regions), even if they are offset by gains elsewhere, or appear small compared to overall aggregate output. There are people who make their livings their livelihoods, have built their communities, and support their families based on today's technology. They mine coal, they run power plants, they drive large trucks. Our planning must take into account their concerns as well. A job that you may get is cool comfort to me if I have lost mine.

The employment effects of the proposed regime can be modeled at the sectoral and regional levels using a dynamic, econometric model like that of REMI, Inc. in Amherst, MA. This model can be used to evaluate various scenarios and should be useful to policy makers since it can help in estimating the sectors and regions most at risk of economic dislocation and job displacement. As we learned from defense downsizing and trade adjustment, macroeconomic assurances of robust aggregate job growth are not enough to deal with actual regional and sectoral dislocations. Such modeling efforts during the post-Cold War reductions in military expenditures and facilities proved quite reliable in predicting the most affected location and sectors. They also were helpful in predicting the magnitude of the impacts. We believe that the Administration should consider sponsoring similar large-scale studies to assess the sectoral impacts of climate change policy.

In any event, we can say with some certainty, that even in a best case scenario— a fully global carbon trading system is in place, and new energy-efficient and non-carbon electricity generation technologies are widely employed throughout the economy — certain sectors such as coal mining and coal transportation (railroads) will suffer serious dislocations. Following your scenario, the combination of electricity restructuring and carbon trading will lead to a major shift from coal to natural gas and renewables in utility (and industry) generation of electricity. The coal industry, and the regions which are heavily dependent on that industry, are already experiencing long-term economic decline. Pursuing an emissions reduction strategy in the United States will accelerate this trend. Given all the uncertainties we have talked about, the rate of acceleration might be slower or faster depending upon certain conditions, but the direction is clear.

Other industry sectors will be affected as well, though probably not as greatly as coal, and perhaps petroleum. The President's climate change technology initiative is an important step in promoting the development and diffusion of new energy-saving and non-carbon energy generating technologies. Unfortunately, the Administration has not provided us with any estimates of the expected returns on this investment in terms of improved efficiencies, economic growth and jobs. Your own models (e.g., the SGM, EMF) can at best only account for the impacts of technology improvements through proxy parameters such as the Autonomous Energy Efficiency Index or the Carbon-Free Electric Backstop Price (reflecting substitution effects through use of new non-carbon electricity generation technologies) used in the MIT EPPA model. We would be very interested in any accounting of the expected economic impacts of the President's technology initiative, particularly its affects on the outputs of key industry sectors.

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At the very least, we anticipate that this initiative will generate some new industrial growth and job creating opportunities. There may also be significant changes in industrial processes and organization, particularly in the main energy-intensive industries, that will have impacts upon a wide range of job-related concerns of our members. The Energy Department's Industry of the Future program, which is slated for substantial funding increases in the President's budget, has already supported significant research and development, jointly with industry leaders, in energy-efficient technologies that could have profound effects on how these industries operate in the future.

We have already discussed with the White House our desire to participate in any future government-industry consultations not only concerning this program, but also to consider industry-specific energy reduction strategies. We have made ourselves available to work with the Administration and with industry to help identify the best means for reducing energy costs in each sector, and to assess any potential economic impacts (especially on jobs) from such measures. We believe that labor's active participation will help to mitigate any potential adverse job-related impacts from introducing new technologies, while ensuring more effective implementation of energy-reduction strategies within these industries.

Finally, while we appreciate the President's stated commitment to assist any workers adversely affected, your testimony works to minimize the serious need to identify specific adjustment mechanisms early, before the impacts are felt by our workers and in communities. For example, we would welcome an examination of how we can use potential money generated by auctioning off carbon permits (as opposed to simply giving them away), as suggested by the Economic Policy Institute, for establishing a climate change adjustment fund. We think this is one of several different transition mechanisms worth looking at, and we are anxious to discuss this further with you.

In conclusion, we have been pressing for some time to have an Administration economic analysis of the climate change situation. Unfortunately, we feel that we still do not have one. This is no time, and not the issue, for equivocating, the stakes are too high. Failing to address the problem could have catastrophic environmental consequences. Erring in judgement about the basic strategy could also have huge economic consequences if we must make big domestic adjustments in mid-stream in 10 or 15 years, and have not laid the foundation for those changes that protect the U.S. economy and U.S. worker's jobs.

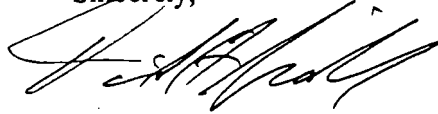
This is not the time to assume an easy answer. Not economically, not politically, not socially, not ecologically. Your current analysis of proposals for solving this global problem leaves us skeptical, and leaves us deeply concerned that too little attention is being paid to the consequences of being wrong. We suggest erring on the side of precaution.

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We agree, that inaction is not a prudent option. But action based too casually on a cascade of optimistic assumptions is unlikely to serve our mutual interests.

We look forward to more data, and to a healthy debate and dialogue with the administration as further plans are developed.

Sincerely,

A handwritten signature in black ink, appearing to read 'David Smith', written in a cursive style.

David Smith
AFL-CIO, Director Public Policy

DS/jy

bcc: Todd Stern
Karen Tremantano

WORK-PROGRAM

JF 8/9/97

WHO (and when)**Targets and timetables (TOP PRIORITY)***The importance of allowing time for capital turnover --**Case-study illustration:*

Graph of replacement chronology of US power-generating plants
(make stylized assumptions on plant life if necessary).

of plants, and cost of replacement, against year.

>

*The economically-optimal path.**In what year is peak of US emissions?**Of other Annex I?**In what year do they return to 1990 levels?*

(1) Minimizing cost/benefit balance
(minus uncertainty or credibility problems).

= > no peak at all? Just slowed rise in emissions?

Need results from Integrated Assessment Models.

>

- Nordhaus
- Manne-Richels? Have Gillingham/Shogren called them?
- Wigley, Richels, Edmonds? "
- Other EMF models?
- Cline?

(2) Minimizing cost of a given level of 2100 concentrations

- Manne-Richels (peak in 2050)
- Others (as above)?
- Can any in-house models (as below) do it?

(3) Compare costs and benefits of "1990 by 2020"
to "peak in 2015 and return to 1990 by ___"

and to doing nothing ("business as usual").

Costs are (i) price of carbon, gasoline, coal...

(ii) effects on income and consumption

Benefits are (i) emissions and concentration

(ii) implied effect on temperature in 2050 or 2100

(using simple linear interpolation from IPCC estimate)

- Any of the IA/EMF models
- Any of the IAT models (DRI, MarkalM, SGM)
- Shackleton and G-cubed
- Other?

>

>

Analogies with 1970s oil shocks

Is magnitude the same? (7/28 memo from Jay) >

How much difference does it make that this would be pre-announced?

" That there would be no transfer to OPEC?

Any bogus reasons why the IAT models did not find such adverse effects?

Did they assume that the Fed could somehow offset supply shocks?

Elucidate the dangers of Wishful Thinking >

- Critique 5-Labs Study Coordinate with Treas.

- More general critique of the "technology" free lunch

Assumption that people ignore money-saving opportunities, that govt.

Pgms. Help (e.g., can change discount rates), that common people are as capable as engineers, that people systematically over-consume energy but not other things, that they live in ideal homes, that energy-price uncertainty plays no role....

Double-counting pgms (in baseline and policy path).

- Historical relationship between prices and EEI (Frankel-Sant.-Franco memo)

Analyze escape clause proposals

- What would be appropriate carbon prices for ceiling? >

If 2015 emissions peak and

(e.g.) 1990 levels in 2040

(As under blueprint)

If 1990 levels in 2010

(As enviros want)

- What do other agencies have in mind? Coord. With Treasury >
("Pomerance-Gruber paper due Aug.8")

- What else did Summers have in mind? "
Global price cap, rather than country-by-country?

Uncertainty

Is there anything to be done in the way of assuming probabilities

- and applying expected welfare,
- with or without risk-aversion
- and option analysis (with irreversible investment)
- allowing for imperfect political credibility

Domestic Implementation

- Incidence of increase in energy prices >
- Has there been a "reluctance to trade" in SO₂ pgm? >
- Should revenues be used to finance soc.sec.? >
- Compute likely amount and path of revenue >

LDCs

Need proposed formulas for LDC participation >

- What is threshold income level for blueprint proposal?
defined so as to include only State Dept.'s "Annex B" countries
- What is a reasonable emissions path formula for future LDC participation?

= F(income, population, 1990 emission levels)

E.g., Nordhaus proposal

US competitiveness if LDCs don't participate

As in Orszag-Frankel-Shogren memo of 8/10/97

- Anyone care to take on a N-factor, N-good, N-country trade model?

N = 2, or

N = 3

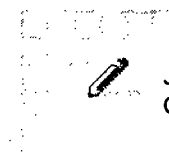
Other

Monitor reports from negotiations (coming via State)

>

Monitor _____

>



Jeffrey A. Frankel
08/10/97 06:14:51 PM

Record Type: Record

To: Jason Shogren/CEA/EOP, Randall W. Lutter/CEA/EOP, Michele Jolin/CEA/EOP
cc: Francine P. Obermiller/CEA/EOP
Subject: CEA work plan on GCC



Over WORKPLAN.G the weekend I discussed with Janet our plans for dealing with Climate Change, which will involve a lot of work over the coming months. I have drawn up a two-page list of things to be done. I anticipate near-daily CEA meetings of our team, chaired by me. (Janet will be participate when possible.) I hope to have our first meeting Monday afternoon.

The team obviously includes Jay and Randy, and Joe Aldy. And Cristian and Qindi as long as they are here (and Tom?). Keith has volunteered too.

Michele and Jay: Which of the two new R.A.s should be the one to work on GCC?
Are there any interns that will be staying past the summer? Otherwise, how about Harsh?

At least at the first meeting, we could probably use a straight macro person for one item (1970s oil shocks). Do we know if Steve or Jeremy or Chris would be most interested?
And we could use someone on social security revenue needs. Sarah or Chris?

We can work some of this out at the staff mtg. Monday.

Francine, When you put together the list for e-mailings, include Michele on it.
JF

WORK-PROGRAM

JF 8/9/97

WHO (and when)

Targets and timetables (TOP PRIORITY)

The importance of allowing time for capital turnover --

Case-study illustration:

Graph of replacement chronology of US power-generating plants
(make stylized assumptions on plant life if necessary).

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Randyt —

• Tomas.

Elucidate the dangers of Wishful Thinking

> JQ (12-1-97)

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N=2, or
N=3

Other

Monitor reports from negotiations (coming via State) >

Monitor _____ >

August 7, 1997

DRAFT

MEMORANDUM FOR: ERSKINE BOWLES

FROM: GENE SPERLING

SUBJECT: Climate change process

To maximize the chances for developing a sensible, successful U.S. effort on climate change in Kyoto, we clearly need both an effective outreach effort and a focused high-level policy process. Todd Stern is running the outreach system extremely efficiently. The purpose of this memorandum is to formalize the management structure for the policy side.

We have already held a series of principals meetings to provide background information and to frame the issues involved. It is now time to move to a decision mode.

The structure I propose is the following. Dan, Katie, and I will meet twice a week in policy oversight meetings that will provide ongoing guidance to the large working groups at the Assistant Secretary level. David Sandalow and Peter Orszag will serve as the conduits between the White House troika oversight group (Dan, Katie, and I) and the Assistant Secretaries. Under the close supervision of the White House troika oversight team, David, Peter, Mark Mazur (Energy) and Jon Gruber (Treasury) will also be responsible for drafting position papers and options memos on the major issues. The oversight troika will then circulate the memos as necessary (e.g., to frame principals discussions), and report back both you and to the relevant principals on an ongoing basis. In addition, we have decided that Larry Summers and Janet Yellen should lead a small economic analysis team to answer any quantitative questions that may arise in evaluating various policy issues. A proposed timeline for critical decisions is found below at Section IV.

I. White House troika oversight group: Gene Sperling, Katie McGinty, and Dan Tarullo

- A. Meets twice a week (Mondays and Thursdays)
- B. Provides oversight to working groups at Assistant Secretary level
- C. Todd Stern to attend all meetings to ensure proper coordination with outreach
- D. When necessary, meetings will include appropriate officials from Treasury, State, and other relevant agencies
- E. David Sandalow (CEQ), Peter Orszag (NEC), Mark Mazur (Energy) and Jon Gruber (Treasury) responsible for drafting memos under the supervision of the oversight troika

II. Assistant Secretaries group

A. Working groups include: Domestic Emissions Trading; International Emissions Trading and Joint Implementation; Technology; Developing Country Commitments; and Federal Undertakings (Goodman, Glauthier)

B. David Sandalow (CEQ) and Peter Orszag (NEC) to provide conduit from oversight troika to Assistant Secretary working groups, which meet regularly.

C. The workplan for the Assistant Secretaries group is attached.

III. Economic Analysis Team

A. Led by Janet Yellen and Larry Summers

B. Decides which tools to use in evaluating specific quantitative questions

C. Feeds back into oversight troika and Assistant Secretaries groups

IV. Timeline for critical policy decisions

<u>Date</u>	<u>Event</u>
August	Refined background papers cleared at Assistant Secretary level and forwarded to principals
	Informal package of proposals developed by White House troika
	Preliminary revenue-recycling options evaluated by White House troika, OMB, and Treasury
	Develop comprehensive voluntary approach to take effect prior to beginning of international regime
September	Writing and refining options memos
Late September	Preliminary decisions on domestic approach and target/timetable options: Domestic policy decisions include structure of domestic emissions trading program, revenue recycling options, technology programs, and Federal undertakings.
October 6	White House conference on climate change
Mid-October	Public release of U.S. targets, timetables, broad domestic approach, and developing economies position

Late October

Penultimate negotiations in Bonn

November

Intense diplomatic campaign, formulating precise negotiating instructions, working with domestic constituencies, and examining post-Kyoto scenarios

December 1-12

Kyoto

**WORK PLAN FOR ASSISTANT SECRETARY WORKING GROUPS
ON CLIMATE CHANGE POLICY ANALYSIS**
(Lead authors indicated in parentheses)

1. Domestic Emissions Trading (Gardiner, Gruber).
Revised paper to be distributed Aug. 8. Includes analysis of auctions (FCC, other experiences) and administrative issues.
 - WTO/MAI issues (Haverkamp)
Paper due Aug. 8
 - Relationship to international trading (Simon)
Draft being circulated for comment.
2. International Emissions Trading and Joint Implementation (Doniger, Gruber)
Revised int'l emissions trading paper to be distributed Aug. 13. Will include additional analysis of institutional and compliance/monitoring issues.
 - joint implementation/additionality (Doniger, Gruber)
Paper due Aug. 13
 - payment/trade account questions (Hunker, Shogren)
Paper due Aug. 13
 - WTO/MAI issues (Haverkamp)
Paper due Aug. 8
3. Technology (Glauthier/Bierbaum)
Sectoral paper distributed. Paper setting forth major policy options to be developed in August. (First draft Aug. 13). President's Committee of Advisers on Science and Technology (PCAST) and DoE Labs preparing reports to the President for October 1 delivery.
4. Developing country commitments (Pomerance, Hunker)
Paper setting forth policy options due Aug. 13
 - escape clause (Pomerance, Gruber)
Paper due Aug. 8
 - competitiveness/trade issues (Yellen, Frankel)
Paper drafted. To be circulated August 9.
5. Federal undertakings (Goodman, Glauthier)
Paper setting forth major policy options due Aug. 22. (First draft Aug. 13).



THE CHAIRMAN

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

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.

ORAL testimony

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Tuesday, July 15, 1997

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At this time the Administration has not settled on a particular set of 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 -- Members of Congress and other elected officials, scientists, economists, business and labor leaders -- about the problems posed by greenhouse gas accumulations and the costs and benefits of corrective action. This discussion 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 a policy 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. Any policy the President 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, however, I would like first to emphasize 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 of policies on the economy: we are concerned with not just the next five years and not just the American economy -- but, rather, we are concerned with economic and physical processes that operate globally and over decades, if not centuries. Both the costs and benefits of climate protection are very difficult to quantify or predict with any certainty. 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.

