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**TESTIMONY OF DR. JANET YELLEN
CHAIR, COUNCIL OF ECONOMIC ADVISERS
BEFORE THE SENATE FOREIGN RELATIONS COMMITTEE
ON THE ECONOMICS OF THE KYOTO AGREEMENT
FEBRUARY 11, 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 am pleased to have this opportunity to appear before the Committee to elaborate on the President's statement.

The international agreement that was reached in Kyoto this past December is a crucial first step in addressing global climate change. But it is only a first step. Since the international effort to reduce greenhouse gas emissions is more of a work-in-progress than a completely finished product, 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, such as global participation and reliance on flexible, market-based measures, that ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will do my best also to provide some rough estimates of costs and benefits.

The Administration is strongly committed to ensuring that these critical elements are reflected in our domestic and international climate change policies. We are firmly committed to meaningful developing country participation, as well as 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 over the next 5 years to jumpstart our efforts.

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 Agreement.

The earth's surface is 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 agreement 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 that are likely if we fail to take any action -- for these costs provide the primary motivation for reducing 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. As a result of the increased concentration of CO₂, the IPCC estimates that global temperatures will increase by between 2.5 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. Many models predict larger increases in evaporation than in precipitation over midlatitude land areas, which would result in drier conditions in those regions, especially during summer in North America and Europe.

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 forecasting 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, migration costs, human amenity, construction, leisure activities, urban infrastructure, and ecological damages such as forest loss and species loss).

A subject of great uncertainty and sensitivity is the "discount rate" that is applied to the benefits of averting future climate change. Such a discount rate is needed if the analysis is to be expressed in monetary terms, because a dollar today is not worth the same as a dollar tomorrow. And 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 of yet, no professional consensus on the issue.

A similar point concerns risk aversion. To what extent are we willing to take chances with our planet? The point applies particularly to catastrophe scenarios. Scientists have thought of many possible scenarios, most of which they are fortunately not yet prepared to pronounce as particularly likely based on current evidence, but which might be truly catastrophic for the planet if they were to occur. There is a strong argument for the Kyoto agreement 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? It is difficult for an economist, or anyone, to know.

Despite these shortcomings and potential problems, respected researchers have developed estimates of the monetary damages expected from an average worldwide temperature increase of approximately 4.5 degrees Fahrenheit (corresponding to, roughly, a doubling of pre-industrial carbon dioxide concentrations). For example, William Cline, then a Senior Fellow at the Institute for International Economics, estimated that such a temperature change would impose annual damages of more than \$70 billion per year on the U.S. economy in today's terms. These damages include \$22 billion in lost agricultural production, \$13 billion in additional electricity costs, and \$8 billion in new costs to maintain the existing supply of fresh water. (Cline's original estimates are quoted in 1990 dollars. The figures given above translated those numbers into 1997 dollars using the annual GDP price index.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of carbon dioxide concentrations. He finds that the Cline estimate is in the center of three estimates for the U.S., and that the high estimate is only 1.3 times greater than the low estimate.

It must be noted, however, that this similarity of aggregate 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. In particular, the estimates may not fully reflect potential non-linearities in the relationships between carbon dioxide 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 quantitative analyses do not, and cannot, accurately reflect the small and unknown possibility of large-scale and potentially irreversible discrete events with potentially catastrophic consequences.

Two such possibilities serve as illustrations. Warming of Northern tundra may release very large amounts of methane from the subarctic permafrost, thereby leading to potentially devastating acceleration of an otherwise controllable global warming process. We do not know at what point, if any, such 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 displacement of the Gulf Stream that warms Western Europe. Evidence from ocean core samples suggests such changes of ocean currents have occurred in previous ice ages. Reductions in the risk of such catastrophic outcomes must be considered in addition to the costs and benefits that can be reasonably quantifiable. Since human beings are typically averse to risk, such possibilities 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, greenhouse gas emissions from all other countries would continue to grow, and the risks posed by climate change would not be significantly abated. 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. The first 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 a long-term objective of limiting greenhouse gas concentrations and encouraged the established 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.

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 take substantial steps to stabilize atmospheric concentrations of greenhouse gases. The Kyoto Agreement, which requires the advice and consent of the Senate, would place binding limits on industrial countries’ emissions of the six principal categories of greenhouse gases: CO₂, 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 agreement, each industrial country’s “1990 baseline” is actually based on 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 1990 levels by the period between 2008 and 2012. To meet that target, net U.S. emissions of greenhouse gases -- all emissions minus removals of CO₂ by certain forestry-related activities -- must average no more than 1,484 million metric tons of carbon equivalent per year during that period. 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 his support of the Kyoto Agreement is dependent on meaningful participation from key developing countries (who are not included in Annex I). The President has also made clear that he will not submit the treaty to the Senate without such participation.

There are several reasons why meaningful participation from developing countries is essential. First, developing countries are projected to contribute a majority of total emissions by 2030 under a continuation of business-as-usual. Without the participation of developing economies, emissions reductions by the industrialized countries will therefore not achieve necessary protection from climate change. Indeed, if developing countries do not participate in the international regime, their emissions could potentially increase by *more* than under their business-as-usual baselines. One mechanism for such an unintended consequence is as follows.

As Annex I countries comply with their targets, their demand for oil will fall, which will probably work to reduce the price of oil on world markets, and perhaps to encourage non-participating countries to use more oil and emit more carbon than they otherwise would have.

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 by U.S. companies domestically. Again, greenhouse gas emissions have the same basic impact on the climate regardless of where they occur. So reductions in developing countries have the same environmental benefit as reductions domestically. 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 on their ability to contribute to the solution. Thus even poor countries should contribute, although the existence of more pressing social needs in such countries will inevitably limit the magnitude of their contributions.

So far I have not mentioned the word "competitiveness." One of the difficulties in analyzing concerns related to competitiveness is that the term itself is used to mean many different things. I have seen at least one study that uses "loss of competitiveness" to refer to predictions of negative effects on the *aggregate* trade balance. As a professional economist, I do not accept the logic upon which that particular argument is predicated: the aggregate trade balance is determined by macroeconomic forces -- the difference between saving and investment -- and not by our environmental policies.

On the other hand, if competitiveness refers to adverse effects on a few specific manufacturing industries -- those that are especially energy-intensive, such as aluminum, paper, and chemicals -- the situation may be more complicated. It is difficult to undergo a significant 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 in Venezuela. Similarly, gas prices were \$3.71 per gallon in Switzerland and \$4.41 per gallon in France. Yet U.S. industry is not moving en masse to Venezuela, nor is European industry moving to the United States. Third, roughly two-thirds of all emissions are not in manufacturing at all, but in transportation and buildings. I therefore believe it more accurate to say that we need developing country participation for the reasons I outlined above, than to say that we need it 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 achieve their objectives 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, the 2,600 economists 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 in some sense 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.

The Kyoto Protocol incorporates this principle of "when flexibility" in four ways:

- First, the cuts to be made in the first period are less severe, and the first period ends much later, than what had been proposed by many other countries, most notably the Europeans.

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 still in the prime of their operating lives, while attaining the same ultimate environmental goals.

- Second, under the Kyoto agreement, 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 next period have not yet been specified].

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 pollutant can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects. The Kyoto Protocol stipulates that countries with binding targets are expected 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 rough analysis indicates that a strategy of reducing non-CO₂ greenhouse gases by *more* than 7 percent below their 1990/1995 baseline levels while reducing CO₂ by *less* than 7 percent below its 1990 level could reduce greenhouse gas emission permit prices by more than 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. 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 agreement includes two important cost-saving provisions of this nature. First, it provides for industrial countries to trade rights to emit greenhouse gases with each other. This market in emissions permits will ensure that emission 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 -- lowering costs without affecting the level of environmental protection.

Second, 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 these provisions will be worked out in negotiations in Buenos Aires later this year.

IV. Difficulties of Economic Analysis of Kyoto Agreement

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 I wish to emphasize once again the inherent limitations to any such estimates. 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. Second are the inherent limitations of available models to analyze even short-term costs and benefits. And finally is a topic I discussed earlier: the impossibility of putting a single monetary number on the long-term benefits of climate change mitigation.

Uncertainties over Certain Provisions in International Effort to Combat Climate Change

The Kyoto Agreement 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 will work, there is still much that we

don't know.

First, as is often the case in a legal document of the length and complexity of the Kyoto Protocol, there are some provisions that require further clarification and interpretation. Of particular concern here is the treatment of so-called sinks -- activities that affect the rate at which carbon is removed from the atmosphere and "sequestered," specifically by the planting of trees.

Second, the details of a number of items -- primarily concerning international trading and developing countries -- are the subject of further negotiations in Buenos Aires next fall, because they had not been definitively settled by the end of the last all-night session 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't 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, I must also note 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 -- including diffusion of existing energy-efficient technologies, as well as research and development of new technologies -- and the extent to which the pace will accelerate in response to government programs. Economics does not offer a good understanding of how technological progress is determined, in part because it is the stuff of experimentation, brainstorming, genius, breakthroughs, perceptions and habits. Invention is largely determined by inspiration -- notwithstanding Edison, who assigned a 99 percent share to perspiration -- and inspiration, in my experience, is difficult to fit into mathematical formulae or economic models. Models and experts on climate change policy tend to have a wider range of disagreement on the speed with which technology can be changed and 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 have enough policy detail to distinguish alternative ways of redistributing revenues that would result if emission permits were to be auctioned. Some are capable of showing short-term macroeconomic disequilibria. Some 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 are also crucial.