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. 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 Analytical 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. 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.

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.

Let me briefly summarize the lessons we have learned from the economics literature so far: :

- 1) 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. Essentially, the lesson we've learned is that the greater the substitution possibilities and the faster the economy can adapt, the lower the costs.
- 2) 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 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."

3) 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. And, 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.

Conclusion

Let me conclude by saying: Policies to promote economic growth, create jobs, and improve the living standards and opportunities of all Americans have been and -- always will be - 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."

I believe that some of the lessons we have learned from the economic literature will help us to achieve the President's goal.

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

Short literature summary on environmental costs and U.S. "competitiveness" July 30, 1997

One concern often raised about attempts to reduce carbon emissions is that such an effort would effect a marked deterioration in U.S. competitiveness. The "competitiveness" argument has at least two versions:

- Without specific developing country targets, U.S. industry will relocate abroad.
- Without specific developing country targets, the demand for U.S. energy-intensive goods will decline and the current account balance will deteriorate.

Before summarizing the literature, it is important to recognize two factors that tend to militate against significant location or trade effects:

- Non-tradeable sectors account for a substantial share of carbon emissions. Transportation and buildings, for example, account for roughly two-thirds of U.S. emissions. For these sectors, the "competitiveness" argument seems largely irrelevant.
- In most manufacturing sectors, energy costs are a small percentage of total costs. According to the 1995 Annual Census of Manufactures, energy costs for manufacturing industries averaged just 2.2 percent of total costs. In electronic equipment (SIC code 36), for example, energy accounts for 1.2 percent of total costs. In instruments and related products (SIC code 38), energy also accounts for 1.2 percent of total costs. Given the small share of energy in total costs in most industries, differential shifts in the relative price of energy across countries are unlikely to have substantial effects on location decisions and trade flows. Another form of this argument notes that significant differentials in existing energy prices across countries do not seem to cause substantial movements in industries. The price of a barrel of heavy fuel oil in 1994, for example, was \$13.65 in the United States and \$5.06 in Venezuela.¹ Yet firms have not generally fled the United States for Venezuela.

The rest of this memorandum briefly summarizes the available literature on both forms of the competitiveness argument. The paucity of studies on climate change policies *per se* necessitates reliance on studies of environmental regulations more generally. Caution may therefore be warranted in applying these results to the climate change issue.

Firm location decisions

The first type of competitiveness argument is a form of the "pollution havens" hypothesis,² in which firms are tempted to relocate to (or to build new plants in) countries with lax environmental standards. The evidence, however, suggests that the pollution havens hypothesis has little empirical support: the costs of complying with environmental regulations are too small relative to other factors (labor costs, tax rates, infrastructure, etc.) to have much effect on firms' location decisions.

- The literature review conducted by Jaffe, Peterson, Portney, and Stavins concludes that "We assess the evidence and find that there is little to document the view that environmental regulations have had a measurably adverse effect on competitiveness. Although the long-run social costs of environmental regulation may be significant, including adverse effects on productivity, studies attempting to measure the effect of environmental regulation on net exports, overall trade flows, and plant-location decisions have produced estimates that are small, statistically insignificant, or not robust to tests of model specification."³
- Esty notes that "empirical studies have shown little propensity of pollution-intensive industries to move to 'pollution havens'...Even in industries with high pollution control costs, companies often face other deterrents to relocations, including high fixed costs and sensitivity to transportation expenses."⁴
- Dean writes that "More stringent regulations in one country are thought to result in loss of competitiveness, and perhaps industrial flight and the development of pollution havens. The many empirical studies which have attempted to test these hypotheses have shown no evidence to support them."⁵
- Summers reaches the same conclusion, writing that "costs of compliance with environmental regulations are generally not a sufficiently high fraction of total cost to be a crucial determinant of location...there is very little evidence of footloose polluting industries."⁶

Studies of plant location decisions at the state level similarly conclude that "there is little direct evidence of a relationship between stringency of environmental regulations and plant location choices."⁷ For example, separate studies by Bartik and Levinson both conclude that plant location is not significantly affected by state-level environmental regulations.⁸

Some have taken the argument even further, arguing that more rigorous environmental standards make domestic firms *more* competitive because the

regulations spur innovation.⁹ Many who find this extreme position unconvincing are nevertheless willing to accept that environmental regulations have little effect on firm location decisions.¹⁰

Trade flows

Even if firms do not move or build plants abroad, trade flows could still shift in response to environmental policies. But existing studies have generally concluded that environmental regulations have little effect on trade. For example, Grossman and Krueger conclude that pollution abatement costs in the United States have had little effect on imports from Mexico or activity in the maquiladora sector.¹¹ Consistent with the lack of a significant negative relationship at the national level, states with higher-than-average pollution abatement spending apparently do not export less than other states.¹²

Climate change studies

Few studies have examined the specific impact of climate change policies. One study by McKibben and Wilcoxon did examine the effect of a carbon tax of \$15 per ton applied in the United States alone, and in the United States and the OECD together, on trade flows. They conclude that "our results suggest that a carbon tax would produce little redistribution of trade in either the short or long run."¹³

A related literature has studied the magnitude of "leakage effects" -- that is, to what extent cuts in domestic emissions would be offset by shifts in production and therefore increases in emissions abroad. This literature has not reached any firm conclusions: Repetto and Austin report that studies of unilateral emissions reduction policies in OECD countries predict leakage rates of between 3.5 and 70 percent.¹⁴

Caveat

In sum, the related literatures suggest that carbon policies are unlikely to effect a massive shift of energy-intensive production abroad. At the same time, the empirical literature on the specific impact of carbon policies is sparse. And an important caveat to the general findings above is that for several industries, energy costs are a significant share of total costs. For example, in primary aluminum production (SIC 3334), energy accounts for 21.4 percent of total costs. In hydraulic cement (SIC 3241), energy accounts for 20.5 percent of total costs, while in inorganic chemicals (SIC 281), the share is 13.7 percent. And in other industries -- including the pulp and paper industry, and the steel industry -- energy is a significant input. In these industries, which account for perhaps 2 to 3 percent of total industrial output, the effects may be more significant than those outlined

Would Stabilizing U.S. Carbon Emissions Feel Like Another 1970's Oil Shock?

Both the '73 and '79 energy price shocks were similar in magnitude to what is projected to result from a policy to stabilize carbon dioxide emissions at 1990 levels by 2010 without trading or joint implementation.

Price Effects of Stabilizing Carbon Emissions

- Government agencies have estimated the implicit price of carbon in fossil fuels that would be implied by a policy to stabilize carbon dioxide emissions at 1990 levels by the year 2010. These estimates presume no trading of emissions reductions among countries and no joint implementation. They are uncertain, and may be too optimistic due to a rosy view of ongoing technological progress. They suggest that the implicit price of a ton of carbon would be about \$100 by 2010 and that fuel prices would rise as summarized below:

Fuels	Current Prices	Baseline Prices (2010)	Prices With \$100/ton Carbon Price	Increase Over Baseline
Gasoline (\$/gallon)	\$ 1.14	\$ 1.22 to \$1.40	\$ 1.58	21 %
Coal (\$/ton)	\$27	\$13.80 to \$16.90	\$79	400 %
Oil (\$/barrel)	\$17	\$20.41 to \$21.24	\$33	58 %
Natural Gas (\$/1000cf)	\$ 2.04	\$ 2.01 to \$2.46	\$ 3.7	64%

- The price hike would be about 88 % for primary fuels (coal, oil and natural gas).

Price Hikes During the Oil Shocks.

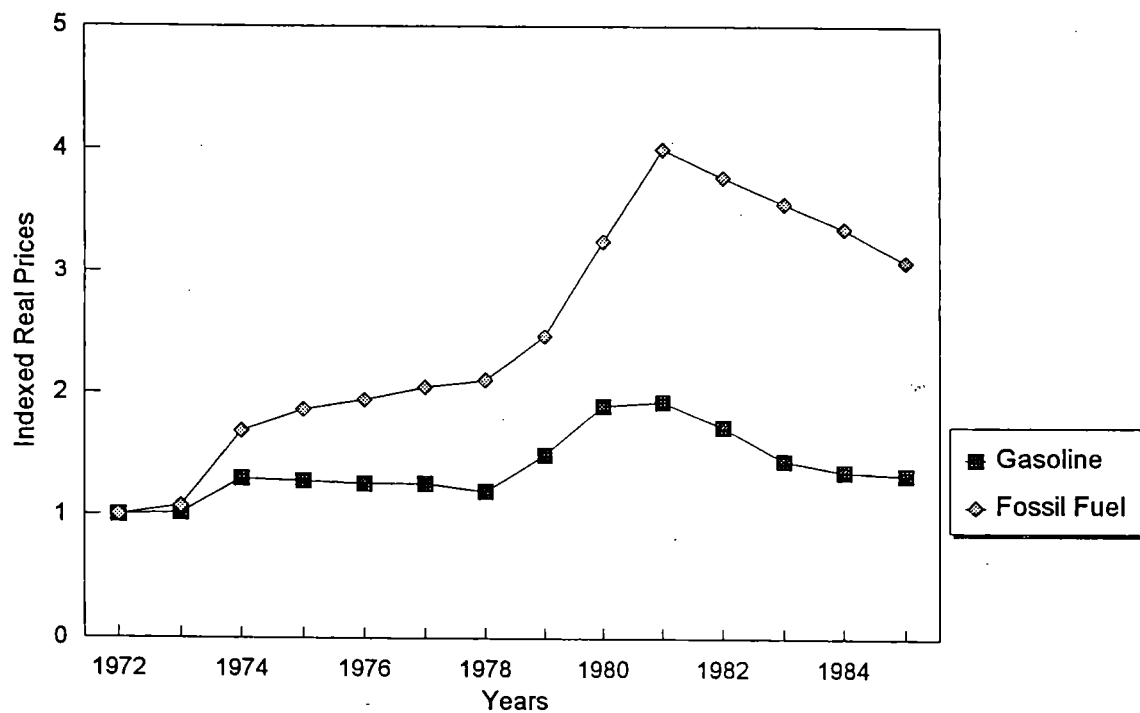
- The oil price shocks of the '70s led to a doubling of fossil fuel prices net of inflation between 1972 and 1975 and another doubling by 1981. See Figure.
- Gasoline prices rose by 30 percent between 1972 and 1974 and by nearly another 50 percent from 1974 to 1981.
- These increases are similar in magnitude to the price increases projected for 2010.

Comparability of These Projections with the 1970s Price Shocks Is Limited

- The shocks were surprises, but a carbon tax would be anticipated.
- The oil shocks affected oil prices directly and other fossil fuels only as substitutes. However, a carbon tax would affect all fuels in proportion to carbon content.

Real Price Changes During Recent Price Shocks

Gasoline and Fossil Fuels



Would Stabilizing U.S. Carbon Emissions Feel Like Another 1970's Oil Shock?

Macroeconomic Effects of the 1970's Oil Shock

- Hall and Taylor in their textbook report that relative to its normal growth path of 2 percent per year, GNP fell 5.8 percent over the 2 years following the '73 price shock and 1.7 percent over the 2 years following the '79 price shock.
- After the oil shocks aggregate consumption also fell very briefly in absolute terms; it remained below trend for about 3 or 4 years after the shocks.
- Unemployment and inflation both rose in the stagflation episodes shown in the attached Figure.

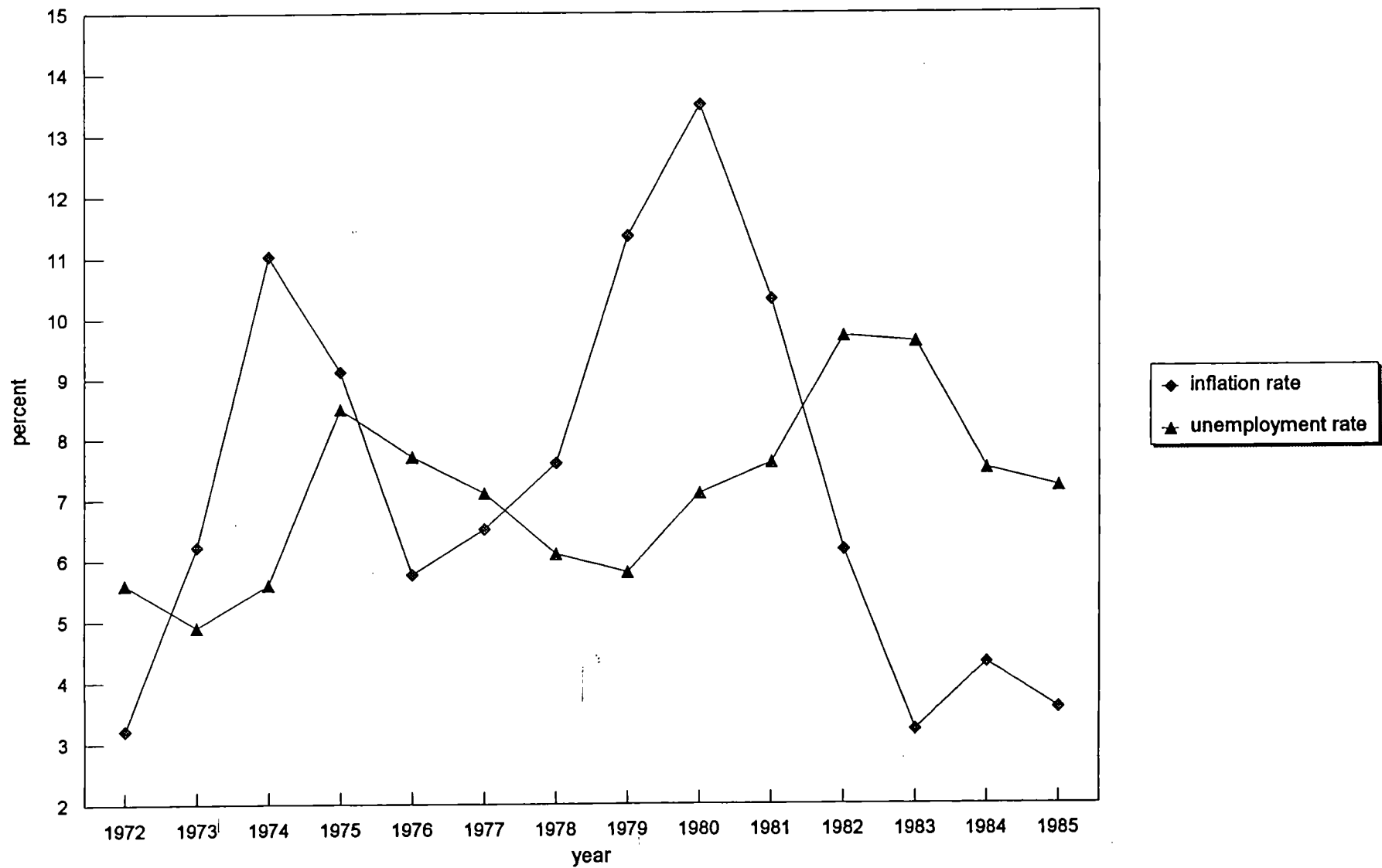
Macroeconomic Effects of Stabilizing Carbon Emissions

- The DRI model in the IAT analysis found that consumption under climate policy (1990 emissions level in 2010) fell under the baseline consumption in 2000 and stayed below baseline through 2020. DRI indicates that a small increase in unemployment, peaking at 4/10 of 1% in 2005, will occur. Projections of the inflation rate are too sensitive to Federal Reserve responses, the nature of the permit allocation (auction or grandfathering), and the characteristics of revenue recycling.