Benefits of Averting Climate Change

As I discussed above, it is evident that the benefits of averting climate change are potentially immense. But I have chosen not to try to quantify them in monetary terms for you, in light of the difficulties I have enumerated -- including the quantitative uncertainty of these benefits, and their timing and therefore the extreme sensitivity of the results to the chosen discount rate.

Instead, what I will do is draw upon a variety of sources in an attempt to add up the various possible costs and benefits of emissions policy *excluding* climate change. To give away the punch line, my conclusion is as follows: the net costs of our policies to reduce emissions are likely to be small, if those reductions are undertaken in an efficient manner, *even before taking into account the benefits of averting climate change itself*. That small net premium excluding the benefits of mitigating climate change, in effect, purchases a partial insurance policy against a serious environmental threat.

V. Assessing the Kyoto Agreement

The existence of modeling difficulties means that the results from any model must be treated with caution. We have therefore employed a broad set of economic tools to assess the Kyoto agreement. 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, and the staff-level Interagency Analytical Team effort last year. Other tools include simple relevant statistics, “meta-analyses” of existing models, historical and sectoral examples, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives.

To my knowledge, as of December, no model -- whether used inside the government or not -- had been set up precisely to analyze the parameters of the agreement that was reached in Kyoto. Most model-builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models. And no model is currently designed to assess sinks, or all six greenhouse gases included in the treaty.

One of the leading models in the field is the Second Generation Model of Battelle Laboratories. 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 agreement or include a role for sinks. We have used the SGM model as a starting point for a preliminary 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, sinks and a possible Annex I trading scheme that could exclude the EU. I will share with you today some preliminary results of this analysis.

Mindful of the limitations of any single model, we are eager to see features of the Kyoto agreement assessed by other models to obtain a better feel for the range of possible effects. Much of this work will continue to go on outside the government. For example, we have had discussions with the Energy Modeling Forum, based at Stanford University. The EMF is a long-running exercise involving many of the leading climate models. We have given the EMF advice on how features of the Kyoto legal language can be translated into terms recognizable to an economist. Unfortunately, the Energy Modeling Forum believes that its members will need at least until mid-year to produce reliable results.

VI. Economic Analysis

With all of that as important background, let us now turn to the task at hand. As we do so, let me emphasize once again that the figures presented below do not incorporate the benefits of starting to mitigate climate change.

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 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 Agreement and our approach to the effort.

Within the Kyoto agreement, this means an insistence on international trading, joint implementation, and, ultimately, on full 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 -- \$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 \$2,000 credit 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 spending -- 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. A reasonable overall estimate of the effects of adding federal electricity restructuring to the rest of the President's program to address climate change is to achieve the same environmental goals at a cost saving of roughly \$16 billion per year.

Estimated Reduction in Costs from Annex I Trading

In the language of the treaty, "Annex I," you will recall, is the set of countries that have agreed to take on binding limitations in emissions of greenhouse gases. Even without

developing country participation -- which, again, the President has emphasized as essential before the treaty would be submitted for ratification -- costs would be reduced substantially by trading among the Annex I countries. To provide some indication of the possible efficiency improvements, Russia and the Ukraine consume six times as much energy per dollar of output as does the United States.

Estimates derived from the SGM model suggest that trading among Annex I countries is likely to 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 Russia and other countries where emission reductions are cheaper than in the United States. The dramatic reduction in costs 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 Agreement.

Estimated reduction in costs from umbrella trading

One possibility that emerged in Kyoto, which none of us foresaw, was the idea that the United States might undertake trading with a subset of Annex I countries, dubbed the "umbrella," that would exclude the European Union. The initial list of proposed participants in the umbrella includes the United States, Australia, Canada, Japan, New Zealand and Russia, with strong indications of interest from some others. The motivation for this idea was that the Europeans have been reluctant to agree to the sort of international trading that we want (preferring that they achieve their goals collectively in a group of their own, called the "EU bubble").

It is too early to say whether the umbrella concept will in fact be accepted by the parties. But it is an important concept to consider, for three reasons. First, it is conceivable that it will be formally agreed to in future negotiations. Second, even if the final treaty does not explicitly include the umbrella, but rather allows trading among all signatories (as the United States has proposed all along), it is conceivable that umbrella countries will agree, outside the treaty, to trade only among themselves. Third, the aversion toward international trading that the Europeans have expressed suggests that they might refrain from making the trades to which they would be entitled -- which would mean that the umbrella would operate in practice, if not in formal international agreement.

The significance of the umbrella idea in the present context is that it has the potential to further reduce costs to the United States. The reason is that if the Europeans do not bid against us for the relatively abundant, low-cost opportunities to reduce emissions in Russia and Eastern Europe, then the price of emissions reductions will be even lower. Results that we have derived from various SGM simulations suggest that, relative to the situation in which there is no trading at all, the umbrella arrangement would reduce costs by an estimated 60-75 per cent, depending on whether the former Warsaw Pact countries are classed with the EU, or are instead

assumed to fall within the umbrella.

Estimated reduction in costs from LDC participation

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

The substantial potential gains from meaningful LDC participation are highlighted by the significant benefits that will likely accrue even from the limited role that the LDCs have already agreed to: the Clean Development Mechanism, modeled after Joint Implementation (JI). JI 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. We estimate that this could cut roughly 55 percent off the reduced costs that result from Annex I trading. [The four countries included in this particular estimate are China, India, Brazil and Korea.] Once these savings have been attained, the estimated reductions to US costs from persuading the rest of the developing world to go along with full commitments are relatively small.

A useful rough check on our estimate of the gains from international emissions trading can be obtained from other modeling efforts, notwithstanding that they are likely to be more distant approximations to the parameters of the Kyoto Treaty. Recent results from six leading models that participated in the Stanford Energy Modeling Forum show that worldwide permit trading would reduce the estimated costs -- defined as lost consumption -- of a full, long-term, global program to stabilize atmospheric concentrations at 550 ppmv by an average of 56 percent, although the results vary from model to model.

I offer these numbers because they show the potential effectiveness of trading in reducing costs dramatically. But it is important that I repeat three caveats: First, as always, there is a wide range of uncertainty around all these estimates. Second, they apply to an idealized version of trading, one that assumes no problems of enforcement or transactions costs. Third, it seems unlikely that we will convince all of our partners to agree in Buenos Aires to the most complete and cost-effective international trading arrangements. Nonetheless, despite these caveats, the numbers still show major savings.

Moreover -- and I can't highlight this enough -- these cost-saving features are fundamental tenets of the U.S. position for ratifying the Kyoto Protocol. If we do not get very solid provisions for international emissions trading and 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 going into Buenos Aires.

VII. Non-Climate Benefits

The costs of undertaking greenhouse gas emission reductions must be compared to the benefits. As I have indicated, for various reasons our analysis does not quantify the benefits from averting climate change itself. But the relative price shifts that are necessary to reduce emissions should produce benefits in three areas: air pollution, traffic congestion, and highway accidents. These benefits are quantifiable. The magnitude of these projected benefits would vary with the permit price.

Reductions in carbon emissions also lead to reductions in emissions of pollutants that contribute to excess concentrations of fine particulate matter and low-level ozone. We estimate significant ancillary reductions of nitrogen oxides and other pollutants and associated cost savings even for low carbon prices. These cost savings would be even larger if carbon emissions reduction efforts could be carefully coordinated with the implementation of the national ambient air quality standards.

Traffic congestion hurts motorists by causing delays and inconvenience. More efficient pricing -- which recognizes the externalities involved -- should lead to reductions in congestion as motorists choose other means of travel, share rides, or even forgo less important trips.

Vehicle use also leads to costly accidents and to highway injuries including fatalities. More efficient pricing will reduce use and create savings from reduced accidents and resultant mortality. The savings from reduced congestion and reduced accidents are significant, even with low carbon prices.

A variety of other benefits that are harder to quantify are likely to result from reductions in carbon emissions. With respect to transportation, reduced vehicle use will also reduce the cost of road repair and maintenance. Second, reduced coal use will lower mercury emissions. Finally, reduced energy use will also increase U.S. energy independence. Our inability to estimate these effects quantitatively does not imply that they are necessarily small or unimportant.

VIII. Preliminary Estimate of the Net Effects of the Kyoto Agreement

We can now combine the various benefits and costs delineated above to provide a preliminary assessment of the likely net impact of the Kyoto agreement. This assessment

excludes, however, both the benefits of averted damage from climate change and also the impacts of a substantial number of cost-mitigating factors, including mitigation through sinks, and emissions reductions achieved as a consequence of the proposed Administration climate change initiatives. An additional limitation of this analysis is that it relies in part on results from one specific model--the SGM model--supplemented by additional Administration analysis to match the results from the model with the institutional details of the Kyoto agreement. The analysis does, however, attempt to account for the impact of trading under the umbrella, joint implementation, and meaning participation by key LDCs. Under these assumptions about international trading, the resource costs of attaining our Kyoto targets for emission reductions might amount to \$7 to \$9 billion. Adding in the non-climate benefits, overall net costs could reach \$5 billion to \$8 billion, or roughly 0.08 percent of projected GDP, under the international trading assumptions and other provisos I have mentioned.

A more tangible measure of costs is the estimated effects on energy prices. Excluding the impact of electricity restructuring, our SGM-based estimate is that the price of emissions could be \$12 to \$16 per ton of carbon equivalent -- and that energy prices at the household level could rise by about 3 percent under the Kyoto accord. Fuel oil prices could rise by about 6 percent, natural gas prices by 4 percent, gasoline prices by 3 percent, and electricity prices by 3 percent. A 3 percent increase in energy prices at the household level would raise the average family's energy bill by about \$75 per year.

These estimates do *not* mean that households' energy expenses will in fact be higher in 2010 than today, however. In the first place, energy prices fluctuate year-by-year for all sorts of reasons. They could go either up or down. But even if we leave out unpredictable fluctuations, the energy price declines from Federal electricity restructuring would be enough to offset the impact estimated above. By 2008-2012, the projected 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda will mean a net reduction in electricity prices in the U.S., even accounting for the small increases noted above.

As highlighted earlier, estimates of the type that I am presenting are fraught with uncertainty. The estimate I just discussed was predicated on the developing country participation that we will insist upon in Buenos Aires as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol. At the same time, the numbers I have cited are in several respects conservative: they leave out several factors, such as the role of sinks and policy initiatives, that could further reduce costs. But before I bring these factors into the analysis, allow me to say a few words about macroeconomics.

Effects on employment and aggregate output

So far I 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, I do not anticipate any significant aggregate effect. Some jobs could be lost in energy-intensive sectors, 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.

The situation might be different if a large energy shock were to hit the economy with no warning, as happened in the oil crisis of 1973-74, when the real money supply, output and employment all contracted sharply. In addition to hitting with no warning, the oil shocks of the 1970s also entailed large transfers from the U.S. and other oil-importing countries to OPEC, thus depressing real income and spending in the former. A self-imposed shift in the relative price of carbon-intensive energy to address global climate change, on the other hand, need not entail such a transfer of purchasing power. Thus there are critical differences between the oil price shocks and the effort to reduce carbon emissions. Our reassuring conclusion regarding aggregate output might also be different if the policy were to be implemented inefficiently (by command-and-control style regulations of the sort put in place in that oil crisis) rather than efficiently (by market mechanisms of the sort that the President has proposed to use).

IX. The Foregoing Estimates Are Conservative Along Several Dimensions

I should emphasize that the estimates I have presented are conservative in the sense that they do not include three factors: the potential cost reductions resulting from the inclusion in the Kyoto treaty of carbon sinks, the potential payoffs to the President's technology or energy efficiency initiatives, or the benefits of mitigating climate change itself. The first omission, sinks, concerns a provision of the Kyoto Protocol that has received less attention than it merits. It is only *net* emissions -- emissions to the atmosphere minus sequestration -- that are to be reduced 7 percent below 1990 levels, not gross emissions. The United States plants many trees every year, and would receive credit for this activity under the Protocol. Very preliminary estimates of the implications for the United States of the Kyoto provision on sinks indicates that carbon sinks could comprise nearly 10% of total required emissions reductions. Decreasing the required emissions reduction by 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 reduce the costs of meeting the Kyoto target by half or more, 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 amount of tree-planting, possibly through some version of the USDA's Conservation Reserve Program, for example.) But neither we nor other analysts are yet sure exactly how to interpret the legal language of the Protocol. Because the quantitative uncertainty is so large, we do not yet have an

estimate with which I feel comfortable. But we do know that the effect of fully modelling the Kyoto provision pertaining to sinks is likely to be both favorable and large.

The estimates I have cited so far also make little allowance for the payoff to the President's \$6.3 billion Climate Change Technology Initiative. The parameter that figures most prominently in analysis of technological progress in the energy field 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. In the SGM model analysis that underlies our assessment, the AEEI is assumed to improve by 1.0 percent per year. Reflecting a conservative interpretation of the 15-year impact of the technology initiative, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook.

Our justification for incorporating into our assessment such 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 have conservatively assumed that there will be substantial lags in producing payoffs from new technology research and dissemination expenditures.

Clearly, this is neither the best outcome the Nation *can* attain nor the best outcome the Administration *expects* to attain as a consequence of our climate change strategy over the next decade. Many energy technology experts forecast more rapid technological progress; and engineering models suggest that some energy improving technologies are available now at negative costs.

If the Administration is successful in speeding the discovery and adoption of new technologies, 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 improvement suggest an increase in the AEEI from 1.0 to 1.25 would be reflected in about a 40% decrease in the permit price.

Our preliminary estimates do not fully reflect potential entrepreneurial response to appropriate incentives. An instructive example of the ability of U.S. industry to perform beyond expectations when given appropriate economic incentives is 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 \$350 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 that offer important market incentives to find cheaper ways of reducing emissions can lead to unexpectedly low prices.

The final, and most important factor that has been left out of the estimates I have presented 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, as I have explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But I trust that nobody will lose sight of our ultimate objective -- keeping our planet the hospitable home that we enjoy today.

CONCLUSION

In conclusion, the Kyoto Agreement and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Agreement 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, and then later with a market-based system of tradeable permits -- to ensure that our objectives are achieved as efficiently as possible.

I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Agreement 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.

[Automated Records Management System Hex-Dump Conversion]

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Joseph E. Aldy (CN=Joseph E. Aldy/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:14-FEB-1998 17:09:30.00

SUBJECT: Re: Revised GCC Testimony

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Randall W. Lutter (CN=Randall W. Lutter/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

TEXT:

Janet,

Randy and I talked today, and we think there are two changes to the testimony from last night that should be clarified.

First, in the Estimated Reduction of Cost from Annex I Trading section, there is a new paragraph comparing SGM to G-Cubed and MRT results on Kyoto. I don't think we should make exact comparisons (e.g., reduce costs by 33%) since G-Cubed simply assumed that about 88% of the U.S. required GHG reductions had to occur in CO2, without integrating a non-CO2 cost curve with the model results. Further, we don't know why MRT yielded such large results -- I have asked Dan to obtain further details on the model assumptions to determine how they handle 6 gases, sinks, paper tons, etc. I think it would be better to state something along the line that we have reviewed other preliminary analyses of Kyoto, and found that G-Cubed results in a lower permit price while MRT results in a higher permit price. Similar modifications in language could be made in the next section on LDC participation as well.

Second, I think the reference in bold to the EMF-14 550 ppm scenarios and varying modeling assumptions is esoteric. The point that is trying to be made here is that since different models have different baseline emissions, allocations in this exercise, done by allowing LDCs to have BAU and Annex I to have the rest, will then vary with different baselines. I think this point is lost on the reader unless one is really familiar with EMF-14. I don't think it should be in testimony, but you might want to use it in Q&A.

Have a great week.

Joe

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Randall W. Lutter (CN=Randall W. Lutter/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:17-FEB-1998 18:05:32.00

SUBJECT: current draft

TO: Peter R. Orszag (CN=Peter R. Orszag/OU=OPD/O=EOP @ EOP [OPD])

READ:UNKNOWN

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TO: JONATHAN.GRUBER (JONATHAN.GRUBER @ MS01.DO.treas.sprint.com @ inet [UNKNOWN])

READ:UNKNOWN

CC: Adele C. Morris (CN=Adele C. Morris/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

Janet: here is the current draft.

Jon: Janet asks that you share a copy with Secretary Summers.

I believe it reflects all the changes we discussed this pm.

In addition, I deleted one paragraph in the ancillary benefits discussion that seemed out of place. It dealt with particulate matter and ozone, and the benefits of reducing emissions that contribute to these. The other categories of ancillary benefits were treated more briefly, so detailed reference to this contentious issue seemed unnecessary.

I have also faxed a copy to State for transmission to Secretary Eisenstat.

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Sanders D. Korenman (CN=Sanders D. Korenman/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:17-FEB-1998 13:27:34.00

SUBJECT: 1st Draft of Affirmative Action Procurement Reform Q&As

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

I am reading it now.

sk

----- Forwarded by Sanders D. Korenman/CEA/EOP on
02/17/98 01:27 PM -----

Richard L. Hayes

02/17/98 12:34:44 PM

Record Type: Record

To: See the distribution list at the bottom of this message

cc: Peter Rundlet/WHO/EOP

Subject: 1st Draft of Affirmative Action Procurement Reform Q&As

Attached please find a 1st draft of the Q&As for the Affirmative Action procurement reform proposal. They are in no particular order, and with some judicious editing I know they can and should be cut-back. Please have at them and give me your suggested changes by this Friday, (February 20), which I will compile and recirculate. Feel free to phrase additional questions (and proposed answers) as you think necessary, e.g., how where the benchmarks derived, etc. I am also preparing a set of basic facts about Federal minority procurement and will be providing comments to Ann's draft message document. Thanks.

Message Sent

To:

Sanders D. Korenman/CEA/EOP

Joseph J. Minarik/OMB/EOP

Sally Katzen/OPD/EOP

Robert N. Weiner/WHO/EOP

Dawn M. Chirwa/WHO/EOP

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Ann F. Lewis/WHO/EOP

Stacie Spector/WHO/EOP

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Mark Gross @ 5148490 @ fax
Linda G. Williams/OMB/EOP

===== ATTACHMENT 1 =====
ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

Unable to convert ARMS_EXT:[ATTACH.D66]MAIL478365742.026 to ASCII,
The following is a HEX DUMP:

AFFIRMATIVE ACTION PROCUREMENT REFORM Q&As

Q. IS THERE REALLY ANYWAY TO JUSTIFY A “RACIAL PREFERENCE” PROGRAM?

A. This is not a racial preference program. Minority firms are not getting a price credit to help them win more contracts than similar firms are winning. Price credits are being used to help level the playing field for small disadvantaged firms, where data show they are not winning their fair share of contract dollars, when compared with otherwise similar firms.