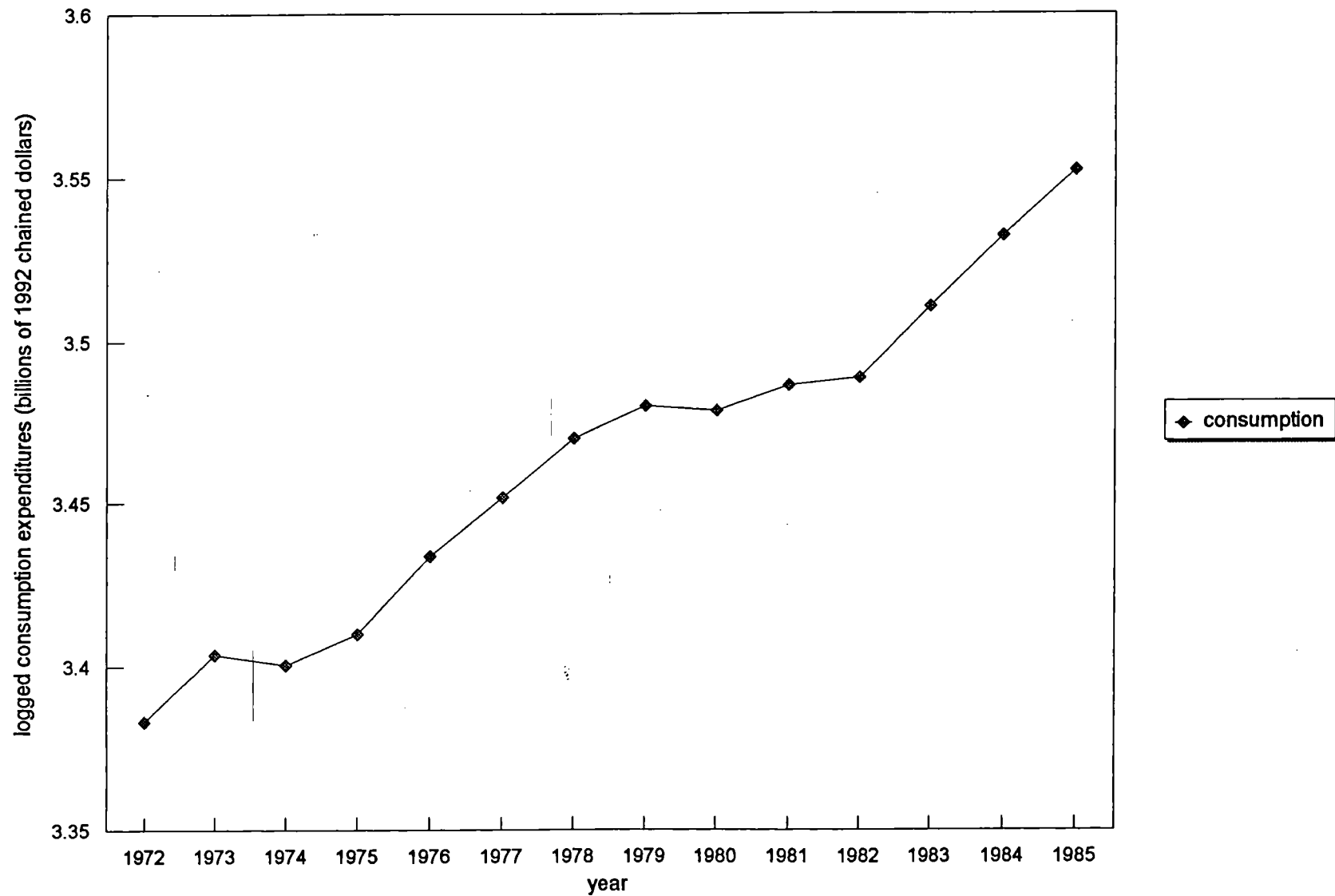
Comparability of Performance after the Oil Shocks and with a Carbon Stabilization Policy

- The shocks were surprises while a stabilization policy would lead to anticipated price changes.
- The shocks represented temporary price spikes while a stabilization policy would likely lead to permanently higher prices. Indeed, carbon prices may grow indefinitely under a given stabilization policy if growth in demand driven by income, population, and technology (e.g., vehicle miles travelled) outstrips innovation in fossil fuel alternatives, and in efficient energy use.

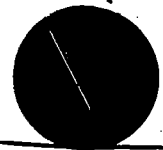
Unemployment and Inflation Rates, 1972-1985



Real Consumption Expenditures, 1972-1985



HAM
JAF
Document No. 115



WHITE HOUSE STAFFING MEMORANDUM

DATE: 7/23 ACTION/CONCURRENCE/COMMENT DUE BY: 7/24 10:00 am
SUBJECT: Climate Change Remarks

	ACTION	FYI		ACTION	FYI
VICE PRESIDENT	☒	☐	McCURRY	☐	☒
BOWLES	☒	☐	McGINTY	☒	☐
McLARTY	☐	☐	NASH	☐	☐
PODESTA	☒	☐	RUFF	☐	☐
MATHEWS	☒	☐	SMITH	☐	☐
RAINES	☐	☐	REED	☐	☐
BAER	☒	☐	SOSNIK	☒	☐
ECHAVESTE	☐	☐	LEWIS	☒	☐
EMANUEL	☒	☐	YELLEN	☒	☐
GIBBONS	☒	☐	STREETT	☐	☐
IBARRA	☐	☐	SPERTING	☒	☐
RADD	☐	☐	TARULLO	☒	☐
MARSHALL	☐	☐	VERVEER	☐	☐
HILLEY	☒	☐	WALDMAN	☒	☐
KLAIN	☒	☐		☐	☐
BERGER	☒	☐		☐	☐
LINDSEY	☐	☐		☐	☐

REMARKS:

Comments to Lowell Weiss

RESPONSE:

PRESIDENT WILLIAM J. CLINTON
CLIMATE CHANGE EVENT
THE WHITE HOUSE
JULY 24, 1997

As we approach the dawn of the 21st century, our great challenge is not only to prepare our children for the world but also to protect the world for our children. This challenge is part of a sacred pact between the generations to ensure that today's progress does not come at tomorrow's expense. And that is why we have no choice but to face up to the full reality of global climate change.

Whenever the security of our people has been threatened, the United States has led the world to action. Climate change poses a threat to all people -- one that is subtle today but which will grow in severity and significance in years to come. The world must act. And the United States must lead. I am determined that we will lead -- responsibly, flexibly, making sure that we promote prosperity as we protect the environment. We have no choice -- and the scientists gathered here today will explain why.

Years ago, scientists could not be sure that human activities would influence our climate. But today, the evidence is in, the science is solid, and what was once theory is now fact: Global warming is for real. On this fundamental issue, the scientific debate is over.

The world's scientists believe that if we do not cut our emissions of greenhouse gases, we will disrupt the global climate. In fact, the overwhelming majority of scientists take their conclusions one step further. They believe there is ample evidence that human activities are disrupting the global climate already today.

Our scientists are issuing clear warnings about what will result if we stick our heads in the sand and refuse to act. If we stay on our current course, average global temperatures may rise 2 to 6 degrees Fahrenheit in next century. To put this in sobering context, the difference in average temperature between the last Ice Age and today is only 9 degrees Fahrenheit.

If we fail to act, scientists expect that our seas will rise 2 feet or more over the next century, and thousands of square miles of Florida, Louisiana, and other coastal areas will be flooded. Infectious diseases will spread to new regions. Severe heat waves will claim the lives of more of our citizens. Our agriculture will suffer, and severe droughts and floods will be more common than ever.

The United States must confront this challenge head-on. As I pointed out recently at a special session of the United Nations, we have only 4 percent of the world's population, and yet we produce more than 20 percent of its greenhouse gases. For the sake of the planet and our own people, we simply must act.

In December, the nations of the world will convene in Kyoto, Japan, to come up with an agreement on how best to achieve meaningful emission reductions worldwide. Working with the American people, this Administration will bring to the Kyoto conference a strong American commitment to realistic and binding limits on our emissions. And let me be clear: Environmental protection and economic growth go hand in hand.

In Kyoto, we will emphasize flexible, market-based approaches. We will embrace research and development efforts that can help provide the technology to meet the new goals. And we will ask all nations -- industrial and developing -- to participate in a common solution.

I know that the nations of the world can work together to defuse the threat of global climate change. I know the science demands it. I know we owe it to our children.

And now, it is my honor to introduce Dr. Sherwood Rowland, the first of the distinguished scientists we will be hearing from today.

Impact of global climate change on US industry

22 July 97

Janet Yellen

Tim: Jay
Q.M. 3

Key points

- The direct evidence is scanty on the likely competitive impacts of an Annex I-only treaty.
- The likelihood the US will lose its competitive edge depends on several factors including the size of the carbon tax and its implementation; the industry's relative share of energy costs to its total costs; and the strength of the R&D commitment.
- Will industries move? First, the "pollution haven" hypothesis does not apply to the large share of carbon emissions that come from industries too costly to relocate (e.g., utilities and transportation). Second, the evidence suggests this hypothesis has little empirical support: the costs of complying with environmental regulations are apparently too small relative to other factors (labor costs, tax rates, infrastructure, etc.) to have much effect on firms' location decisions. But this literature might not apply to climate change policies given the magnitude of the policy options under consideration. Third, substantial differences in costs across countries already exist.
- Some industries with high energy costs might relocate, open new plants abroad, or shut down plants prematurely. The DOE's Argonne study identifies six energy intensive industries that might be affected: basic chemicals, petroleum refining, aluminum, iron and steel, paper and allied products, and cement. But even in these industries, firms do face some deterrents to relocate, including high fixed costs and sensitivity to transportation expenses. And if energy-efficient technologies come through, the impact would be lessened.
- Will industries lose market share (trade deficit)? While exports in energy-intensive goods will fall, this will be offset by, say a decrease in oil imports, and an increase in energy-efficient technology exports. And flexible implementation matters: if an international emission trading system is established and depending on how emission permits are allocated, the US could be either net buyer or seller of emission permits. Plus if the revenues from a permit system are recycling through reductions in distortionary taxes, e.g., payroll or corporate income taxes, an offsetting effect would exist.
- Do we undermine our own efforts at emission reduction? Estimates of carbon leakage range from 1 to 20 percent, where carbon leakage is the ratio of increased non-Annex I emissions to decreased Annex I emissions. This remains an open and intriguing research question.

ECONOMISTS' STATEMENT ON CLIMATE CHANGE

*Endorsed by Over 2000 Economists
including six Nobel Laureates*

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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WASHINGTON, D.C. 20520-7250

JLY
JAF
AHM
JS
JR
MS

To: Climate Lunch Group

From: Timothy Wirth

Attached is an excellent summary of
Climate to date, done by Eileen Clausen
in a farewell memo.

I urge you to read this - call me
if questions or suggestions.

Viv

July 19



United States Department of State

Washington, D. C. 20520

Desk

97 10 10 10

INFORMATION MEMORANDUM

S/S

July 15, 1997

UNCLASSIFIED

TO: G - Mr. Wirth

FROM: OES - Eileen Claussen 

SUBJECT: My Thoughts on Climate Change

I thought it might be useful to lay out my thoughts on where things stand on the climate change issue internationally and domestically before I leave the Department. I will also make some suggestions on strategies to pursue in the months ahead.

INTERNATIONAL STATUS

We are at a virtual standstill in the international negotiations. There are nine large issues on the table, and an enormous amount of posturing on all sides. The United States lost a great deal of credibility in recent months as a result of our failure to propose specific targets or even to give an indication of what we might be able to accept.

1. Targets and Timetables

You know of the EU's proposal for a 15% reduction below 1990 levels in 2010. The EU also has a 2005 target (of 7.5% below 1990 levels) on the table. At the present time, there is no movement by others on a target. The U.S. has no target (although we have said that the EU targets are not possible for us), and neither does Japan, Canada, or others in Annex I. We have also been explicit about not accepting a target date of 2005, since it would be unlikely that we could ratify a treaty, obtain implementing legislation and promulgate the rules and regulations that would be required in time for a 2005 date. This issue is complicated by the EU position that it will not discuss other parts of the U.S. proposal until we put a target on the table.

UNCLASSIFIED

2. The EU Bubble

The EU target is based on the presumption that the EU is allowed to "bubble" its emissions; in other words, the EU, taken as a whole, will meet its overall target but individual countries may have different targets (i.e. Portugal may increase 40%, Germany may decrease 15% etc.). This is viewed as blatantly unfair by Japan, Australia, the U.S. and others. It is, in essence, a system of differentiated targets with internal trading within the EU. We have said that there are really three choices for how to deal with the EU. First, the EU could have one target, and be one party to the Convention, just like any other single country. Alternatively, it could have each EU member agree to the same target (the one we all agree to), and then the EU could trade emissions within itself so that each country was satisfied. This would be acceptable as long as every other country could also engage in trading. Finally, there is the EU proposal itself, where each country would agree to a different target, but that only the EU as a whole would have to meet the internationally agreed target. This last option, particularly if emissions trading is not allowed for all countries, is completely unacceptable. It is likely that the EU will suggest that they maintain their position on the bubble, but agree to emissions trading for everyone in Annex I in exchange.

3. Emissions Trading

We have put forward a proposal for emissions trading within Annex I, that is, among all countries that have binding targets. This proposal has received some support from Australia, Canada and New Zealand. It is viewed with suspicion by Japan, although they are unlikely to oppose it. The Russians are very supportive of this idea, since they would be the country most likely to have emissions to spare. This is the case because their emissions dropped substantially below 1990 levels during the early 1990s, and their economy remains in disarray. The EU claims it is too complicated to be agreed in Kyoto, and will not discuss it further until other targets are on the table. I suspect that the EU will eventually agree to this proposal although other issues will be raised. We have already heard comments to the effect that the purchase of Russian emission credits will not benefit the environment, allowing us, in effect, to purchase existing reductions rather than do our own. This is true, but is also an argument that could be used with the Germans, since their target is only possible because of the parallel situation in eastern Germany. It is possible that

emissions trading may end up by being limited in scope, allowing a country only to trade a portion of its emissions.

4. Joint Implementation

The U.S. has traditionally been a strong supporter of joint implementation, but has been unable to gain many supporters for its proposal internationally. At the present time, we are supported by the Central American governments, Canada, Australia, New Zealand, Norway and possibly Peru. The EU has raised objections, at least for this round of the negotiations, and the Japanese appear ambivalent. The developing countries, with the exception of those listed above, remain opposed. Developing countries are now engaged with us in an experimental joint implementation stage (called activities implemented jointly) where no credits are assigned. They claim first, that they want the experimental phase to finish and be evaluated before reaching further agreement; second, that technology transfer is required by the Convention, and therefore should not involve the transfer of emissions credits; and finally, that if they are eventually going to be subject to targets, they would like cheap reduction options available to them, not to those who participate in joint implementation rather than taking reductions in their own countries. Other complicating factors have also been raised, including the difficulties of establishing a suitable baseline for a given project, how to determine what is truly "additional" about the project's emissions reductions, and how to divide those reduction credits among different countries.

5. Policies and Measures

The Berlin Mandate discusses both targets and "policies and measures." The EU has been a strong supporter of harmonized and mandatory policies and measures, which could include everything from energy taxes to harmonized refrigerator efficiency standards. The Japanese seem perfectly willing to support the EU here, and the Canadians are ready to follow suit. Only the U.S. remains so strongly opposed to such measures, arguing that each country is fundamentally different, and that each country should have the freedom to decide on which policies and measures to use to implement its target. The compromise here may be a list of measures that individual countries could consider, although this will not be a compromise that will be reached easily.

6. Differentiation

Japan, Australia and Norway have argued that their circumstances are sufficiently different (Japan because it is so energy efficient, Australia and Norway because they are enormous fuel exporters), that there should not be a uniform target, but rather differentiated targets based on a set of criteria. This view is made more persuasive given the way in which the EU proposes to operate (i.e. differentiating within the EU). Strong opposition comes from the EU (which refuses to acknowledge its hypocrisy) and the U.S. We have argued against differentiation on the grounds that there is no consensus among any countries on a scheme that might be used, and also that, in light of the lack of support, it would not be possible to reach a conclusion in December in Kyoto. As a practical matter, we would fare poorly in any scheme - we are the largest emitter, we are among the most energy intensive (i.e. energy used per unit of GDP), and we are the largest per capita emitter, too. But it is not clear whether the countries who support this approach will simply "give it up" in Kyoto.

7. Compensation

The OPEC countries, who are not supportive of any agreement, have raised the issue of compensation. They believe that if a climate change treaty reduces oil imports from their countries, they should be compensated. While it would seem that this is a complete non-starter, other developing countries seem to be rallying to their side, and the EU has been acting like they think some compromise is possible here, at least in terms of an analysis on what our actions might do to their economies. While this proposal as drafted is unlikely to be successful, we are the most vociferous opposition.