Q. WHAT DO THE BENCHMARKS MEASURE?

A. For each industry, the benchmarks measure the “capacity” compared to the “utilization” of small disadvantaged businesses. The “capacity of small disadvantaged businesses is their share of contracting dollars typically obligated in 1996 to firms, ready and willing to contract with the federal government, controlling for the size and age of the firms. “Utilization” is the actual small disadvantage business’ share of contracting dollars obligated.

Q. WHAT FIRMS WERE THE SMALL DISADVANTAGED BUSINESSES COMPARED TO?

A. The U.S. Department of Commerce gathered data to look at firms that were already and willing to contract with the federal government in 1996. Using data from 1996, the U.S. Department of Commerce gathered data from three sources: a representative sample of firms that either won or lost bids on competitive government contracts; all other firms that had new definitive contract actions let in fiscal year 1996, and; all firms certified for participation in the Small Business Administration’s 8(a) program.

Q. IF THERE IS A DIFFERENCE BETWEEN THE DOLLARS WON BY SMALL DISADVANTAGED BUSINESSES, AND THE DOLLARS THEY WERE EXPECTED TO WIN, DOES THAT MEAN THE FEDERAL GOVERNMENT IS DISCRIMINATING AGAINST SMALL DISADVANTAGED BUSINESSES?

A. Not necessarily. Differences between dollars won, and dollars typically awarded to firms of similar size and age, could reflect the effects of discrimination in the private sector on the competitiveness of small disadvantaged businesses in the federal sector.

Q. COULD THE DIFFERENCES BETWEEN SMALL DISADVANTAGED BUSINESSES AND OTHERS, IN THEIR FEDERAL CONTRACTING EXPERIENCE, BE THE RESULT OF GREATER EFFICIENCY FOR OTHER FIRMS? AND IF SO, IS THIS PROGRAM JUST REWARDING THE INEFFICIENCY OF SMALL DISADVANTAGED FIRMS?

A. No, the program is aimed at leveling the playing field for small disadvantaged businesses. Because the benchmarks compare firms of equal age, and size, within the same industry, many economists think that management ability among those firms would be similar. Any remaining differences between small disadvantaged firms and others, are likely to be related, directly or indirectly, to some factor of discrimination like access to working capital or price discrimination from suppliers.

Q. WHY SHOULD THE GOVERNMENT CARE IF THIS PARTICULAR GROUP OF FIRMS

IS "UNDER USED," AS OPPOSED TO ANY OTHER GROUP OF FIRMS?

- A. The President is committed to removing any vestiges of racial discrimination, as a barrier to the full participation of all Americans in our society and economy.

Small, disadvantaged businesses play a significant role in making the competitive bid process more competitive.

- SDB firms represent about 16 percent of all firms in the competitive bid process, with higher shares in some industries
- In many industries, SDB presence is vital to the competitive process. For instance, in the standard industrial code for repair services, almost 10 percent of solicitations would have resulted in only one bidder, if SDB firms had not also bid.

- Q. GIVEN THE SMALL BUSINESS ADMINISTRATION'S 8(A) PROGRAM, DOESN'T THIS PROGRAM CREATE ADDITIONAL ADVANTAGES FOR THE SAME FIRMS?

- A. No.

- The price credit program will be offered to a set of small, disadvantaged business owners virtually distinct from the set of firms in the 8(a) program. Fewer than 10 percent of the small disadvantaged businesses who bid on contracts, outside the 8(a) program, are 8(a) firms
- Slightly more small, disadvantaged businesses are participating in the competitive bid process (estimated to be about 7,000, excluding 8(a) firms that participate in the non-8(a) competitive bid process) than are in the 8(a) program (around 6,200).
- While still small, these non-8(a) small, disadvantaged businesses, tend to be larger, slightly older, and appear to have higher productivity than 8(a) firms. Though we have not, at this time, determined their relationship to the 8(a) program, the data are consistent with these firms being predominantly successful graduates of the 8(a) program and not firms that were unable to meet 8(a) certification standards.

- Q. WHY HAVE TWO PROGRAMS AIMED AT MINORITY BUSINESSES? CAN'T THIS PROGRAM JUST REPLACE THE SMALL BUSINESS ADMINISTRATION'S 8(A) PROGRAM?

- A. No. The price credit, which addresses fair utilization of existing disadvantaged businesses, needs the 8(a) program to help address the low presence of minority firms. Because the problems faced in firm creation are different from the problems existing firms face in being successful, one policy tool is unlikely to address both sets of problems.

- Q. DOESN'T THIS PROGRAM CREATE NEEDLESS TOOTH GNASHING OVER RACE, WHEN THE GAPS IN CONTRACTING FACED BY MINORITY FIRMS IS SMALL?

- A. No. The gaps between the amount of contracting dollars awarded to small disadvantaged businesses, and the average size of contracts typically won by firms of their size, can be large. For instance, in the industrial classification for engineering, accounting and management related services, SDBs won about x percent of contracting dollars, though given their firm size, SDBs might have won about x percent of contracting dollars. On a national scale, SDBs won about x percent of contract dollars in competitive bids for general construction, while given their firm size they might have won about x percent.
- Q. WON'T THIS PRICE CREDIT MEAN THE COST OF DOING FEDERAL GOVERNMENT PROCUREMENT WILL BE HIGHER?
- A. No.
- Price is only one factor in determining a winning contractor. The low bid is not the automatic winning bid. Further, only a small share of government contracting is subject to full, and open, competition bids.
 - In the short run, the price credit may make all firms bid more competitively. The experience the Department of Defense had with its authority to use a price credit showed that in the industries, where we are applying the price credit, the price credit did not increase costs for the Department of Defense for the contracts won by small disadvantaged businesses. Almost all small disadvantaged businesses that won contracts were the low bid.
 - Over time, the government's interest is in maintaining a competitive process. Small disadvantaged firms have proven themselves important to keeping the process competitive. So, in the end, a viable, small disadvantaged business community helps keep costs down.
- Q. WHY DO MINORITY FIRMS GET PRICE CREDITS IN INDUSTRIES WHERE THEY ALREADY MAKE UP A LARGE SHARE OF CONTRACTS, FOR INSTANCE, AS IN STANDARD INDUSTRY CODE 73?
- A. This program is not a racial preference program, and it is not a racial quota. The price credits are being used to level the playing field for small disadvantaged firms, where the data show they are not winning their fair share of contract dollars, when compared to otherwise similar firms. The purpose of the benchmarks is not to preordain a limit on minority contracting, but to establish a fair and level playing field. On that fair and level playing field, minority contracting may be at a high, or a low level. Overall, small disadvantaged firms make up 25 percent of the firms identified in the data base used to create the benchmarks. Adjusting for the age and size of those firms, it could be expected that they could handle 12 percent of all contracting. So, in some industries that number will be higher, and in other industries it will be lower.

Minority firms face discrimination that makes the type of industries they start businesses in differ from the types of industries non-minorities start businesses. Consequently, they will be more

concentrated in some industries than others. Because of differences in access to clients, perhaps because of overt discrimination, perhaps because of differences in the ability to network, minority firms can also have different attitudes toward public sector contracting than non-minority firms. Unlike employment, civil rights laws do not cover business contracts with other businesses. Because the public sector is so small compared to the private sector, minority firms may show up as a disproportionate share of businesses in the public sector.

By way of example, think back to when women were virtually excluded from private sector law practice. Imagine that 90 percent of law graduates who pass their bar exams are male, and 10 percent are female. Also, imagine that the federal government hires 15 percent of all new law students. Ignoring state and local government for now, that would put 85 percent of lawyers in the private sector. Now, back to the exclusion of women from private practice. If private law firms did not hire women, and instead all came to the federal government for work, then 67 percent of applications for federal government will have a legal work force that is two-thirds female. If the government does not have a legal work force that is two-thirds female, then it would have to hire some unqualified males, or outbid the private sector to get qualified males.

Suppose because of discrimination in employment, and discouragement on the part of schools, instead of going on to law school, women with the same ability to do legal work went into social work. Imagine that 80 percent of social work graduate students were female. Social work is a profession where a disproportionate share of the workers are in the public sector. So imagine that the federal government hires 40 percent of all social workers graduates. But in this case, the non-federal sector also hires women. If men and women equally apply to the federal and non-federal sector, then 80 percent of job applicants will come from females. Again, if the government does not hire a social worker workforce that is 80 percent female, it would have to hire some unqualified males, or outbid the non-federal sector to get qualified males.

To finish the example, if social workers are only 1 percent of all government employees, the high share of women who are in social work will not offset their potential for under-representation in the federal sectors as a whole. If the government does not take measures to have a fair hiring practice, in the examples given, then it would have to hire unqualified applicants or outbid the private sector to get qualified applicants. Neither is a satisfactory outcome.