8. Developing Country Actions

We have put forward a set of proposals that would apply to all developing countries, essentially "advancing" their existing commitments. In our text, we require that they take a series of actions, measure the effects of those actions, and report on what they have accomplished. While there are likely to be some changes to our language, the EU is generally supportive of our suggestions. I suspect that what the developing countries accept will be dependent on the target that developed countries negotiate.

9. Evolution

This is the most difficult and the most important of the U.S. proposals. We have argued that developing countries must agree in Kyoto to a subsequent negotiation in which they will assume binding targets and in which we will agree on a mechanism that allows for the "graduation" of countries from developing country status (and targets) to developed country status (and targets). We have no support for this concept, except for Canada, Australia and New Zealand. The EU believes it is too strong (and maybe, if weakened, could be part of a Kyoto mandate), the Japanese believe it could derail a successful conclusion in Kyoto, and the developing countries seem unready to accept it, even in cases where they understand its importance in solving the problem. We will have no chance of treaty ratification without such an agreement. In fact, Senate views on a treaty (represented by the Byrd amendment) would require more than the Administration has proposed -- including the acceptance of new commitments by the developing world. Such new commitments are clearly impossible under the Berlin mandate.

DOMESTIC STATUS

The domestic situation we face is extremely difficult. Whatever momentum we may have had coming from the July 1996 meeting in Geneva has dissipated, and if we are to succeed, we must work hard to rebuild domestic support for our approach and probable proposed target.

1. Industry

The industries that are most likely to be negatively affected by any climate change regime are very well organized and well funded. They have argued that significant cuts will cripple them, that developed country targets in the absence of developing country targets will disadvantage the U.S., and that the Administration is going to agree to a protocol without sufficient dialogue and support in the United States. Our failure to release the economic analysis we have done bolsters the first and last of these points, although if the data were released, the arguments would persist. On developing countries, their stance is designed to derail the negotiations, since the

Berlin Mandate explicitly precludes new commitments for developing countries. These industries also claim that there is no consensus on the science. They are, for the most part, members of the Global Climate Coalition, and include the coal industry, most of the oil industry, the railroads, and most of the electric utility industry.

There are two other industry constituencies that are important. The first of these is the group that would stand to gain from any climate change protocol, namely the renewable and solar energy industries, as well as those that promote the use of gas. They are not well organized, and have been a very weak voice supporting the Administration. Their group is the Business Council for a Sustainable Energy Future. Enron is the most influential member.

The third group is the International Climate Change Partnership. Most members are multinationals, and range from Carrier Corporation to British Petroleum to Dupont. These companies agree that the science is compelling, and that the framework we presented internationally (binding targets, flexibility, and developing country commitments) is a good one. However, they are disenchanted by our failure to share the economic analysis, and to further engage on the level of a target. The support of these companies is vital. But in order to it, their confidence needs to be rebuilt.

2. The Environmental Community

This community is also split on this issue. All environmental NGOs are concerned about the kind of target that the U.S. will propose. They have all supported targets beginning in 2005 (which the Administration has said is too early), and levels of reduction close to or resembling the EU. Some groups support trading and joint implementation (EDF in particular), while other have insisted on increased auto efficiency standards (the Sierra Club). If our target is too modest and does not go beyond stabilization, we will be heavily criticized by all.

3. The Congress

The most telling example of where we are in the Congress is the Byrd Resolution. This resolution, drafted by the coal industry, was a personal project of Senator Byrd, and now has more than 60 signatures. It stipulates that if developed countries have binding targets agreed in Kyoto, so must the developing world. Although this idea has

not been tested in the House, it is likely that we would see a similar line up. The reality is that there are too few Hill supporters of action on climate change to deal with this issue. The Administration has not engaged the Congress over the past six months, and we see little support emerging based on NGO lobbying. This has left the field completely open to the naysayers, and the result is pretty clear.

4. Domestic Implementation of a Treaty

of the Senate. It will also require Congressional passage of implementing legislation and the promulgation of rules and regulations by the Executive Branch. Even if the ratification hurdle is passed, developing and passing implementing legislation will be extremely difficult. Like The Clean Air Act, there will be different regional and sectoral

impacts from efforts to reduce greenhouse gases. Decisions on how to distribute the burden between the transportation sector, the utility sector, and the household and commercial sector will have to be made. Legislators will have to focus on what to do with the coal industry and coal miners, the industry and labor group that will be most affected. Finally, we will have to look at different implementing mechanisms. The notion that a domestic "cap and trade" program will be all that we need is short-sighted. While such a system will work well for utilities (1/3 of our carbon dioxide emissions), it is not clear how the system can be made to work for transportation, or for the other greenhouse gases (methane, nitrous oxide, etc.) that we will have to regulate.

THOUGHTS FOR A STRATEGY

The task facing the Administration and the international community is enormous, given the timetable for decision, the difficulty of the issues to be decided, and the politics associated with those issues. But certain items must be faced immediately:

1. Building a Domestic Base

Nothing will substitute for an earnest dialogue, including a discussion of possible and realistic targets, timetables and impacts of those targets and timetables. This must be conducted at all levels, and with all

constituencies. It will only work if we are open, and share the results of our analyses, whether it is our economic analysis, or our analysis of long-term pathways leading to different atmospheric concentrations of greenhouse gases. The President must hold some meetings with selected CEOs (perhaps through the Business Roundtable) who are engaged in this issue, as well as with some Members of Congress. Others will also have to be heavily engaged. We will need to listen, as well as to share information and ideas. The only time frame that works is for this to occur over the summer.

Some groups will never be satisfied with a solution, since they wish only for there to be no solution. But there should be some members of all communities who could unite behind a realistic proposal. In particular, we need to build a core group from the Business Council, the ICCP, and those parts of EEI that are most forward looking. It may be possible to move the auto companies if they are assured that domestic implementation will not fall on them in the form of CAFE standards. Some oil companies, particularly those with heavy investment in alternative energy sources may also be willing to engage.

We will also have to try to see if there can be common ground between the Administration and organized labor. This will not be an easy task. The Mineworkers have been strong and vocal on this issue, and it is not clear that their views can be reconciled with ours. However, there are others within the AFL-CIO who are more positive (including the Steelworkers and the Oil, Chemical and Atomic Workers), and we should attempt to work with all of them together.

Similarly, we will have to work closely with those members of the environmental community who are prepared to accept a reasonable solution. EDF, NRDC and WWF are obvious candidates. But even with those who are unlikely to be sympathetic, a good dialogue that covers what is possible and what is not might blunt some of the expected criticism.

If the outreach effort culminates in a White House Conference, it is critical that everything be programmed well enough in advance to assure a positive result. A White House Conference that does not result in a shared consensus on the need for action, combined with an acceptance of the principles that will form the basis of our negotiating position would not be helpful.

2. Making our Way Through the International Maze

The end game, of course, is the international negotiation. Even if we are successful in building some support domestically, the critical question is whether a deal can be struck in Kyoto. Key players include the EU, Japan, China, Brazil, India and the OPEC countries. We will need to engage all of these countries (or groups of countries) separately from the negotiating fora. A meeting at a high level with the EU and Japan could be useful after the October negotiating session. It must be kept small, and should, in essence, be an attempt to see if a deal is possible. High level visits to Saudi Arabia, India, Brazil and China are also important, and should be conducted before November. Again, these should be designed to assess whether a deal could be reached in December.

No matter how good the preparation, reaching a satisfactory conclusion in Kyoto will be extremely difficult. It is worth some time and effort to determine what follow-on process would be desirable if a deal is not achieved. The key will be keeping the issue alive. Those who oppose any agreement should not come away from Kyoto thinking that they were victorious. Tough questions that we will need to face if no agreement is possible include: if the stumbling block is developing country actions, do we need a change of mandate? If the stumbling block is the strength of the reduction commitment, can we put forward a package that cuts more deeply, but over the long term? And if that is the solution, what interim steps can be agreed? If the issue is the flexibility provisions, particularly joint implementation, are there different options for working with developing countries that could be introduced? Finally, we will need to decide what the best timetable is for an agreement. Certainly, it would be best to reach an agreement in Kyoto. It is early in the Administration's second term, and bold steps are easier the farther they are from an election year. But if the projected schedule is closer to the year 2000, is that something we can live with?

cc:

CEQ - KMcGinty
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NEC - DTarullo



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Subject: 1997-07-24 CLIMATE CHANGE BRIEFING

THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release

July 24, 1997

**PRESS BRIEFING BY
KATIE MCGINTY,
CHAIR OF THE COUNCIL OF ENVIRONMENTAL QUALITY;
DAN ALBRITTON,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION;
AND JERRY MELILLO,
OFFICE OF SCIENCE AND TECHNOLOGY POLICY**

The Briefing Room

12:40 P.M. EDT

MR. LOCKHART: Good afternoon. Before Mike comes down for the regular daily briefing, we've asked some of our colleagues here to come in. As you know, the President begins a series of events today on the issue of global climate change which will lead up to the Kyoto meeting in December. He'll be meeting with some eminent scientists today including some Nobel laureates.

I've asked Katie McGinty, the Chair of the Council of Environmental Quality, to come down , along with Dan Albritton, the Director of the Aeronomy Lab at the National Oceanic and Atmospheric Administration; and Jerry Melillo, the Associate Director for Environment of the Office of Science and Technology Policy.

MS. MCGINTY: Thanks, Joe.

Q How are those Redwoods?

MS. MCGINTY: Good afternoon. Not to change the topic. As Joe has indicated, today the President launches his campaign to engage the American people on the important issue of climate change. Today we will hear from some of the most distinguished scientists in our country, and indeed, in the world, on these issues.

These scientists will tell us in clear and certain terms why it is that we can't stick our hand in the sand on this issue. Infectious diseases -- already we're seeing diseases like malaria and dengue fever at our borders; indeed, Russia has seen an incidence of malaria return. These diseases will only spread as the climate warms.

Rapid increases in deaths from heat stroke -- just two years ago we saw 400 people die in Chicago from a record-breaking heat wave. Increasingly severe storm systems -- and in just the last century, we've seen a 20-percent increase in the severity of storm systems here in the United States. Now, insurance companies will tell you that has meant billions of dollars in losses here in the U.S.

Rapid sea level rise -- we stand to see thousands of square miles of our coastal states -- Florida, Louisiana -- lost to inundation from sea level rise. Indeed, we may lose a third of the Everglades from sea level rise. Severe droughts also can be expected like the ones we saw in 1988 that cut U.S. agricultural production and productivity by a third.

As I've said, these things are not just theoretical. Some things are happening now. The heat waves that have killed people, 1993 outbreak of the Hanta virus in the southwest U.S. followed on the heels of severe droughts and then heavy rains.

What the scientists want to say today is that these kinds of things are exactly in line with the predictions that they would make -- could happen as a consequence of climate change. And these are the kinds of things that can become increasingly severe, common and widespread if, again, we stick our heads in the sand on this issue and just allow ourselves to continue with business as usual.

The President has identified this issue of one of extremely seriously moment for the United States from an environmental perspective, from an economic perspective as we've already seen -- damaging storm systems, for example -- and from a national security perspective because of the global disruption that could come from climate change. Having identified this as a serious issue for the United States and one that is important to our security, the President has also determined that the United States

will show leadership here to join all of the countries in the world to taking responsible steps to meet this challenge.

Now, having said that, the President has also said you can do these things dumb and you can do them smart. He is determined that we will pursue this issue as we have all of the environmental challenges we have addressed, and that is in a way that shows the interlinkages between environmental progress and economic progress. There's a \$400-billion market for environmental technologies and services to, in part, address this issue and it will be part of the President's effort that U.S. companies are seizing those opportunities as we take on the climate challenge.

The President will articulate and pursue policies that are flexible, that are market-oriented, and again, that enable us to take this challenge and turn it into economic opportunity. This launches our effort in the coming months. We will continue the effort to engage the American people in general, but also to bring in the business community; leadership from Capitol Hill, from the environmental groups, from state and local government to find and tease out those ideas that will help us again to change this challenge into a very significant opportunity for the United States.

Today is a very important first step in this campaign and I think it will open all of our eyes to the reality of this challenge and to the very serious consequences that would follow if we were to pursue a course of no action on this issue.

To flesh some of that out, let me turn it over to Dan Albritton, one of our leading experts in this issue.

Q Why did you wait so long when this has been an issue now for several years?

MS. MCGINTY: Not to duck it, but why don't we continue with the presentations and come back for questions.

MR. ALBRITTON: Thanks. Katie's outlined the activities that are occurring today and why. From a scientific perspective, the reason that we are here today is basically that the Earth's climate system and humankind are co-involved. By that I mean, our activities, along with natural changes on the planet have the capability of changing the planet on which we live. It also implies that, as inhabitants of the planet, if the climate system were to change to unfavorable states, then we would be impactees.

And so, the issue before decision-makers in governments and industry is, on the one hand, our activities and lifestyle have the potential of changing the planet, and on the other hand, as impactees we would be involved in receiving the impacts of that change.

The complexity of that balance of cost and benefits approaches led governments to ask the expert communities around the

world to prepare their very best understanding of the climate system and our role in it and their understanding of the impacts to humankind of the climate system were to change.

Very large reports were prepared and delivered to governments last year. What we will be summarizing today for you in the way of context are the major points associated with our involvement with the climate system both on the front end and on the receiving end.

The scientific community, in addressing the question of how well do we understand the climate system and our role in it, have come up with perhaps five take-away messages. I'll summarize those five for you and my colleague, Jerry Melillo, will comment on the take-away messages associated with the impacts of climate change on humans.

I'll arrange those five points in the order of things that scientists are absolutely confident in down to things that we wish we had more information about. And I'll try to explain why the certainty and the uncertainty are both relevant to those wrestling with approaches and decisions on this.

The first point. There is a natural greenhouse effect on the planet, and we understand its basic principles very, very well, namely, we know that there are trace gases in the atmosphere that absorb part of the heat that would be radiated to space, and thereby have the potential for raising the temperature on the planet. In fact, those greenhouse gases have been part of our atmosphere as long as we've had an atmosphere. In fact, if it weren't for those greenhouse gases that are already naturally in the atmosphere, our planet would have an average temperature of six degrees Fahrenheit, not 60 degrees that we enjoy today. And so, the principles of trapped heat by a small set of gases is the rationale for us having the life on planet as we know.

Well, why is greenhouse then often deemed an issue? The issue arises is that in the last 100 years -- and this is point number two -- we've begun to change the composition of the atmosphere through our activities. That is we've been adding to, during the industrial area, the natural amount of greenhouse gases that were on the planet.

For example, CO₂ has increased 30 percent since the industrial era. And we know that it's because of the use of fossil fuel to generate energy and thereby develop the lifestyle that we enjoy. Other greenhouse gases are increasing as well. Scientists have impeccable measurements that demonstrate this steady increase of the amount of greenhouse gases since we gained the capability of altering the amount of greenhouse gases.

Third point, and this now is a forecast -- what I've mentioned up until now is what has happened in the past and at the present. The forecast is that, if greenhouse gases were to continue

to increase as they have been doing, our best understanding of how the planet is going to respond to that is that the average temperature of the planet will increase perhaps 3.5 degrees Fahrenheit by the end of the next century.

Associated with that would be an increase in sea level, because a warmer ocean and melted glaciers mean more water, more space occupied by the ocean. There will be an increase in sea level of perhaps 20 inches, which would add, of course, to storm surges and other things.

If the planet were to choose to change its temperature about 3.5 degrees, it would be larger than any natural change that's occurred since the last Ice Ages. This puts a scale on the nature of the change, and it would be more rapid than any change that we've seen since the last Ice Age.

The point that perhaps is the most policy-relevant about this is that the CO₂ that we use to get here today is going to be in the atmosphere long after we're gone; namely the resonance time of CO₂ in the atmosphere is longer than the human lifetimes, and therefore, if the planet starts changing climate, the long resonance time of these greenhouse gases means that it will be a very slow process to reverse.

Point number four, have we seen anything yet? Global temperatures have warmed over the last century, and the balance of evidence suggests that part of that warming is due to our activities. For example, we've been taking the temperature of the planet for about 125 years, beginning with seaboard thermometers, and now having the very sophisticated weather thermometers that we have, that data shows that the planet's warmer now. It's warmer by about a half to one degree Fahrenheit, compared to the middle of the last century. And, naturally, as weather and climate do, that warming has been up and down and up and down, but steadily upward over that long period.

Associated with that is an increase in sea level of about four inches to 10 inches, so there is a consistent picture. Associated with that warming is a retreat of mountain glaciers -- very obvious -- three aspects of the fact that we now live in a warmer world.

The key question is not whether we have a warmer world right now or not; the key is what caused the change. That half to one degree is about the size of what the natural changes have been since the last ice age. And so scientists have had the challenging job of looking for a half a degree needle inside of a half a degree haystack.

In this most recent statement by the World Science Community, they believe now that they see reasons that not all of that change has been natural, and they make that by looking at the pattern of the change compared to the pattern that you would expect from natural behavior or from CO₂ behavior. So the world is warmer.

We believe, at least in part, it's due to our having added greenhouse gases to the planet.

Fifth point -- and this states more about our level of knowledge -- fifth point is that it's a very complex planet and we do have imperfect knowledge of some of the details. That implies that we can't predict what the climate change will be in a given city or a given state or what the climate will be or a particular summer will be in any particular place.

The understanding of the smaller details of the climate system and the size of computers and our lack of observations in many areas means that our predictions are at the current time either globally or regionally. Now, regionally, though, can be important. For example, scientists are saying that large land masses will warm and dry out faster than smaller land masses or the oceans. And, obviously, that has implications to countries involved in large continents.

Secondly, higher latitudes will warm more than lower latitudes. This has implications for effects and things about farming and where that might shift. It's also fairly clear that the warming will occur largely at night. And this increase in that regime has to do a lot with impacts on animal populations and crops.

The question frequently comes up, what can you say about extremes? Extremes are probably the more difficult things for scientists to predict, but they can say some things. And it's this: that in a warmer world, there's more evaporation; more water in the atmosphere; more variable, in a sense, more tropical, and hence the hydrological cycle -- storms, clouds and so on -- will be a much more active system. It's summer in Washington compared to other times in Washington. This means that the rainfalls are likely in warmer world to be heavier rainfalls. There would be more frequency of hot, dry periods.

The question comes up frequently about hurricanes. The jury is still out scientifically. It's not clear whether hurricanes will be more intense or more frequent in a warmer world -- a very difficult call.

Finally, what about surprises? Scientists answer, yes, to that. We're entering a warmer regime of climate than we've had experience for. And as nature is inclined to do, it's going to reveal a process to us that we probably don't know now. And so, the probability of either rude or happy surprises in the century ahead are very high. And you only have to remember that we didn't predict the Antarctic ozone hole. It was a regime of chlorine in the atmosphere that we had never experienced. It triggered a process that we didn't know as scientists and we were rudely surprised by that. The climate system has such non-linearities for sure. And there will be surprises, both rude and happy surprises.

In summary, from an understanding of how well scientists

understand the climate system and our role in it, there are five points that I've tried to make. Number one -- this is a real issue; it's worth your time in explaining it, the government's time in debating it, industry's time in engaging -- it's a real issue. Secondly, some degree of human-influenced climate change now appears to be inevitable. Third, discernible signs that we are changing the climate are at hand at present. However, exactly what will happen in particular places at particular times will remain difficult to predict. And the fifth point, and probably one of the more important scientific points, is that any human-induced climate change that were to occur would be very, very long and slow in reversing it because of the lifetimes.

Let me quickly add -- and this will underscore what Jerry can summarize for you, too -- this is not the view of one scientist, this is the view of thousands of scientists who were asked to give their current statement of scientific understanding. I believe that those statements made by the entire scientific community are of high value to decision-makers in government and industry and those who acquaint the public with such complex things.

Number one, it's prepared by the expert communities. It is their vast, vast majority viewpoint, and it represents, since it goes from forcings to changes to impacts to options, it represents one-stop shopping on a complex, complex issue. Because of the large impacts associated with climate change, because of large impacts of doing anything to avoid it, a key element, we think, in this process is what we're doing here today, both at the White House and here, and that's dialogue. And that's why both Jerry and I really do appreciate the opportunity to lay out the scientists' viewpoint for these, and there is plenty of time afterwards; if I've hurried through any of these points, please do bring them up again. Thanks.

MR. MELILLO: Good afternoon. I'm going to try to be very brief so that we can get to questions. As Dan outlined, more than 2,500 scientists have come together to produce the Intergovernmental Panel on Climate Change Report that includes one large component on impacts.

The impacts range across issues of human health, water resources, agriculture and food supply, coastal zone integrity and management, forests and forestry, fisheries and natural areas. And we don't want to minimize the importance of natural areas, because they provide a whole suite of services to us that are absolutely critical for society's maintenance.

Now, very briefly, I want to indicate and underline some of the things that Katie said. The human health issue has been one that has been tremendously interesting to all of us. The prospect of climate change brings with it the prospect of a shift in the distribution of vector-borne diseases, such as malaria. There are model estimates that would suggest that with a doubling of CO₂ and the associated change in climate, we might see in the range of 50 million to 80 million more cases of malaria in a year.

With respect to water resources, water is a critical asset for all nations of the world, and -- disputed one in many regions. General circulation models would suggest significant changes in water availability and soil moisture in particular, which is essential for growing crops, and one model, the general fluid dynamics model at Princeton, would suggest that at four times current levels -- or pre-industrial levels of CO₂, the soil moisture levels in the heartland of the United States could drop by as much as 30 to 50 percent, which would make agriculture in that area very difficult.

For natural systems, there will be many surprises, I'm sure. One of the concerns that ecologists have is that as climate zones shift, so, too, will vegetation distribution shift. However, it will not shift in an orderly fashion. Species will move at varying rates, and there could be long periods of reorganization in the world's vegetation. That could be very difficult for us to deal with and affect adversely some of those services that we count on natural ecosystems providing us, such as the cleansing of water, the stabilizing of landscapes against erosion, and the stabilizing of coastal zones against storm surges.

So I think there are an array of impacts that we can talk about, but as Dan mentioned, there's probably going to be a tremendous amount of regional and temporal texture in the degree of those impacts.

To begin to understand the regional consequences of climate change and to give some vision to what kinds of regional changes we might expect, the administration through the Office of Science and Technology Policy and the U.S. Global Change Research Program, has begun a series of 17 regional workshops on the climate change issue. And in these workshops we attempt to do four things. The first thing that we do is try to get an understanding outside of the climate change issue, either climate variability or climate change, what the current stresses are that regions are facing for their environment, their economics and their social structure.

The second question is, how would climate variability, if it were to increase, or climate change if it were directional, either amplify or dampen these current stresses. The third question is, what kind of information, in addition to the information that the people in these regions already have, what kind of additional information would they need to begin to think more clearly about the climate change issue. And that helps us to set a research agenda, by the way. And finally, what kinds of coping strategies could they think of that would be useful to deal with their current stresses and also have a positive effect on ameliorating the climate change issue.

And I must say we've had four of these 17 workshops, and each one of them has been truly fascinating, with some surprising stresses surfacing to the top of the various lists. For example, in

Alaska, one of the greatest concerns is the melting of permafrost with global warming. This has tremendous implications for infrastructure in the state of Alaska. Approximately -- I think it's about 80 percent of the state of Alaska -- is under land by frozen soil. As this soil melts out, you can imagine what it does to building structures and the roads and airports. And we've been told that already, the permafrost in Alaska is warming; in some places in Central Alaska it's actually melting out. This could result in a slumping in those areas of anywhere between five and 10 meters, and present an array of problems, such as difficulty keeping rural airports functioning -- which is the link to civilization for many of these isolated places -- and tremendous difficulty in keeping roads flat so that you can move around this state.

I could go on with examples, but I think I'm going to stop and open it to questions.

Q You want the public to realize that there is a problem. What can the public do? Does the administration want the public to do things such as stop cutting their lawn with a combustion engine, stop barbecuing, eliminate the combustion engine? What do you want people to do?

MS. MCGINTY: Part of this dialogue will be to identify what the best solutions are. But in our mind, it won't involve the kinds of things you've just suggested, it will involve things like energy efficiency. Currently, if you think of energy, for every three units of energy we produce, we basically throw out two of them just through wasteful practices. That's money we're throwing out. It's also the leading contributor to this challenge.

So the idea is, what are the technologies we can employ that will reduce the pollution, and in that instance especially, save us money, improve our efficiency. Those are the kinds of things we know are out there that we want to identify and through this effort put into place.

Q You must have some examples. Can you give us any besides turning our thermostat down?

MS. MCGINTY: Sure. All of this week we have had the leading vice presidents for research of the three automobile companies in Washington. We have launched with them what we call a Partnership for a New Generation of Vehicles. Through this partnership, by the early years of the next century, we will produce a vehicle that achieves 300 percent the fuel efficiency of current vehicles -- 80 miles to the gallon. And we are on our way through that partnership with the Big Three to produce that kind of vehicle.

Q Have you come any closer to setting macro-goals for emissions of greenhouse gases? Because the U.S. has already rejected the European proposal to stabilize at 1990 levels. Where are we moving in terms of that?

MS. MCGINTY: We have outlined the framework for what the next steps on climate should look like. One, the United States has said the current voluntary approach hasn't fully worked. The world community needs to come together around binding emissions limits. We have put that forward.

The United States has also put forward the notion that, again, there are smart ways to do this and dumb ways. The smart way is that we use flexible approaches, we harness market forces, we use market mechanisms to achieve those emissions reductions.

Third, that all countries in the world, not just the developed countries -- and clearly, we in the United States have a responsibility here as do other industrial countries -- but developed and developing countries have to be part of the solution.

Now, what we have not put forward as yet is the exact -- what's called target and timetable -- emissions level and year for achieving that emissions level. We have not yet put forward those numbers in the international arena. This process is designed to enable us to do that by the mid, late fall when these negotiations internationally will reach that point and have to come to terms with that issue.

Q You described -- these two gentlemen described part of their presentation as a forecast of the bad things that would happen. Can you explain to us or can they explain to us how hypothetical this situation is or how concrete it is? And a second part to the question, you presented a very good sort of sky is falling scenario; it would seem that there would have to be some positive aspects of global climate change and I know that some countries think that their agriculture might work out better with climate change. Can you address any of those issues?

MS. MCGINTY: Dan, do you want to take that on?

MR. ALBRITTON: As I've mentioned, representing how the planet will respond is a very challenging scientific job. What the scientists have tried to do is evaluate the effect of their ignorance. The 3.5 degree warming for a doubling of CO₂, which could occur some time in the next century, is in the middle of an uncertainty range which could be as high as six degrees warming, could be as low as 2 degrees warming. And so, with high confidence, the current scientific community is saying that for a doubling of CO₂, which could occur sometime in the next century, the planet will warm somewhere between two degrees Fahrenheit and six degrees Fahrenheit.

They got those two ranges by pushing all of their known ignorance in one direction and pushing all of their known ignorance in the other direction. They are very confident that the planet will respond in that range for a doubling of CO₂.

In terms of the pluses and minuses of that, Jerry can expand upon those points.

MR. MELILLO: When I talked about the fact that there would be texture or place to place variation in response, that was part of what I was alluding to. Indeed, let's take the example of agriculture. The analyses would suggest that indeed, globally, there may be some winners and there may be some losers. As it turns out, the winners are most likely to be in the developed countries, and that is also the place, of course, where there is capital available to be able to respond and to adapt to changes in climate.

Those places where the climate currently is semi-arid, the agriculture is largely dry-land agriculture without the benefit of any kind of irrigation, and those places that are subject to periodic droughts -- and there is a large portion of the tropics that would fall into this category -- might well be the places where there would be real losses in agricultural productivity.

In fact, when the modelers do their analyses, the predictions about agricultural productivity changes under a two-times CO2 world -- that's both the climate and the fact that the carbon dioxide concentration of the atmosphere has doubled -- would be plus or minus 40 percent, depending upon where you were on the face of the Earth and what your conditions were.

A lot of the minus numbers fall into the tropics where, over the next 100 years, we expect at least a doubling of population. So indeed, there are winners and losers. To predict exactly where they'll be, as Dan pointed out, is currently beyond us, but what we can do is paint a picture of vulnerabilities, and this is clearly a vulnerability.

Q President Clinton made political points against George Bush because Bush denied global warming. And yet, this is the second term of President Clinton and there is no national theme for fuel conservation, miles per gallon and other things we could be doing. Why is that? Why is it only now?

MS. MCGINTY: We have been at this job since the beginning of the President's first term. The President reversed the policy of the previous administration and signed up to trying to achieve 1990 levels of emissions by the year 2000. We put together a very ambitious program of investments in energy efficiency and renewable energy technologies. We will fall short of that goal not because the President did not articulate it and not because we did not put together a thorough program of action, but because, for example, the Congress has cut by -- on the order of 50 percent the nation's investments in energy efficiency and renewable energy technology.

I just mentioned this Partnership for a New Generation of Vehicles. We've also been at that work for about two years or maybe even a little bit more. We have been moving forward on this agenda consistently since 1993.

Now, there are certain things, however, that now catalyze this work. First is, as Dr. Albritton noted, the science itself has gelled in a significant respect in just the last year and a half or so as the scientists, for the first time, have determined that there is -- to quote them -- "a discernable human impact" on the climate. That's only in the last year or year and a half that that determination has been made, and that has quickened the discussion.

Second, we do now face an international negotiation which will culminate at the end of this year, in December in Kyoto, Japan, 150-plus countries, nations in the world will come together to conclude a treaty on this issue. So we've been at it, but there are certainly things that have quickened the discussion in the last year, year and a half.

Q Is Senator Byrd's resolution consistent with your negotiating position in these talks?

MS. MCGINTY: Well, certainly, the notion that developing countries need to be part of the solution is something that we absolutely agree with. In fact, as I articulated, this has been an essential part of the U.S. position in these negotiations internationally. We are not supported on this point by, for example, many in the European Union and certainly not by many in the developing countries themselves -- the point being that as developed countries take the lead here, as we must, we need developing countries also to pick up the baton and help become part of the solution to this problem.

So we absolutely agree with the resolution in that respect.

Q Can you tell us what you're talking about when you say -- you refer to those who have their heads in the sand -- are you talking about members of Congress, people in industry, other scientists? Who are you talking about?

MS. MCGINTY: The point was that we can't -- it was a general point that the evidence is such that we take a very high risk if we decide to put our hands in the sand on this issue. Now, having said that, on this issue, like any other serious issue, there are the extremes. There are those who will say that this is nonsense, that we should do nothing, that we should let the dice roll here, it's okay that we currently have levels of greenhouse gases in the atmosphere that are higher than any we've seen in the last 200,000 years. What's the big deal? Let's roll the dice, let's see what happens. There are some who will say that.

There are some that will say the sky is falling or the

sea level is rising and we have to all run for the hills, and let's take drastic action, 15 percent cuts by tomorrow in our emissions. That would drastically hurt our economy.

The President is saying this is a serious issue; it's an issue on which we will not stick our head in the sand, but it is an issue on which we will take responsible action and action that can very well provide us economic opportunity if we do it right.

Yes, sir.

Q If I can take advantage of you being here to ask a quick question on Saturday's environment summit. Is the President going to go to Tahoe with the commitment that's been requested by the Governors of Nevada and California for the \$300 million? And, secondly, is he going to have an answer for them on the low-intensity burn?

MS. MCGINTY: The President will -- and I don't want to -- I mean, these announcements are for him to make -- however, we have participated in and organized in the region a series of intensive discussions with local and state leaders to say Lake Tahoe is a priceless national jewel; what are the threats to it and what needs to be done to help it. Whether it's water quality, transportation or forest health issues, very real ideas came out of that dialogue. The President will have very real and concrete measures he will announce and to which the federal government will contribute when he is out there.

Q But if I can follow, Governor Miller and Governor Wilson this week said that they didn't want the President coming out there empty-handed, is the word that Governor Wilson used.

MS. MCGINTY: And he will not.