The example is a simplification of the problem, of course. It serves to highlight how discrimination in the private sector can affect utilization in the federal sector. However, the example would also have to acknowledge that discrimination in the private sector could affect the federal sector in other ways. For example, in the case of the lawyers, if federal personnel offices hired experienced lawyers, then males would clearly have advantages over females because of discrimination in the private sector. In that way, though the personnel officers may not be using an unreasonable job requirement, they would still carry the effects of private discrimination into the public sector. And so, even though women may be found in the private sector, way out of proportion to their numbers in the overall population of lawyers it may still prove necessary, in this example, for the federal government to take some action to prevent repeating discrimination.

Q. WHAT IS THE PURPOSE OF THE CLINTON ADMINISTRATION'S NEW REGULATIONS
TO REFORM AFFIRMATIVE ACTION IN FEDERAL PROCUREMENT?

A. These regulations are a serious and thoughtful effort to ensure that federal affirmative action procurement programs comply with the standards set in the Supreme Court's 1995 decision in *Adarand v. Peña*. They also fulfill the President's commitment to "mend, not end" these programs. These regulations continue this country's efforts to eliminate the effects of past and continuing discrimination against minority-owned firms lawfully, without eliminating affirmative action entirely.

Q. HOW DOES THIS NEW PROGRAM DIFFER FROM THE SDB PROGRAMS PREVIOUSLY IN EFFECT?

A. There are several significant differences. First, the proposal would tighten certification requirements for small, SDB's. Second, agencies would be required to implement measures that do not rely on race to broaden the opportunities for small, minority firms. Third, a series of "benchmarks" estimated by the Department of Commerce would tie the use various SDB procurement mechanisms to statistical data demonstrating that minority-owned firms have been disadvantaged in particular industries. The proposed system would only use SDB set-asides at a last resort and after trying lessor means. Instead, contracts would be open to all firms and agencies would be able to use price evaluation adjustments as part of the bidding process, a tool that was previously authorized only at the Department of Defense and in a few other aspects of federal procurement.

Q. DOESN'T THE SUPREME COURT'S *ADARAND* DECISION PROHIBIT THIS TYPE OF AFFIRMATIVE ACTION PROGRAM?

A. No. The Supreme Court confirmed that the federal government can use affirmative action to remedy the effects of racial discrimination, but held that we must narrowly tailor such programs to serve a compelling government interest. After a thorough review of federal affirmative action programs and the legislative history and justifications for them, the Justice Department concluded that there still exists a compelling need for federal procurement programs that benefit disadvantaged minority businesses. However, agencies must change the manner in which they use affirmative action in federal procurement to meet the requirements of *Adarand*.

Q. WHAT MAKES THIS NEW SYSTEM NARROWLY TAILORED?

A. The Supreme Court identified six relevant factors when using race and ethnicity to award federal contracts, which these regulations address.

- First, agencies must always to use race-neutral alternatives, such as outreach and training, to the maximum extent possible.
- Second, race cannot be the sole factor in SDB procurement decisions — all firms obtaining federal contracts, must show that they qualify to perform the work.

- Third, SDB procurement mechanisms will be used only when the data on procurement shows that minority businesses have been disadvantaged.
- Fourth, the authorized SDB procurement mechanisms and price evaluation adjustment percentages, by major SIC group, will be based on an annual analysis of the use of SDB firms as related to the number of qualified SDBs to perform the work in question.
- Fifth, as SDB firms are more successful in obtaining federal contracts, the authorized price evaluation adjustment level will decrease automatically and end altogether, with the elimination of discrimination in various sectors of the economy.
- Finally, the new program will not over burden non-SDB businesses. The overwhelming percentage of federal procurement money will continue to flow, as it does now, to non-minority businesses.

Q. WON'T THIS PROGRAM RESTRICT OPPORTUNITIES FOR NON-DISADVANTAGED FIRMS?

A. No. In 1997, only 6.5 (check) percent of the federal government's purchasing was conducted with disadvantaged businesses even with the use of affirmative action programs. Thus, 94 (check) percent of the government's business goes to non-SDB firms. The President's review of affirmative action programs did find that the use of set-asides has created some concentrations of SDB awards in some industries and regions. The Defense department suspended use of the rule of two set-aside program in October 1995. That action was taken because of the Justice Department's review and recommendation and after several cases were filed challenging the constitutionality of that program.

- For one, the new regulations open participation in the SDB program to more women and nonminorities.
- Second, firms that do not participate in SDB programs received more than 94% of the government's contracting business in FY 1996, and that will likely continue under the new proposal.
- Third, contracts will be awarded in competitive bidding, with price evaluation adjustments, rather than being set aside for bidding only by SDB firms.
- Finally, the regulations are designed to ensure that SDB awards will not be unduly concentrated in particular industries and geographic markets. The benchmark limitations will limit the use of SDB procurement mechanisms to circumstances where discrimination has reduced SDB participation in contracting.

Q. WE HAVE HAD AFFIRMATIVE ACTION IN FEDERAL PROCUREMENT FOR TWO DECADES. WHY DO WE STILL NEED MINORITY BUSINESS PROGRAMS? DO THEY REALLY SERVE A "COMPELLING INTEREST?"

A. Yes. In the 1970's, minority-owned firms received only 1% of the federal contracting dollar. With affirmative action programs, minority businesses have been able to make progress in breaking into a government procurement system that had effectively locked them out before. The evidence today demonstrates, however, that discriminatory practices continue to create additional hurdles for minority firms competing for government contracts. The available evidence of discrimination paints a compelling picture for remedial action in government procurement, a need that was reaffirmed by Congress in 1994 when it enacted FASA.

Q. WHAT EVIDENCE DO YOU HAVE TO BACK UP YOUR CONTENTION?

A. The evidence is overwhelming and has been thoroughly documented in an analysis of the legislative history and available empirical data conducted by the Department of Justice. For example,

- the typical white-owned business receives three times as many loan dollars as the typical black-owned business with the same amount of equity capital.
- In construction, white-owned firms receive fifty times as many loan dollars as black-owned firms with identical equity. Once formed, the exclusion of minority firms from "old boy" business networks deprives them of critical information about potential contracts and places them at a competitive disadvantage.
- Difficulties in obtaining bonding also hinder minority firms who want to participate in government procurement. One Louisiana study found that minority firms were nearly twice as likely to be rejected for bonding, three times more likely to be rejected for bonding for more than \$1 million, and on average were charged higher rates for the same bonding policies than white firms with the same experience level.

Q. IS THE SBA 8(A) BD PROGRAM AFFECTED BY THE NEW REGULATIONS?

A. Yes, but the 8(a) program would remain in effect. The 8(a) program is a business development program that is distinct from the other SDB programs.

- It is more narrowly tailored because of its more stringent requirements for eligibility and certification, especially with respect to whether participating firms are economically disadvantaged.
- Firms in the 8(a) program must develop and meet business development plans and they may only stay in the program for a limited time. The Justice Department will continue to defend the constitutionality of the program on that basis.

Q. WHAT IMPACT WILL THE BENCHMARKS HAVE ON SBA'S 8(A) BUSINESS DEVELOPMENT PROGRAM?

A. To ensure that affirmative action in federal procurement is fair and consistent with the spirit of these reforms, agencies use of the 8(a) program will be guided by the benchmark limitations established by the new regulations. If the level of minority contracting in an industry exceeds the benchmark calculation, the SBA Administrator can take several steps, including: (1) limiting entry of new firms into the program in that industry for some time; (2) accelerating graduation for firms that do not need the full period of sheltered competition; or (3) limiting the number of 8(a) contracts awarded in particular industries or in specific geographic areas where contracts may be unduly concentrated.

Q. HOW WILL THE BENCHMARK LIMITATIONS WORK?

A. The benchmark limitations will represent the level of minority participation in federal procurement that would be expected in the absence of discrimination. They are a measure of the capacity of minority contractors to perform the work in a particular industry — or what it would be, absent discrimination. Benchmark limitations will be calculated for major SIC groups at the two-digit level. If in an industry, SDB participation in federal procurement matches or exceeds the capacity of SDB firms to do the work, the authorized price evaluation would be adjusted downward accordingly.

Q. HOW WILL THE PRICE EVALUATION ADJUSTMENTS WORK IN PRACTICE?

A. In competitive, negotiated competitions, contracting officers will be able to award a contract to an SDB if the SDB is qualified to perform the work and its bid is within a certain percentage of the fair market value of the contract. The Federal Acquisition Streamlining Act ("FASA") passed by Congress in 1994 authorizes credits of up to 10%. Under the new regulations, price evaluation adjustments will be anywhere from 0 to 10% of fair market value, depending upon an analysis conducted by the U.S. Department of Commerce. Prime contractors, who commit to using SDB subcontractors, will also be eligible to receive an adjustment. However, the proposal does not require agencies to use numerical credits based on the price of the contract. Agencies will have flexibility to develop other methods for awarding credits to SDB's and prime contractors who use SDB subcontractors.

Q. ARE THE BENCHMARK LIMITATIONS QUOTAS?

No. A quota is a fixed number that must be achieved despite the availability of qualified individuals. It lacks flexibility and disregards merit. The benchmark limitations are precisely the opposite. They impose limitations on the use of SDB procurement mechanisms. As minority firms are more successful in obtaining federal contracts, reliance on them will decrease. The benchmark limitations provide a means to measure success in providing opportunities for SDBs,

but they do not set a minimum or a maximum level of minority contracting that must be achieved. Never would an agency ever be required to award a contract to an unqualified firm simply to meet a benchmark.

Q. WILL SDB SET-ASIDES BE PERMITTED UNDER THESE REGULATIONS?

A. Not at first. Agencies would only be authorized to award price evaluation adjustments under the new program. Only if these mechanisms do not eliminate the vestiges of discrimination in particular industrial sectors, will the use of set-asides be considered.

Q. WHO IS ELIGIBLE TO PARTICIPATE IN THIS PROGRAM? IS THE PROGRAM RESTRICTED TO MINORITIES? HOW MANY FIRMS DO YOU EXPECT TO APPLY?

A. Any business owned and controlled by one or more socially and economically disadvantaged is eligible to participate in the program. Although statute presumes certain racial and ethnic minorities to be disadvantaged, the regulations permit others to be included as well, for example, a poor Appalachian white person who has never had a quality education or the ability to expand his or her cultural horizons. In order for a non-minority firm to establish their eligibility, the new regulations permit them to establish that they are socially and economically disadvantaged under a lower standard of proof — a preponderance of the evidence test rather than a clear and convincing test.

Q. WHICH GROUPS HAVE A REBUTTABLE PRESUMPTION OF BEING SOCIALLY DISADVANTAGED? ARE WOMEN A PRESUMED GROUP?

No. The following designated groups are presumed to be socially disadvantaged: Black Americans; Hispanic Americans; Native Americans (American Indians, Eskimos, Aleuts, or Native Hawaiians); Asian Pacific Americans (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru); Subcontinent Asian Americans (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands or Nepal).

Q. WHAT IS THE PROCESS FOR CERTIFYING DISADVANTAGED AND ECONOMIC STATUS? WHAT EVIDENCE WILL SBA RELY UPON?

A. In determining whether an individual is socially disadvantaged, SBA will consider the totality of the circumstances experienced by the individual, such as their education, employment and business history, as it demonstrates such disadvantage. In evaluating whether an individual is economically disadvantaged, SBA will consider the extent to which a disadvantaged individual's ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities. A person will be ineligible if their net worth exceeds \$750,000, net of the value of their home or financial interest in the firm.

Q. IS THE NEW PROGRAM A RETREAT FROM CURRENT AFFIRMATIVE ACTION PROGRAMS? WILL IT RESULT IN A REDUCTION IN MINORITY CONTRACTING?

A. The new regulations implement the authority extended to federal agencies by FASA in 1994 to promote opportunities for SDBs, including the use of the measures such as price evaluation adjustments for SDB. Previously, only DoD and a handful of smaller agencies had this authority. Agencies are also being encouraged to make even greater efforts to use tools that do not explicitly rely on race in procurement decisions, such as outreach and training for SDB contractors.

Q. WHAT EFFECT WILL THESE REGULATIONS HAVE ON WOMEN-OWNED BUSINESSES?

A. These new regulations may increase opportunities for women and other non-minorities. By lowering the standard of proof that women-owned businesses, among others, must meet to establish that they are socially and economically disadvantaged, qualifying as SDBs will be easier for them.

- This proposal does not alter the current goal for the inclusion of women in federal contracting, nor does it alter the Department of Transportation's Disadvantaged Business Enterprise program, which includes women in its procurement goals. Neither of these programs provide for price evaluation adjustments or sheltered competition.
- In addition, under Supreme Court precedent, strict scrutiny does not apply to classifications based on gender. Adarand, therefore, does not require the application of strict scrutiny to these programs focused on creating opportunities for women-owned businesses.

Q. DOES THIS PROPOSAL ATTEMPT TO COMBAT FRAUD?

A. Yes.

- For the first time, firms must present a certification from entities approved by SBA that the identified socially and economically disadvantaged individuals in fact own and control the company.
- The new rules also require prime contractors to verify an SDB's status by consulting an SBA list for both subcontract targets and for the subcontracting plan.
- Also, the rules allow for challenges as to the veracity of a firm's representation of being an SDB.
- In addition, the Department of Justice and SBA are committed to identifying and prosecuting to the full extent of the law individuals who misrepresent their SDB status.

Q. DOES THIS PROGRAM CREATE BENEFITS FOR UNQUALIFIED FIRMS?

A. No. Every firm is required to meet all quality and performance standards in order to be selected for any contract award.

Q. DO THESE NEW REGULATIONS AFFECT THE DEPARTMENT OF TRANSPORTATION'S DBE PROGRAMS?

No. DOT's DBE program is covered by a separate statute. (More)

Q. WON'T THESE REGULATIONS REPRESENT A GREAT DEAL OF ADDITIONAL WORK FOR PRIME CONTRACTORS?

A. No. These regulations will not require significant contractor investment or a long implementation period, nor will they be particularly complex to carry out, particularly for contractors who have experience dealing with DOD. All of the procurement mechanisms contained in the rule have been used in DOD for some time. In extending them to the civilian agencies, we have simplified them to maximum extent possible and they should not cause unnecessary difficulties as entrepreneurs try to follow them.

Q. WHAT IS THE PROCESS FOR DETERMINING WHEN ADDITIONAL OR ALTERNATE DBE PROCUREMENT MECHANISMS WILL BE AUTHORIZED?

A. Under the rule, the Department of Commerce is not limited to the SDB procurement mechanism identified in this section where the Department has found substantial and persuasive evidence of (1) a persistent and significant underutilization of minority firms in a particular industry, attributable to past or present discrimination; and (2) a demonstrated incapacity to alleviate the problem by using those mechanisms.

By the same token, if an agency feels a particular industry category to bear a disproportionate share of the contracts awarded by a contracting activity's goals for SDB concerns, requests for a determination, including supporting rationale, including any peculiarities related to industry, regions, or demographics, may be submitted to Commerce for a determination. If approved by commerce, a contracting office will be permitted to limit the use of the approved SDB mechanism in future limitations only.

Q. HOW ARE YOU GOING TO KEEP PRIME CONTRACTORS FROM MISREPRESENTING THEIR SDB UTILIZATION?

A. These new regulations require firms claiming an SDB procurement benefit to be certified and

included on a SBA-maintained register. By requiring prime contractors to check that register before treating them as SDBs, they will know that they are using legitimate SDB firms. Moreover, the government will review the accuracy of any reports submitted by prime contractors as part of the normal contract oversight.

Q. DO THE BENCHMARKS FACTOR IN THE LEVEL OF SUBCONTRACTING? HOW IS THIS DONE, WHEN THERE IS NO SUCH DATA BASE TO DO IT WITH?

A. No. (Elaborate).

Q. IN ITS MAY 23, 1996 PROPOSED RULE, THE DOJ INDICATED IT INTENDED TO STEP UP OUTREACH AND TECHNICAL ASSISTANCE. ARE THERE ANY SUCH INITIATIVES BEING PURSUED?

A. ???????????.

Q. ARE AFFIRMATIVE ACTION PROCUREMENT PROGRAMS STILL NEEDED?

A. Yes. Disadvantaged business programs were enacted in response to specific findings that discrimination has impeded the ability of minority-owned and other disadvantaged firms from developing in our economy. Affirmative action has closed many gaps in economic opportunity, but the need remains.

Q. AREN'T AGENCY GOALS FOR AWARDING CONTRACTS TO SDBS REALLY QUOTAS?

A. No. Goals are not a numerical straight-jacket -- they reflect an aspiration that a certain percentage of contracting will be with disadvantaged firms, not a guarantee that it will happen. Indeed, until 1993, even the 5% goal was not achieved. The only consequence of failure to meet a goal is that an agency will be expected to continue to make a good faith effort. Similarly, the 5% goal is not a cap.

Q. WHAT OTHER CHANGES ARE YOU MAKING TO THE SBA 8(A) BD PROGRAM?

A. SBA is working hard to improve the efficiency of the program and have already carried out important changes in this regard. In the future, we hope the program can give meaningful help to a greater number of eligible participants. (More)

Q. WHAT MUST AN SDB DO TO BE ELIGIBLE FOR THE PROGRAM?

A. To be eligible for a price credit, an offeror must submit a certification, obtained within the past three years, that the business is owned and controlled by one or more socially

disadvantaged

persons. Members of designated minority groups seeking to participate in SDB programs fall

within the statutorily mandated presumption of social and economic disadvantage established

in Section 8(d) of the Small Business Act. Non-presumed offerors who do not fall within the

statutory presumption can qualify by submitting evidence proving their social and economic

disadvantage status.

Q. WHO BE RESPONSIBLE FOR CERTIFYING SDBS?

A. The Small Business Administration's Office of Government Contracting and Minority Enterprise Development will administer the new SDB Certification program. In particular, they will:

- certify all qualified concerns requesting SDB certification;
- decide protests and appeals;
- establish and oversee a nationwide network of private certifiers who will help SBA process applications, ensure that they are complete and correct in form, and make a determination that the applicant firm is in fact owned and controlled by the individuals identified as the owner; and
- maintain a national public on-line registry of certified SDBs.

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Randall W. Lutter (CN=Randall W. Lutter/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:18-FEB-1998 09:22:55.00

SUBJECT: current draft is attached

TO: Peter R. Orszag (CN=Peter R. Orszag/OU=OPD/O=EOP @ EOP [OPD])

READ:UNKNOWN

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TO: JONATHAN.GRUBER (JONATHAN.GRUBER @ MS01.DO.treas.sprint.com @ inet [UNKNOWN])

READ:UNKNOWN

CC: Sandra F. Daigle (CN=Sandra F. Daigle/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

CC: Adele C. Morris (CN=Adele C. Morris/OU=OMB/O=EOP @ EOP [UNKNOWN])

READ:UNKNOWN

TEXT:

My apologies for the transmission of yesterday without the attachment.