Q He will have some commitment on --

MS. MCGINTY: I will not announce what they are, but let me just say again, we have heard some very real and concrete suggestions as to what we need to do around Lake Tahoe, and the President will have some very real and concrete initiatives that the federal government will undertake to be a positive partner with others in the region in saving and restoring Lake Tahoe.

Q Related to that, Babbitt has endorsed the low-intensity burn in previous conferences earlier in July. Can you give any assurances that that will work and that it will be safe to the residents there?

MS. MCGINTY: Let me just say our forest policy will be dictated by the best science. What the science has told us is that in some respects, the Smokey Bear campaign has been overly successful, and the consequence of stamping out every fire, including naturally-occurring fires has been that we now have a tinderbox in

many places of the country.

About a year ago, in the face of that, we made what might be considered a bold determination, but a determination driven by the science that we would increase the use of what's called prescribed burns to begin to thin out some of that tinderbox kindling that has built up over the decades. That will certainly be part of our approach to enhancing and trying to improve forest health in the Lake Tahoe region. The degree of it, the intensity of it will be driven by the science.

Q Does't that clash in any way with your endorsement of this Quincy Library Group plan to take trees out before you burn?

MS. MCGINTY: Not at all, and to say that there will be use of some prescribed burn is not to preclude the possibility that there also will be thinning of some trees, taking them out before you do the prescribed burn. You can, and should, do both.

Q What would the administration like to see coming out of Kyoto related to the developing countries? What kind of language should be in that agreement?

MS. MCGINTY: We very much want to see an agreement that shows real participation on the part of developing countries in becoming part of the solution to this challenge. We have suggested ideas along the following lines: It's our position that a new category of countries should be created under the treaty, that instead of just developed and developing countries, maybe we should recognize that Bangladesh, for example, is in a very different place and situation than Singapore is, for example, and that maybe there should be a third category of countries recognizing the economic development that has occurred in some developing countries.

Related to that, that those countries would take on binding obligations probably not equivalent to the obligations of developed countries, but more than the obligations of developing countries.

Also related to that, that we would think about an automatic graduation process, so that as a country reaches a certain level of economic growth and development, they automatically would flip into the developed country category and take on legally binding obligations.

Q Do you envision specific targets and timetables for that category -- countries at that point?

MS. MCGINTY: For that third category of countries, at that point, yes, absolutely, right.

Q Do you think it's feasible to do a cost benefit analysis -- domestically, the United States -- of putting in limits on carbon or fossil fuel emissions? And will you attempt to do that

before setting the targets for the December treaty?

MS. MCGINTY: Well, certainly what we will do and will be essential in figuring out the best approach to this is to do a cost-benefit analysis, if you will, of the various policy approaches we might take. So, for example, if there is a suggestion that comes out of these dialogues that says, one-third of our emissions are due to inefficient buildings. And if we would just invest in X, Y or Z-building technology, we can improve the situation. We will have to do a cost-benefit analysis of how much we want to invest, and if we invest, what's the benefit? Emissions reductions. How close does it get us to meeting an overall objective? We will do that we might pursue a policy initiative.

Q But will you have to analyze the cost of global warming to the U.S. economy or to some other standards here in the United States?

MS. MCGINTY: Whether we'll do it independently or just look at the plethora of literature and scientific information, economic information that is out there -- there are many different people around the country that have models that are analyzing those kinds of things. And I very much expect we will engage some of those folks in looking at that, yes.

Q Could I ask about a scientists comment on the question of the temperature change since the last Ice Age? You mentioned in the last 100 years or so, there had been a one or half degree increase, which is equal to what had changed since the last Ice Age. What was the change then in that period, that previous period since the last Ice Age, as far as you know? Up or down or around or what?

MR. ALBRITTON: The temperature record that we have going back, say, 15,000 years, back to the last Ice Age times is based on, first of all, tree rings -- other proxy indicators, but they are accurate to show that over that period the Earth, itself, has changed its temperature over long, slow undulations of about one-half to one degree. And so, in looking backwards on what the size of natural variation can be, we can confidently say, it's in the range of part of a degree Fahrenheit, up to a degree Fahrenheit.

Now, since the industrial period, we have very carefully, of course, measured the temperature change. And since the preindustrial times, that one degree warming can be stated also with high confidence.

The third thing I mentioned was, of course, a forecast that when CO₂ doubles, what will be the added temperature from that is the 3.5 degrees Fahrenheit. So there's the scale factor. The planet changes its own temperature on the range of a half a degree to a degree or so. A change of that size we have seen in the last 150

years. We believe part of that is due to greenhouse gases.

Q The original change from the Ice Age to the last century, you don't know whether that was up or down, or does it just sort of vary --

MR. ALBRITTON: It varies. For example, about 600 years ago, the so-called "Little Ice Age," that's when grapes and wine-producing in England ended and the Greenland colonies stopped for the Nordics -- it was a half to three-quarter of a degree below the average. So the natural range the planet swings its own temperature is plus or minus a degree.

Q Twice, you mentioned during your discussions that you were looking for binding agreements. How would you enforce binding agreements, and how realistic are they considering we can't control nuclear weapons, we can't control drugs -- how are we going to enforce any binding agreement?

MS. MCGINTY: Just take the example of other environmental treaties we've had. The Montreal Protocol on the chemicals that deplete the ozone layer, chlorofluorocarbons -- how you make that binding is when countries sign up to it, as the United States signed up to the Montreal Protocol. You come back home and you go to your respective legislature, parliament or diet, and you proscribe legislation that is legally binding and that will enable you to meet that target. So that in the United States, we came back and, under the Clean Air Act, then implemented a set of requirements that basically phased out and ended the production and use of

chlorofluorocarbons in the country. And you would have to do a similar thing here. You would have to come back and whatever the goal was that was agreed to, come back and implement legislation of one kind or another that would get you there.

Q I don't mean to argue, but a lot of countries in the world don't have legislative processes. There are dictatorships or whatever form of government. And we also do have a problem of the smuggling of CFCs right now, even though that's supposed to be a legally-binding treaty.

MS. MCGINTY: No, I absolutely agree. In every kind of international exercise that you undertake there is always the problem of ensuring that you will have 100 percent compliance. It's always a difficult challenge. We have no reason to expect that this will be any less of a challenge to ensure 100 percent cooperation and compliance. Having said that, though, we do know what the mechanisms are that you put in place, and the President's commitment will be that this country, giving its word, will live up to its word.

Okay, thank you all very much.

END

1:28 P.M. EDT

Climate Change: Basic Background

"The science is clear and compelling. We humans are changing the global climate. Concentrations of greenhouse gases in the atmosphere are at their highest levels in more than 200,000 years, and climbing sharply....Here in the United States, we must do better....In order to reduce greenhouse gases and grow the economy, we must invest more in the technologies of the future. I am directing my Cabinet to work to develop them. Government, universities, business and labor must work together....[I]n order to do our part, we have to first convince the American people and the Congress that the climate change problem is real and imminent."

-- President Bill Clinton
United Nations, June 26, 1997

Why is Climate Change on the Agenda Now?

In less than five months, the world's nations will convene in Kyoto, Japan to set binding greenhouse gas emission limits for developed nations. This meeting, called the Third Conference of the Parties, will follow critical negotiating sessions to be held in Bonn, Germany over the next several months.

The Kyoto Conference is the culmination of a process that began in 1992 at the United Nations Conference on Environment and Development in Rio de Janeiro (the "Rio Summit"). The Rio Summit produced the Framework Convention on Climate Change (the "Framework" or "FCCC"), to which 165 nations are presently parties.

Under the Rio Framework, developed nations agreed to a *non-binding* goal of lowering their emission of greenhouse gases to 1990 levels by the year 2000. Nearly every developed nation, including the U.S., will fail to achieve this goal.

In 1995, the parties to the Rio Framework met in Germany (the "First Conference of the Parties") and negotiated the Berlin Mandate. Under the Mandate, the parties agreed (i) that they would continue to pursue the Rio Framework's goals, (ii) that the developed nations should negotiate a "follow-on" agreement, which would cover the post-2000 period, and (iii) that there would be no new commitments for developing nations, though developing nations would be required to advance implementation of commitments they made in Rio.

In 1996, the parties met again at Geneva, Switzerland (the "Second Conference of the Parties"). There, the United States called for a binding agreement on greenhouse gas emissions in the post-2000 period. The Administration now intends to conclude such an agreement in December in Kyoto.

The Science is Compelling.

Greenhouse gases. Scientists have long understood that greenhouse gases in nature (principally water vapor, carbon dioxide, methane and nitrous oxides) keep the Earth's temperature an estimated 60 degrees Fahrenheit warmer than it would be absent such gases, thus sustaining our existence on the planet.

As a result of human activities, the concentration of greenhouse gases have increased markedly since the Industrial Revolution. The concentration of CO₂ -- which accounts for about 85% of all greenhouse gases -- has increased 30% since preindustrial times from 280 to 360 parts per million. Current projections indicate that, unless action is taken, atmospheric concentrations of CO₂ will dramatically increase in the next century to over 700 ppm -- which would be the highest level of CO₂ in 50 million years.

Scientific consensus. There is no serious scientific debate about the proposition that (1) greenhouse gases are rapidly building up in the atmosphere; (2) that these increased

concentrations will change our climate; and (3) that these changes may have serious adverse and disruptive consequences. Even those who would question whether climate change is *already* occurring recognize the truth of this fundamental proposition. During the next century, if we continue on a business-as-usual trajectory, climate models project an increase in global temperature of about 2-6.5° F -- a rate of warming faster than at any time in the last 10,000 years. By way of reference, a cooling in average temperatures of just 9° F brought on the last ice age.

In addition, the scientific evidence is clear and compelling that human activity -- notably increasing use of fossil fuels -- has in fact started to change the global climate. The UN-sponsored Intergovernmental Panel on Climate Change (the "IPCC"), concluded in 1995 that "the balance of evidence suggests that there is discernible human influence on climate change." Some 2600 of the world's leading scientists have publicly endorsed the IPCC's findings, saying that "[h]uman-induced global climate change is under way." The scientists observed that "further accumulation of greenhouse gases commits the Earth irreversibly to further global climatic change and consequent ecological, economic and social disruption." Among the evidence consistent with the view that climate change is already occurring:

- Average global temperature has increased by almost 1.0° F in the past century;
- The ten warmest years of the century have occurred since 1980, and 1995 was the warmest year on record;
- The 1980s were the warmest decade on record;
- Sea level has risen 4-10 inches in the past century.
- U.S. rainfall has increased 6% over the last century, an amount of water equal to half the yearly flow the Mississippi river;
- At the same time, increased evaporation has caused some areas, such as the Great Plains, California, Texas and Maine, to get drier.
- Mountain glaciers are melting worldwide. For example, Glacier National Park has lost 70% of its glacial area in the last 100 years.

The impact of a business-as-usual increase in greenhouse gas concentrations. The impacts could be very serious as CO₂ concentrations reach and exceed two times preindustrial levels:

- **Human Health:** Warmer temperatures are projected to increase fatalities from heat stress of the kind that killed 400 in Chicago in 1995 and expand the geographic ranges for diseases like malaria and dengue fever. Fifty to eighty million more cases of malaria alone are projected worldwide.
- **Extreme weather:** The change in the planet's water cycle is projected to lead to increased frequency and intensity of extreme weather events such as floods and drought.
- **Sea Level Rise:** Sea level is projected to increase by an additional 6-38 inches by 2100. Scientists' "best guess" estimate of a 20-inch rise would inundate 9,000 square miles of the United States, with Florida and the Gulf Coasts most at risk.

- **Agricultural Impacts:** Changes in growing seasons, water availability, soil moisture and precipitation could cause significant regional shifts in food productivity, with decreases in food production in many of the world's poorest regions.
- **Natural ecosystems will be degraded:** For example, during the next century the geographical range of forests is expected to move several hundred miles north exceeding the ability of many forests to migrate. The northeast may lose its beech trees and sugar maples. Western conifer forests will likely shrink.

Some Key Facts About Emissions.

- Climate change is a global issue, requiring a global response. While developed countries have contributed 75 percent of total greenhouse gas emissions since the beginning of the Industrial Revolution, by 2035, emissions from developing countries are expected to exceed those from developed countries.
- The United States, with only 4% of the world's population, is responsible for more than 20% of global emissions. U.S. per capita emissions are roughly 50% greater than the OECD average and eight times that of China.
- CO₂ emissions account for about 85% of all US greenhouse gas emissions, and fossil fuel combustion makes up 99% of U.S. CO₂ emissions.
- 1995 CO₂ emissions in the United States were divided equally among the three major end uses: buildings (35%), industry (34%), and transportation (31%).
- Current carbon emissions in the United States by fuel type are: petroleum (42%), natural gas (23%), and coal (35%)

Climate Change Can Be Addressed Without Hurting the Economy

The President's remarks to the Business Roundtable: "I have devoted my passion and the best ideas I could come up with to try to get this country in good shape economically and socially. But I do believe it is folly for us to believe that we can go into the next century without a strategy that says we're going to be responsible and we're going to do our part and lead the world on environmental issues . . . Let'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."

The economists agree. More than 2400 economists, including eight Nobel laureates, have publicly declared that, if implemented properly, emission reductions "would slow climate change without harming American living standards, and these measures may in fact improve U.S.

productivity in the longer run.”

Our international policies. The United States has proposed a three-part framework for achieving a stronger, more cost-effective and comprehensive treaty:

- **Binding Emission Targets.** To help guarantee the effectiveness of global efforts to reduce greenhouse gas emissions, the U.S. will promote binding targets for developed nations to reduce their emissions. Almost all developed nations, including the United States, will fall well short of the non-binding goals in the 1992 Rio Convention.
- **Flexibility.** To ensure that emission reductions are pursued in the most cost-effective manner, the Administration supports proposals for maximum flexibility, such as allowing the trading of emission permits among developed nations and allowing so-called “joint implementation,” under which developed and developing countries work together on specific energy projects to reduce emissions. These measures can provide strong incentives to achieve the greatest possible reductions at the lowest possible cost.
- **Participation of Developing Countries.** Climate change is a global problem that requires all nations to commit to appropriate action. While it is proper for industrialized nations to take the first steps, the developing countries -- whose emissions are projected to catch up with those of the developed world by 2035 -- must be part of the solution. The U.S. proposal calls on developing countries to advance their existing commitments under the 1992 Convention; and to agree to a subsequent negotiation in which, by 2005, they will accept binding targets and agree on a mechanism allowing “graduation” from developing country status to developed country status.

Our domestic policies. The President has not yet endorsed any emissions target or timetable, and specific policies to implement a target and timetable are still being developed. But the Administration’s policy work is guided by certain broad principles.

- President Clinton is committed to responsible, balanced action to confront the threat of climate change. The Administration rejects both extremes of the climate change debate: those who want to take drastic actions that would severely disrupt our economy and those who dismiss the scientific evidence and say we need not act.
- President Clinton will only take actions that preserve our vigorous economic growth. The Administration believes -- and has demonstrated -- that environmental protection and economic growth can and should go hand in hand.
- The Clinton Administration will emphasize solutions based on flexible, market-based policies, not government regulation. These programs include emissions

trading within the United States.

- The Clinton Administration will invest in research and development to promote technologies that reduce the emissions that cause climate change, save energy, and reduce our dependence on foreign oil. We will work to help American industry increase its role as the world leader in developing environmental technology.

The Administration Has a Strong Record to Build Upon.

Over the last four and a half years, the Administration has built a strong climate change record.

The Climate Change Action Plan (CCAP). CCAP began in 1993 with a goal of returning total U.S. greenhouse gas emissions to their 1990 levels by the year 2000. Although the CCAP will fall well short of this goal, CCAP programs will result in emissions reductions of about 76 million metric tons of carbon-equivalent by the year 2000.

The plan includes some 50 initiatives covering major sectors of the U.S. economy. It addresses energy demand, energy supply, and forestry. Agency participants include DOE, EPA, and USDA. The CCAP includes measures to reduce all significant greenhouse gases in all sectors of the economy. It is a voluntary program that relies on partnerships and cooperation between the public and private sectors in developing new low-emissions, high-efficiency technologies.