----- Forwarded by Randall W. Lutter/CEA/EOP on 02/18/98
09:17 AM -----

Randall W. Lutter

02/17/98 06:05:48 PM

Record Type: Record

To: JONATHAN.GRUBER @ MS01.DO.treas.sprint.com @ inet, Peter R.
Orszag/OPD/EOP, Janet L. Yellen/CEA/EOP

cc: Adele C. Morris/CEA/EOP

Subject: current draft

Janet: here is the current draft.

Jon: Janet asks that you share a copy with Secretary Summers.

I believe it reflects all the changes we discussed this pm.

In addition, I deleted one paragraph in the ancillary benefits discussion that seemed out of place. It dealt with particulate matter and ozone, and the benefits of reducing emissions that contribute to these. The other categories of ancillary benefits were treated more briefly, so detailed reference to this contentious issue seemed unnecessary.

I have also faxed a copy to State for transmission to Secretary Eisenstat.

===== ATTACHMENT 1 =====
ATT CREATION TIME/DATE: 0 00:00:00.00

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CHAIR,COUNCILOFECONOMICADVISERSBEFORET

HEHOUSECOMMERCECOMMITTEEONTHEECONOMICSOFTHEKYOTOAGREEMENTMARCH4,1998}Thank

yo

u,Mr.Chairman.ThePresident hassaid that we can work to avert the grave dangers of climate

change, while at the same time maintaining the strength of our economy. I am pleased to have this

opportunity to appear before the Committee to elaborate on the President's statement. The

international agreement that was reached in Kyoto this past December is a crucial first step in

addressing global climate change. But it is only a first step. Since the international effort

to reduce greenhouse gas emissions is more of a work in progress than a completely finished

product, it is not yet possible to provide a full authoritative analysis of it. Many of the specific

issues in several crucial areas are not completely resolved in the diplomatic arena, forcing any

attempt 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, such as effective

international emission trading arrangements, meaningful developing country participation

and reliance on flexible, market-based measures, that ensure that reductions in global

greenhouse gas emissions are consistent with continued strong economic growth. I will explain

the reasoning underlying my 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, as well as emission 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 over the next 5 years to jumpstart our efforts. 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 economists perspective, for the Kyoto Agreement. T@4

<DL!T\$&))+-0d24XTT The earth's surface is warming from the accumulation of greenhouse gases from myriads of sources worldwide. None of these seem to presently pay 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 agreement is that without such an international agreement, individual nations will not have the proper incentive 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 that are likely if we fail to take any action for these costs provide the primary motivation for reducing 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 4

If global emissions continue unabated, the atmospheric concentration of CO₂ will likely double relative to its preindustrial level by mid-way through the next century. As a result of the increased concentration of CO₂, the IPCC estimates that global temperatures will increase by between 2.5 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 any given region at any 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 over ocean. Many models predict larger increases in evaporation than in precipitation over midlatitude land areas, which would result in drier conditions in those regions, especially during summer in North America and Europe. Potential consequences associated with this shifting 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 fresh water supplies, and damage to ecosystems and biodiversity. Economic and Monetary Damages & D # 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 forecasting 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). A subject of great uncertainty and sensitivity is the discount rate that is applied to the benefits of averting future climate change. Such a discount rate is needed if the analysis is to be expressed in monetary terms, because a dollar today is not worth the same as a dollar tomorrow. And 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 of yet, no professional consensus on the issue. A similar point concerns risk aversion. To what extent are we willing to take chances with our planet? The point applies particularly to a

catastrophe scenarios. Scientists have thought of many possible scenarios, most of which they are fortunately not yet prepared to pronounce as particularly likely based on current evidence, but which might be truly catastrophic for the planet if they were to occur. There is a strong argument for the Kyoto agreement 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? It is difficult for an economist, or anyone, to know. Despite these shortcomings and potential problems, respected researchers have developed estimates of the monetary damages expected from an average world-wide temperature increase of approximately 4.5 degrees Fahrenheit (corresponding to, roughly, a doubling of pre-industrial carbon dioxide concentrations). For example, William Cline, then at the Institute for International Economics, estimated that such a temperature change would impose annual damages of more than \$70 billion per year on the U.S. economy in today's terms. These damages include \$22 billion in lost agricultural production, \$13 billion in additional electricity costs, and \$8 billion in new costs to maintain the existing supply of freshwater. (Cline's original estimates are quoted in 1990 dollars. The figures given above translated those numbers into 1997 dollars using the annual GDP price index.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of carbon dioxide concentrations. He finds that the Cline estimate is in the center of three estimates for the U.S., and that the highest estimate is only 1.3 times greater than the lowest estimate. It must be noted, however, that this similarity of aggregate 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. In particular, the estimates may not fully reflect potential nonlinearities in the relationships between carbon dioxide 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 quantitative analyses (%, %) do not, and cannot, accurately reflect the small and unknown possibility of large-scale and potentially irreversible discrete events with potentially catastrophic consequences. Two such possibilities serve as illustrations.

Warming of Northern tundra may release very large amounts of methane from the subarctic permafrost, thereby leading to potentially devastating acceleration of an otherwise controllable global warming process. We do not know at what point, if any, such 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 displacement of the Gulf Stream that warms Western Europe. Evidence from ocean core samples suggests such changes of ocean currents have occurred in previous ice ages. Reductions in the risk of such catastrophic outcomes must be considered in addition to the costs and benefits that can be reasonably quantifiable. Since human beings are typically averse to risk, such possibilities 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: "0 The effort must be global, to address the global externality inherent in the nature of the problem.

(# "0 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, greenhouse gas emissions from all other

countries would continue to grow, and the risks posed by climate change would not be significantly abated. 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. The first 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 a long-term objective of limiting greenhouse gas concentrations and encouraged the established 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. 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 take substantial steps to stabilize atmospheric concentrations of greenhouse gases. The Kyoto Agreement, which requires the advice and consent of the Senate, would place binding limits on industrial countries' emissions of the six principal categories of greenhouse gases: CO₂, 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 agreement, each industrial country's 1990 baseline is actually based on 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 1990 levels by the period between 2008 and 2012. To meet that target, net U.S. emissions of greenhouse gases -- all emissions minus removal of CO₂ by certain forestry-related activities -- must average no more than 1,484 million metric tons of carbon equivalent per year during that period. 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. %XX 0 #XVX%;#The President has made clear that his support of the Kyoto Agreement is dependent on meaningful participation from key developing countries (who are not included in Annex I). The President has also made clear that he will not submit the treaty to the Senate without such participation. There are several reasons why meaningful participation from developing countries is essential. First, developing countries are projected to contribute a majority of total emissions by 2030 under a continuation of business as usual. Without the participation of developing economies, emissions reductions by the industrialized countries will therefore not achieve necessary protection from climate change. Indeed, if developing countries do not participate in the international regime, their emissions could potentially increase by more than under their business as usual baselines. One mechanism for such an unintended consequence is as follows. (%) As Annex I countries comply with their targets, their demand for oil will fall, which will probably work to reduce the price of oil on world markets, and perhaps to encourage nonparticipating countries to use more oil and emit more carbon than they otherwise would have. 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 by U.S. companies domestically. Again, greenhouse gas emissions have the same basic impact on the climate regardless of where they occur. So reductions in developing countries have the same environmental benefits as reductions domestically. 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 on their ability to contribute to the solution. Thus even poor countries should contribute, although the exi

stence of more pressing social needs in such countries will inevitably limit the level of their contributions. So far I have not mentioned the word competitiveness. One of the difficulties in analyzing concerns related to competitiveness is that the term itself is used to mean many different things. I have seen at least one study that uses the loss of competitiveness to refer to predictions of negative effects on the aggregate trade balance. As a professional economist, I do not accept the logic upon which that particular argument is predicated: the aggregate trade balance is determined by macroeconomic forces, the difference between saving and investment and not by our environmental policies. On the other hand, if competitiveness refers to adverse effects on a few specific manufacturing industries that are especially energy intensive, such as aluminum, paper, and chemicals, the situation may be more complicated. It is difficult to undergo a significant 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 in Venezuela. Similarly, gas prices were \$3.71 per gallon in Switzerland and \$4.41 per gallon in France. Yet U.S. industry is not moving en masse to Venezuela, nor is European industry moving to the United States. Third, roughly two thirds of all emissions are not in manufacturing at all, but in transportation and buildings. I therefore believe it more accurate to say that we need developing country participation for the reasons I outlined above, than to say that we need it to avoid adverse effects on competitiveness.

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 achieve their objectives in the most efficient manner possible. The nature of the climate change problems 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 to fall. Such methods have long been championed by economists interested in increasing the efficiency of protection. Indeed, the 2,600 economists who signed the 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 in some sense 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. The Kyoto Protocol incorporates this principle of when flexibility in four ways: "0 First, the cuts to be made in the first period are less severe, and the first period ends much later, than what had been proposed by many other countries, most notably the Europeans. 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 still in the prime of their operating lives, while attaining the same ultimate environmental goals.