Because of lower-than-expected fuel prices and higher-than expected economic growth and electricity demand, overall emissions growth has outstripped the emissions reductions achieved by CCAP. Additionally, Congress has made significant reductions (about 40% in recent years) in CCAP's funding, thus preventing full implementation of some of CCAP's initiatives.

Federal energy consumption. The Energy Policy Act of 1992 and Executive Order 12902 challenge Federal building managers to reduce energy consumption by 20% per square foot by 2000, and 30% by 2005, relative to a 1985 baseline. With declining Federal resources available, the Federal Energy Management Program is emphasizing the use of private-sector investment through energy-saving performance contracting and utility financing of energy efficiency to meet these goals. The combination of Federal funding and anticipated private sector funding of up to \$4.3 billion through 2005 should make these goals attainable.

Partnership for a New Generation Vehicle (PNGV). Although the fuel economy of cars has nearly doubled in the last 25 years, Americans travel more than twice as many miles today as we did in 1970, with a net result of increased fuel consumption and increased greenhouse gas emissions from personal vehicles. While technology has reduced many of the emissions from automobiles, CO₂ emissions are the exception.

The PNGV program joins the big three U.S. automakers, Federal agencies and many suppliers of materials and equipment in an effort to develop a more efficient automobile. The program's goal

is to triple the fuel efficiency of passenger cars with no decrease in comfort or safety.

Partnership for Advancing Technologies in Housing (PATH). Energy use in buildings is responsible for about a third of U.S. greenhouse gas emissions, and rising. Major improvements can be made in the quality of housing, while reducing energy use by 50% or more and lowering costs. The PATH initiative will bring together building suppliers, assemblers, insurance companies, and state and local regulators to explore and demonstrate how innovation in construction markets can achieve environmental goals with an affordable, attractive product. Discussions are underway with jurisdictions in Colorado, Florida and California. HUD, DOE, and NIST are playing major roles.

Biomass Energy Initiative. The biomass energy initiative involves converting agricultural crops to liquid and gaseous fuels. The Departments of Energy and Agriculture are now working with private companies to improve technologies and to demonstrate the potential for such power projects to aid rural development. The initiative has sponsored pilot projects in New York, Minnesota and Iowa.

Million Solar Roofs Initiative. DOE will lead an effort to place one million solar energy systems on U.S. roofs by the year 2010, by using existing Federal grants, procurement, and other programs, and by working with local communities, businesses, governments, and utilities to increase sales of solar energy systems. By 2010, this initiative could avert carbon dioxide emissions equivalent to those of 850,000 cars and will produce the same electrical generating capacity as several coal-fired power plants.

The President's Committee of Advisors on Science and Technology (PCAST). The President directed PCAST to conduct a review of national energy R&D policies, which would assess their adequacy and "ensure the United States has a program that addresses its energy and environmental needs for the next century." PCAST will present its recommendations on publicly-supported R&D, incentives for private energy R&D, and commitments to international energy R&D, by October 1, 1997.

Regional Climate Change Workshops. The White House Office of Science and Technology Policy and the U.S. Global Change Research Program are sponsoring a series of workshops to examine the vulnerabilities of various regions of the United States to climate variability and climate change and to gather information across regions to support national scientific assessment (called for in the Global Change Research Act of 1990). Eighteen workshops with the full involvement of relevant stakeholders are being held in different regions of the country.

Climate Change Message

Climate change is a serious problem for us, our children and our grandchildren. The President is committed to taking responsible action to confront the threat that climate change poses. The United States will support international agreements that set realistic goals and that require participation by all countries -- industrial and developing. At home, we support flexible, market-based reforms based on the principle that vigorous economic growth and protection of the earth must go hand in hand. It is up to us not only to prepare our children for the world of the 21st century, but to protect that world for our children.

Climate Change Talking Points

The Need for Action

- There is now scientific consensus that (1) greenhouse gases are rapidly building up in the atmosphere; (2) that these increased concentrations will change our climate; and (3) that these changes may have serious adverse and disruptive consequences. Even those who would question whether climate change is *already* occurring recognize the truth of this fundamental proposition.
- In addition, the scientific evidence is clear and compelling that human activity -- notably increasing use of fossil fuels -- has in fact started to change the global climate. More than 2,600 of the world's leading scientists have said that "human-induced global climate change is underway" and that continued increases in emissions of carbon dioxide and other greenhouse gases "commits the earth irreversibly to further global climatic change and consequent ecological, economic and social disruption."
- Scientists agree that global warming and disruptions in the world's climate could seriously harm human health -- projections include an additional 50 million cases of malaria per year; increase the incidence and intensity of devastating floods and droughts; raise sea levels enough to inundate 9000 square miles along the U.S. coastline; decrease food production in some of the world's poorest nations; and threaten the survival of many plant and animal species.
- In December, more than 160 nations, including the United States, will meet in Kyoto in an effort to complete negotiations on a new international climate change agreement.

International Agreements -- Background and Principles

Background

- The new climate change convention will replace a 1992 agreement adopted at the Earth Summit in Rio. That agreement included *non-binding* commitments to reduce greenhouse gas emissions.
- The industrialized nations, including the United States, agree that the new convention should require them to set and reach *binding* commitments and timetables for reductions in greenhouse gas emissions.
- Members of the European Union and other industrialized countries have proposed that by the year 2010, developed nations agree to reduce their greenhouse gas emissions to a level 15 percent below 1990. The United States believes that target is unrealistic but we have not yet proposed our own target or timetable.

Principles

- The Clinton Administration is committed to rapid action to reach an agreement that is balanced, strong and cost-effective in time for the December meeting in Kyoto, Japan.
- The United States will only support an agreement that requires all nations to participate in a common solution to the global problem of climate change. Like other industrialized nations, we realize that our responsibility for large proportions of current emissions requires us to agree in Kyoto on binding targets for reductions. But any agreement must also require developing nations to commit to appropriate action. [Note: By the year 2035, scientists estimate that emissions from developing countries will exceed those of developed nations.]
- The Clinton Administration is committed to reaching an agreement that establishes realistic targets and timetables for reduced emissions. The United States will only make commitments that the President believes our nation can reach without slowing economic growth or damaging the economy.
- The United States believes that an agreement should be based on flexible, cost-effective methods to reduce emissions of greenhouse gases. Specifically, the United States proposal calls for “emissions trading” among industrialized nations and so-called “joint implementation,” which will allow developed and developing countries to work together to reduce emissions on specific energy projects. These measures will provide strong incentives to achieve the greatest possible emission reductions at the lowest possible cost.

Domestic Policy -- Background and Principles

Background

- The United States has 4 percent of the world's population and is currently responsible for more than 20 percent of the world's carbon dioxide emissions. Emissions produced by buildings, industry and transportation each account for roughly one-third of that total. Despite efforts to reduce emissions through federal programs and voluntary partnerships, U.S. emissions of carbon dioxide and other greenhouse gases substantially exceed 1990 levels. (We are not alone; almost all industrialized nations will fail to meet the non-binding pledge in the Rio agreement to reduce emissions to 1990 levels by the year 2000.)
- Current Clinton Administration programs to reduce emissions of greenhouse gases include a partnership with Detroit to triple fuel efficiency of passenger cars; pilot projects to help farmers and industry convert crops to liquid and gaseous fuels; and a Department of Energy program to add one million solar energy systems to buildings by the year 2010.

Principles

- President Clinton is committed to responsible, balanced action to confront the threat of climate change. The Administration rejects both extremes of the climate change debate: those who want to take drastic actions that would severely disrupt our economy and those who dismiss the scientific evidence and say we need not act.
- President Clinton will only take actions that preserve our vigorous economic growth. The Administration believes -- and has demonstrated -- that environmental protection and economic growth can and should go hand in hand. More than 2000 economists, including eight Nobel Laureates, have 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 Clinton Administration will emphasize solutions based on flexible, market-based policies, not government regulation. These programs include emissions trading within the United States.
- The Clinton Administration will invest in research and development to promote technologies that reduce the emissions that cause climate change, save energy, and reduce our dependence on foreign oil. We will work to help American industry increase its role as the world leader in developing environmental technology.

Conclusion

- Whenever the security of our people has been threatened, the United States has led the world to action. Climate change poses a threat to all people -- one that is not immediately apparent today but will grow in severity and significance in years to come. The world must act. And the United States must lead. The President has made it clear that he intends to do so and has committed himself both to develop balanced, flexible policies to accomplish our aims and to lead a major effort to educate the public about the importance of this issue -- an effort that will culminate in a White House Conference on Climate Change in early October. It is the challenge and the commitment of this Administration to continue promoting prosperity as we protect the environment.

REMARKS BY THE PRESIDENT
IN ADDRESS TO THE UNITED NATIONS
SPECIAL SESSION ON ENVIRONMENT AND DEVELOPMENT

The United Nations
New York, New York

June 26, 1997

Thank you very much. Mr. President, Mr. Secretary General, ladies and gentlemen: Five years ago in Rio, the nations of the world joined together around a simple but revolutionary proposition, that today's progress must not come at tomorrow's expense.

In our era, the environment has moved to the top of the international agenda because how well a nation honors it will have an impact, for good or ill, not only on the people of that nation, but all across the globe. Preserving the resources we share is crucial not only for the quality of our individual environments and health, but also to maintain stability and peace within nations and among them. As the father of conservation in our nation, John Muir, said, "When we try to pick anything out by itself, we find it hitched to everything else in the universe."

In the years since Rio, there has been real progress in some areas. Nations have banned the dumping of radioactive wastes in the ocean and reduced marine pollution from sources on land. We're working to protect the precious coral reefs, to conserve threatened fish, to stop the advance of deserts. At the Cairo Conference on Population and Development, we reaffirmed the crucial importance of cooperative family planning efforts to long-term sustainable development.

Here in America, we have worked to clean up a record number of our toxic dumps and we intend to clean 500 more over the next four years. We passed new laws to better protect our water, created new national parks and monuments, and worked to harmonize our efforts for environmental protection, economic growth and social improvement, aided by a distinguished Council on Sustainable Development.

Yesterday, I announced the most far-reaching efforts to improve air quality in our nation in 20 years, cutting smog levels dramatically, and, for the first time ever, setting standards to lower the levels of the fine particles in the atmosphere that form soot. In America, the incidence of childhood asthma has been increasing rapidly. It is now the single biggest reason our children are hospitalized. These measures will help to change that, to improve health of people of all ages, and to prevent as many as 15,000 premature deaths a year.

Still, we here have much more to do, especially in reducing America's contribution to global climate change.

The science is clear and compelling: We humans are changing the global climate. Concentrations of greenhouse gases in the atmosphere are at their highest levels in more than 200,000 years, and climbing sharply. If the trend is not changed, scientists expect the seas to rise two feet or more over the next century. In America, that means 9,000 square miles of Florida, Louisiana, and other coastal areas will be flooded. In Asia, 17 percent of Bangladesh, land on which 6 million people now live, will be lost. Island chains such as the Maldives will disappear from the map, unless we reverse the predictions.

Climate changes will disrupt agriculture, cause severe droughts and floods and the spread of infectious diseases, which will be a big enough problem for us under the best of circumstances in the 21st century. There could be 50 million or more cases of malaria a year. We can expect more deaths from heat stress. Just two years ago, here in the United States in the city of Chicago, we saw the tragedy of more than 400 of our citizens dying during a severe heat wave.

No nation can escape this danger. None can evade its responsibility to confront it. And we must all do our part -- industrial nations that emit the largest quantities of greenhouse gases today, and developing nations whose green house gas emissions are growing rapidly. I applaud the European Union for its strong focus on this issue, and the World Bank for setting environmental standards for projects it will finance in the developing world.

Here in the United States, we must do better. With 4 percent of the world's population, we already produce more than 20 percent of its greenhouse gases. Frankly, our record since Rio is not sufficient. We have been blessed with high rates of growth and millions of new jobs over the last few years, but that has led to an increase in greenhouse gas emissions in spite of the adoption of new conservation practices. So we must do better, and we will.

The air quality action I took yesterday is a positive first step, but more must follow. In order to reduce greenhouse gases and grow the economy, we must invest more in the technologies of the future. I am directing my Cabinet to work to development them. Government, universities, business and labor must work together. All these efforts must be sustained over years, indeed, over decades. As Vice President Gore said Monday, "Sustainable development requires sustained commitment." With that commitment, we can succeed.

We must create new technologies and development new strategies like emissions trading that will both curtail pollution and support continued economic growth. We owe that in the developed world to ourselves and, equally, to those in the developing nations.

Many of the technologies that will help us to meet the new air quality standards can also help us to address climate change. This is a challenge we must undertake immediately and one in which I personally plan to play a critical role.

In the United States, in order to do our part, we have to first convince the American people and the Congress that the climate change problem is real and imminent. I will convene a White House Conference on Climate Change later this year to lay the scientific facts before our people, to understand that we must act, and to lay the economic facts there so that they understand the benefits and the costs. With the best ideas and strategies and new technologies and increased productivity and energy efficiency, we can turn the challenge to our advantage.

We will work with our people and we will bring to the Kyoto conference a strong American commitment to realistic and binding limits that will significantly reduce our emissions of greenhouse gases.

I want to mention three other initiatives briefly that we are taking to deal with climate change and to advance sustainable development here and beyond our borders.

First, to help developing nations reduce greenhouse gas emissions, the United States will provide \$1 billion in assistance over the next five years to support energy efficiency, develop alternative energy sources and improve resource management to promote growth that does not have an adverse effect on the climate.

Second, we will do more to encourage private investment to meet environmental standards. The Overseas Private Investment Corporation will now require that its projects adhere to new and strengthened environmental guidelines, just as our Export-Import Bank already does and as I hope our allies and friends soon will. Common guidelines for responsible investment clearly would lead to more sustainable growth in developing nations.

Third, we must increase our use of new technologies even as we move to develop more new technologies. Already, we are working with our auto industry to produce cars by early in the next century that are three times as fuel-efficient as today's vehicles. Now we will work with businesses and communities to use the sun's energy to reduce our reliance on fossil fuels by

installing solar panels on 1 million more roofs around our nation by 2010. Capturing the sun's warmth can help us to turn down the Earth's temperature.

Distinguished leaders, in all of our cultures we have been taught from time immemorial that, as Scripture says, "One generation passes away and another comes, but the Earth abides forever." We must strengthen our stewardship of the environment to make that true and to ensure that when this generation passes, the young man who just spoke before me and all of those of his generation will inherit a rich and abundant Earth.

Thank you very much.



toman @ rff.org
07/25/97 07:20:00 AM

Record Type: Record

To: Michele Jolin

cc:

Subject: thoughts on Yellen testimony

July 24, 1997

TO: Michele Jolin

CC: Jay Shogren

From: Mike Toman

SUBJECT: Yellen testimony

Michele, in our conversation the other day after Janet testified, you expressed curiosity about what I thought of the testimony. I think it makes a number of strong statements. It conveys the uncertainty surrounding the issue and it provides support for a number of the good aspects of the Administration's treaty proposal, such as incentive-based approaches and flexibility. I would, however, like to raise a couple of points, none of which are news to Jay. They have to do more with nuances in the message. I know that Janet's testimony had to be an inherently political document, and I appreciate the need for care in the message. My points go to how CEA can continue to be the impartial arbiter of economic information and analysis, even in this highly politicized context.

(1) My biggest concern by far is with the citation of the 2300 economists that emissions abatement can be a cheap or free lunch. I would urge CEA strongly not to cite this anymore. This was an exercise that was disingenuous at best, in that many of the prestigious signers did not think at all about how their words would be read politically and out of context, especially the point about emissions reductions at no cost to the economy. The statement actually says that "there are policy options that would slow climate change without harming US living standards, and these measures may in fact improve US productivity in the longer run"; and then that "The most efficient approach to slowing climate change is through market-based policies." Contrary to what some agencies would say, they were not arguing that goals like stabilizing emissions at 1990 levels can be met at zero or negative cost, whether or not market-based policies are used. Indeed, the vast majority of economists would not believe this. I know of at least one of the prestigious signers who regrets it now, because of how this statement

has been distorted in the debate, and I would urge CEA not to give comfort to those who would misuse it by citing the statement, unless you are prepared to add a lot of caveats. (The same problem arises in the President's Business Roundtable speech -- the win-win opportunities are there, but they may be limited. This obviously is more complicated, since he is the boss, but I would not go out of my way to make this point and I would try to get something into the weekly briefing about this.)

(2) Related to point (1), I was surprised to see the discussion of revenue recycling in the testimony. First, while I think revenue recycling can offset some of the costs of abatement, I think one of the absolute weakest conclusions from the IAT analysis was the idea that money from auctioned permits could be used to engineer an economic boom. The bulk of the economics profession familiar with this issue is moving in the direction of much greater modesty concerning what revenue recycling can do. Second, at least some of the revenue recycling options that would (partially!) offset abatement costs are things like capital gains tax cuts that seem to bother the Administration. Finally, I was unsure that the Administration wanted to have a discussion of revenue raising, even if it is through the cosmetically different strategy of permits auctions rather than a tax. Unless the Administration really wants to discuss this, I would urge a soft-pedaling of the issue along with the rest of the win-win message.

(3) In the "how the economy works" section, I would have put in a caveat about the controversy (better still, doubt, though that might not have cleared interagency review) surrounding the existence of a large volume of cheap energy-efficiency improvements. I also would have cautioned against double-counting both the well of cheap energy-efficiency opportunities and the cost savings from emissions trading. As Jay has pointed out to me, part of how emissions trading works to cut costs is to stimulate innovation in energy efficiency. Counting these two influences on cost separately is a sleight of hand to lower cost figures.

(4) The discussion of which countries participate may somewhat overstate the practical possibilities in the medium term for moving countries like China away from "dependence" on coal, though that is clearly an important long-term goal and technology is the answer. The key medium term question, it seems to me, is whether our taking action first in the expectation that poorer countries will take differentiated actions later is harmful to our interests. That essentially becomes a question of whether LDCs like China will gain an unfair economic advantage from "carbon leakage." I do not think that harm would be too severe, provided we are not expected to do too much in the short term and provided (as the Administration has proposed already) there is a date certain when poorer countries must face some limits (which will still have to be less aggressive in practice than whatever we do). This is an important issue politically because I think the Administration wants to distinguish itself from those who would do nothing unless all countries were in at the same level of commitment right away, and those who would at the other extreme

indicate we should just jump off the cliff and then look back to see who followed.

(5) A couple of more specific points: It is important to communicate how the "How the economy works" factors are interrelated with the "how the plan is implemented" factors. For example, the point about how rapidly reductions are implemented is directly related to the ease of substitution. Similarly, the ability of policy to stimulate technical innovation is related to how sensitive innovation is to the cost of carbon emissions and the "well" of energy-saving opportunities.

On a somewhat different issue, the discussion of underlying uncertainties seems to suggest that the abatement costs are as uncertain as the benefits of emissions reduction, and these costs are more uncertain than is the case in analyzing other economy-wide policy issues, e.g., income tax reform. I think the costs are uncertain, but not as much as the benefits are (that does not mean the benefits are trivial, we just don't know much), and I am not convinced the costs are more uncertain than in other big issues. What policy analysis doesn't just generate a range of potential impacts and costs? And, has anyone proposed to develop a single definitive model? While I would never defend the IAT process or outcome, I think people at the staff level did try their best, and they should be assessed against the right yardstick of expectations. I also don't think you want to leave yourself open to having these criticisms come back to haunt you in other contexts where policy analysis is necessarily quick, sloppy, and imprecise.

I hope these comments are of use to you and in particular that they are not too technical or tone-deaf. I look forward to seeing you at Alicia's party next week, and please feel free to contact me beforehand if you have any questions.

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Climate Change Working Groups
Core Members
July 14, 1997

I. Domestic emissions trading

1. EPA (Gardiner and Doniger)
2. Treasury (Wilcox and Gruber)
3. OMB (Minarik)
4. CEA (Shogren)

II. Developing country commitments

1. State (Pomerance)
2. AID (Hales)
3. Treasury (Geithner)
4. Commerce (Hunker)
5. WH Task Force (Forrister)

III. International emissions trading and joint implementation

1. State (Pomerance)
2. AID (Hales)
3. Justice (Simon)
4. CEA (Frankel)
5. OMB (Gotbaum)
6. DOE (Reicher)
7. Commerce (Hunker)
8. WH Task Force (Forrister)

IV. Technology programs

1. OMB (Glauthier)
2. DoE (Reicher and Romm)
3. OSTP (Henry Kelly and Rosina Bierbaum)
4. EPA (Gardiner and Doniger)
5. Treasury (Gillingham)
6. CEA (Frankel)
7. DoT (Kruesi)
8. USDA (Rawls)
9. Commerce (Hunker, Good)

V. Regulations and Standards

1. OMB (Glauthier)
2. EPA (Gardiner and Doniger)
3. DoE (Reicher and Romm)
4. Treasury (Gruber)

VI. Transition Assistance

1. Labor (Montgomery)
2. EPA (Gardiner)
3. NEC (Robyn)

CLIMATE CHANGE POLICY PROCESS
TIMELINE

Principals Meetings:

July 18 - Developing Country Commitments
July 25 - Technology Strategy
August 1 - International Emissions Trading
August 8 - TBD

early-mid September: principals consider decision memoes on domestic programs (emissions trading, technology programs, etc.)

mid-late September: principals consider decision memoes on international issues (targets and timetables, emissions trading, developing country commitments)

early October: White House conference

mid-October: decisions on all issues (level of detail will vary)

November and early December: refine decisions on all issues

Name	Title/Affiliation	Background	Phone #	Fax #	Status
Gardner Brown	U of Washington	Economists' Statement; biodiversity, endangered species	(WA)		
~~Emily N. Castle~~	~~Oregon State University~~	~~CEA, Economists' Statement~~	~~(OR)~~		
Uncertain					
Dallas Burtraw	Resources for the Future	Economists' Statement; emissions trading, market mechanisms			
Joseph Stiglitz PRT (also in nation-wide)	Chief Economist, World Bank	Ex-chair of CEA; involved in economics section of IPCC; emissions trading, JI			

I. What specifically can I do to encourage technological advances that will help us to slow carbon emissions? How much is technology development dependent on market incentives rather than Federal spending on R&D and dissemination programs?

Holdren

Jorgensen

Get names of other technology people from TJ et. al.

Solow

Munnell

II. Very specifically, balancing the benefits of acting against the costs of doing so, how aggressive should we be in reducing carbon emissions?

Cline

Nordhaus

Jorgensen

Dudek (EDF)

Blinder

Solow

Katz

Tyson

III. How worried should I be about "competitiveness" arguments and the impact of climate policies on U.S. industry generally? In which specific industries are there likely to be problems?

Krugman

Esty (?) -- good because he has links to the greens

AFL-CIO

Ehrlich

Cooper

Repetto

Sachs

Stiglitz

IV. What is the most efficient way of reducing carbon emissions?

> > [Follow-up: How much can we learn from the SO₂ trading program that we already have, to ensure that carbon reductions are undertaken efficiently?]

V. Are there suggestions you have for how the U.S. Government itself can be more efficient in using energy?

Former government officials: Deutsch

VI. Can you recommend any kind of safety valve to protect the economy against unexpectedly high costs of reducing emissions?

Nordhaus

Katz

Tyson

BARBARA BOXER
LEGISLATIVECOMMITTEES:
APPROPRIATIONS
BANKING, HOUSING, AND
URBAN AFFAIRS
BUDGET
ENVIRONMENT
AND PUBLIC WORKS

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July 15, 1997

MEMORANDUM

TO: Members and staff
FROM: Staff
SUBJECT: July 17, 1997, global climate change hearing before the EPW Committee

The Committee on Environment and Public Works will hold a second global climate change hearing on Thursday, July 17, at 10:00 a.m. in Room 406 of the Dirksen Building. The first hearing, which took place on July 10, focused on science and economics. Thursday's hearing will focus on the position of the United States as it and some 165 other nations prepare for the December 1997 round of international climate treaty negotiations in Kyoto, Japan. This memorandum provides background for the July 17th hearing by including discussion on:

- I. Issue Overview;
- II. Background on Negotiations;
- III. Major Negotiations Issues;
- IV. Position of the United States; and
- V. Witnesses.

I. Issue Overview

The United States and some 165 other nations are negotiating changes to the existing 1992 U.N. Framework Convention on Climate Change (FCCC) which could require specific, legally binding greenhouse gas (GHG) emissions reduction commitments for the post-2000 period. These international negotiations are to culminate at the Third Conference of the Parties to the U.N. Framework Convention, scheduled for December 1-12, 1997, in Kyoto, Japan.

The December 1997 Kyoto round is occurring as the result of concerns voiced by Parties about the adequacy of countries' commitments under the FCCC to "protect the climate system for the benefit of present and future generations." Many Party nations conclude that a forcing mechanism or clear market signal is required to achieve meaningful emissions reduction actions. These concerns were expressed in a 1995 U.N. ministerial declaration known as the "Berlin Mandate," which set a 2-year schedule for continued negotiations to address GHG emissions. The FCCC contains a legal framework that upon ratification commits signatories' governments to voluntary reduction of greenhouse gases, or other actions such as enhancing greenhouse gas sinks. These actions have been aimed at stabilizing global atmospheric emissions of greenhouse gases at 1990 levels by the year 2000.

On October 19, 1993, President Clinton released the domestic Climate Change Action Plan (CCAP), which involved measures to attain the goal of greenhouse gas emissions stabilization as outlined under the terms of the FCCC. The CCAP relies on a comprehensive set of voluntary actions by

industry, utilities and other large-scale energy users. It also promotes energy-efficiency upgrades through new building codes in residential and commercial sectors, and other energy-efficiency improvements in generic energy-generating or using technologies. The consensus within the Administration and elsewhere, however, is that the United States and many other industrialized countries will not achieve voluntary stabilization goals as prescribed in the FCCC.

II. Background on Negotiations

Laying the foundation for future United Nations negotiations on a climate change convention/treaty, the Intergovernmental Panel on Climate Change (IPCC) was organized in November 1988 to assess the "scientific information... related to the various components of the climate change issue" and to formulate "response strategies for the management of the climate change issue."

In August 1990, the First Assessment Report of the IPCC was adopted by U.N. General Assembly. It has formed the basis for subsequent international negotiations on a framework convention. The U.N. General Assembly in December 1990 established an Intergovernmental Negotiating Committee (INC), which was charged with preparing an effective framework convention on climate change, containing appropriate commitments and any related legal instruments as might be agreed upon. The General Assembly also called for the framework convention negotiations to be completed prior to the June 1992 U.N. Conference on Environment and Development (UNCED) and opened for signature during that conference.

Framework Convention on Climate Change

The INC commenced negotiations in February 1991 and concluded talks in May 1992, when parties met as a whole to finalize the text of a so-called Framework Convention on Climate Change (FCCC). The FCCC was opened for signatures at the June 1992 UNCED conference in Rio de Janeiro ("the Earth Summit"). On June 12, the United States, along with 153 other nations, signed the FCCC. President Bush signed the instrument of ratification October 13, 1992, and deposited it October 15, 1992, with the U.N. Secretary General. Having received over 50 countries' instruments of ratification in December 1993, the Convention entered into force March 24, 1994.

First Conference of Parties (COP) to the FCCC — Berlin Mandate

The First Conference of Parties to FCCC (COP-1) met in Berlin, Germany, March 27- April 6, 1995. This was the first opportunity to consider amendments or a separate protocol to the treaty (FCCC). Timothy Wirth, Under Secretary of State for the Environment, represented the U.S. delegation at a ministerial session at the conclusion of COP-1. As the result of concerns voiced in Berlin over the adequacy of countries' commitments, a 2-year Analytical and Assessment Phase (AAP), to negotiate a "comprehensive menu of actions" from which countries may pick and choose options to address climate change which for them, individually, make the best economic and environmental sense. COP-1 in Berlin spawned the upcoming Kyoto round during which potentially binding emission reductions are to be negotiated.

The principles of the Berlin Mandate have endured throughout working sessions which have occurred since COP-1. FCCC parties have discussed possible amendments and protocols and whether numerical aims, such as targets and timetables, binding or non-binding agreements, or

technology-related goals, alone, are adequate for climate protection. Also, Parties addressed what some have called an arbitrary division between Developed and Developing countries, and the respective requirements of each class under FCCC. Criticism has been levied by some Developed countries that many newly industrializing countries, such as Brazil, India, and China, would continue to enjoy certain exemptions under possible future, legally binding emissions reduction agreements, even though these and some other countries stand to become the greatest contributors to future greenhouse gas emissions.

III. Major Negotiation Issues

From the perspective of the United States, the top 3 negotiation issues include:

1. Developing countries. How successful will the U.S. and other Developed countries be in securing emissions reduction commitments from Developing countries, particularly countries like China, Brazil, India, or Korea which will continue to emit an increasing share of GHGs.
2. Targets and timetables. If legally binding GHG emission reductions are required, what will be the level of stringency? How much will current emission rates be curbed? What deadlines will apply? The further the deadlines, the greater the opportunity for capital stock turnover and resultant cost reduction.
3. Domestic Flexibility. The U.S. has pushed hard against proposals by the European Union to require "harmonized policies and measures," namely, energy taxes, increased CAFE standards, uniform appliance standards, etc. Instead the U.S. has sought agreement on flexibility mechanisms such as the banking and trading of emissions allowances and joint implementation. A clear test of U.S. success will be whether or not these uniquely American market-based measures are included in any Kyoto agreement.

IV. Position of the United States

On January 17, the United States presented to the U.N. Secretariat a *U.S. Draft Protocol Framework*, for consideration in the 1997 international negotiations. The U.S. proposal is a three-part framework to reduce GHG emissions among developed countries. In brief, it states that:

- (1) GHG emission reduction targets should be binding;
- (2) emission reduction goals should focus on the medium term (i.e., 2010 to 2020); and
- (3) countries should have broad flexibility domestically in implementation.

This three-part U.S. proposal is summarized as follows, reflecting the priorities of the Clinton Administration.

Emissions Targets or "Emissions Budget". Multiple emissions budget periods are proposed, including a second period in which emissions are equal to or less than the first period, thus assuring continued progress toward achievement of FCCC environmental objectives. Parties with budgets

would be allowed to "bank" and "borrow" a limited amount of emissions from a future budget period, and also to trade emissions.

Reporting and Compliance. Countries would set national systems for measuring emissions and for achieving compliance and enforcement. Implementation efforts would be reviewed and consequences of non-compliance, or non-attainment, would be determined by the Conference of the Parties.

Advancing Developing Country Efforts. Requires all Developing Country Parties to adopt "no regrets" measures (measures providing a net, independent economic benefit) to mitigate greenhouse gas emissions, conduct annual inventory of emissions and report on steps taken to reduce emissions. Actions would be reviewed annually by the Conference of Parties.

Emissions Trading and Joint Implementation. Full emissions trading among countries with emissions budgets (if in compliance with all obligations under the agreement), joint implementation between countries with and without emissions budgets, and transfer of reduction credits achieved by the former qualified projects to non-emission budget countries.

Long-Term Efforts Under the Convention. Includes periodic review of the scientific knowledge about global climate change and sets a long-term goal for atmospheric greenhouse gas concentrations. Calls for a date certain for negotiation of future emissions reduction obligations, and implements a graduation mechanism to strengthen obligations of Developing countries.

II. The Witnesses

Panel One

Honorable Timothy E. Wirth, Under Secretary for Global Affairs, Department of State.

Honorable Janet Yellen, Chair, Council of Economic Advisers.

Panel Two

Mr. Kevin J. Fay, Executive Director, International Climate Change Partnership (ICCP) of Arlington, Virginia.

Mr. William O'Keefe, Executive Director, Global Climate Coalition (GCC) of Washington, DC.

- I Oval Mtg
- II Roosevelt Mtg
- III Other Cabinet Members

→ Meeting w/
Bus & Cong Groups

Kevin Tey
Alliance for
Sust Energy

Hillary

↓
How get them to
feed in to
policy process

- people's views
- what will
be debated
- look for good ideas

→ Need to have someone sit with

→ Need for alternative
talking points

Cals
Dinner

Calendar to Report

↓
work w/
Cabinet
Affairs

Need
for
WH
Principal
Policy
Dinner