2. Second, under the Kyoto agreement, the emission 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.

3. Third, there is allowance for banking emission reductions within the 2008-2012 period, for use in a subsequent commitment period [although the emission targets of the next period, for use in a subsequent commitment period]

iod have not yet been specified].

(#(# 0,%) 2. What flexibility (gases and sinks) The

second type of flexibility is what flexibility, along two dimensions. XVXXXV The first is the

8 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 pollutant can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects. The Kyoto Protocol stipulates that countries with binding targets are expected 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 8

be cheap to achieve the same environmental benefit by eliminating one molecular unit of SF

6 \$

than nearly 24,000 units of CO₂. p Some initial rough analysis indicates that a strategy

of reducing non-CO₂ greenhouse H gases by more than 7 percent below their 1990/1995 baseline levels while reducing CO₂ by less 4

than 7 percent below its 1990 level could reduce green

house gas emission permit prices by more than 10 percent. #XVXXXVN[#XVXXXV 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. These second sources 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. Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO₂ at much lower costs than reducing emissions of greenhouse gases. #XVXXXVa#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 agreement includes three important cost-saving provisions of this nature."

0 First, it provides for countries that take on binding targets, at present the industrial

%X" countries, to trade rights to emit greenhouse gases with each other. This market in emissions permits will ensure that emission reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emission reductions in other participating countries when doing so would reduce their costs lowering costs without affecting the level of environmental protection.

(#(# "0 Second, the agreement provides for joint implementation by Annex I countries. Thus if ,%) one industrial country

did not develop a program of tradeable emission permits, U.S. firms could nonetheless implement projects for which they could receive emission reductions credits in the U.S.

(#(# "0

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.

(#(# Detail of these provisions will be worked out in negotiations in Buenos Aires later this year. IV. Difficulties of Economic Analysis of the Kyoto Agreement

p 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 I wish to emphasize once again the inherent limitations to any such estimates. Such limitations should not be surprising to you: economists have a difficult

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 ample,the costs of emissions reductions depend critically on the extent of global participa
 tion and international trading that a treaty is assumed to feature. But in addition to the depe
 ndence of the results from a given model on the precise assumptions, different models can give
 different answer even when all the assumptions are specified to be the same a concrete illu
 stration of the range of uncertainty to which we must assign the predictions of anyone individua
 l model. One area in which the uncertainty is particularly large is the pace of technologica
 l progress including diffusion of existing energy efficient technologies, as well as resear
 ch and development of new technologies and the extent to which the pace will accelerate in resp
 onse to government programs. Economics does not offer a good understanding of how technologi
 cal progress is determined, in part because it is the stuff of experimentation, brainstorms,
 genius, breakthroughs, perceptions and habits. Invention is largely determined by inspira
 tion notwithstanding Edison, who assigned a 99 percent share to perspiration and inspiratio
 n, in my experience, is difficult to fit into mathematical formulae or economic models. Model
 sand expertson climate change policy tend to have a wide range of disagreement on the speed wi
 th which technology can be changed and the scope for speeding the diffusion of existing energy
 efficient technologies than on any other single issue. Furthermore, each model has streng
 ths and weaknesses; each has questions to which it is better or worse suited to answer. Some, fo
 rexample, model the energy sector in detail. Some allow for the fact that a coal fired power pla
 nt cannot costlessly be converted to one that runs on natural gas. Some have enough policy deta
 il to distinguish alternative ways of redistributing revenues that would result if emission
 permits were to be auctioned. Some are capable of showing short term macroeconomic disequili
 bria. Some include a long term carbon cycle (%,%) model that can keep track of the accumulat
 ion of greenhouse gas concentrations in the atmosphere and their climatological effects. Som
 e break down the rest of the world into regions and so can model international trade. No one mode

I do everything, and therefore we must not rely blindly on the results of any one model or set of models. Professional judgement and economic intuition are also crucial. Benefits of Averting Climate Change As I discussed above, it is evident that the benefits of averting climate change are potentially immense. But I have chosen not to try to quantify them in monetary terms for you, in light of the difficulties I have enumerated including the quantitative uncertainty of these benefits, and their timing and therefore the extreme sensitivity of the results to the chosen discount rate. V. Assessing the Kyoto Agreement H In order to evaluate the likely net economic impact of the Kyoto Agreement, excluding the benefit of mitigating climate change itself, we have drawn upon a variety of tools to assess the various possible costs and nonclimate benefits of the Administration's emissions reduction policy. To give a way the punchline, my conclusion is as follows: the net cost of four 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 designing effective international trading and joint implementation mechanisms in Buenos Aires. That small net premium, excluding the benefit 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, we have employed a broad set of economic tools to assess the Kyoto agreement. We have drawn on the insights of a wider 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, and the staff level Interagency Analytical Team effort last year. Other tools include simple relevant statistics, metaanalyses of existing models, historical and sectoral examples, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives. To my knowledge, as of December, no model whether used inside the government or not had been set up precisely to analyze the parameters of the agreement that was reached in Kyoto. Most model builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models. And no model is currently designed to assess sinks, or all six greenhouse gases included in the treaty. 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 agreement 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, sinks, a possible Annex I trading arrangement that could exclude the EU, and the Clean Development Fund. I 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 agreement 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, Energy Modeling Forum, based at Stanford University, is a long running model comparison exercise involving many of the leading climate models. We have provided advice to the EMF on how features of the Kyoto legal language can be translated into terms recognizable to an economist and are hopeful that the group will conduct a full scale analysis of the Kyoto protocol. Unfortunately, the Energy Modeling Forum believes that its members will need at least until midyear 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 cost of cutting emissions can be much reduced if flexible, market mechanisms are used. Our economic analysis highlighted the importance of such flexible, market based mechanisms which are reflected, at the President's insistence, in the Kyoto Agreement and our approach to the effort. Within the Kyoto agreement, this means an insistence on international trading, joint implementation, and, ultimately, on meaningful developing country participation.

Domestically, this means that we implement any emissions reduction through a market-based system of tradeable emissions permits, which ensure 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 \$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 100 percent, \$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 \$2,000 credit 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 X V X X X V \$2.7 billion over the next 5 years in additional research and development spending covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and crosscutting 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 consultation 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. # X V X X X V # 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. A reasonable overall estimate of the effect of adding federal electricity restructuring to the rest of the President's program to address climate change is to achieve the same environmental goals at a cost saving of roughly \$16 billion per year, given progress to date in the various States. 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 would 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 trading among Annex I countries is 100 percent likely to 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 U.S. economy, including the cost to domestic firms of purchasing emission permits from Russia and other countries where emission reductions may be cheaper than in the United States. The dramatic reduction in costs 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 Agreement. Estimated reduction in costs from umbrella trading

One possibility that emerged in Kyoto, which none of us

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saw, was the idea that the

United States might undertake trading with a subset of Annex I countries, dubbed the umbrella. The initial list of proposed participants in the umbrella includes the United States, Australia, Canada, Japan, 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 permitting trading. The motivation for this idea was that the Europeans have been reluctant to agree to the sort of international trading that we want (preferring that they achieve their goals collectively in a group of their own, called the EU bubble). It is too early to say whether the umbrella concept will in fact be accepted by the parties. But it is an important concept to consider, for three reasons. First, it is conceivable that it will be formally agreed to in future negotiations. Second, even if the final treaty does not explicitly include the umbrella, but rather allow trading among all signatories (as the United States has proposed all along), it is conceivable that umbrella countries will agree, outside the treaty, to trade only among themselves. Third, the aversion toward international trading that the Europeans have expressed suggests that they might refrain from making the trade to which they would be entitled which would mean that the umbrella would operate in practice, if not in formal international agreement. The significance of the umbrella idea in the present context is that it has the potential to further reduce costs to the United States. The reason is that if the Europeans do not bid against us for the relatively abundant, low-cost opportunities to reduce emissions in Russia and Eastern Europe, then the price of emissions reductions will be even lower. Results that we have derived from various SGM simulations suggest that, relative to the situation in which there is no trading at all, the umbrella arrangement would reduce costs by an estimated 60 to 75 percent, depending on whether the former Warsaw Pact countries are classed with the EU, or are instead assumed to fall within the umbrella. Estimated reduction in costs from 33 developing countries (DC) participation is 70 to 80 percent. The next consideration is participation by developing countries. The President has said that he will not submit the treaty for ratification without such participation which would further reduce the costs involved. The substantial potential gains from meaningful developing country (DC) participation are highlighted by the significant benefits that will likely accrue even from the limited role that the LDCs have already agreed to: the Clean Development Mechanism, modeled after Joint Implementation (JI). It cannot realistically be expected to yield all the gains of binding targets for developing countries, but it might have 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 models suggest that full participation by non-Annex I countries could cut roughly 55 percent (check) 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. 8

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These numbers because they show the potential effectiveness of trading in reducing costs dramatically. But it is important that I repeat three caveats: First, as always, there is a wide range of uncertainty around all these estimates. Second, they apply to an idealized version of trading, one that assumes no problems of enforcement or transactions costs. Third, it seems unlikely that we will convince all of our partners to agree in Buenos Aires to the most complete and cost-effective international trading arrangements. Nonetheless, despite these caveats, the numbers still show major savings. Moreover, I can highlight this enough: these cost-saving features are fundamental tenets of the U.S. position for ratifying the Kyoto Protocol. If we do not get very solid provisions for international emission trading and 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 found

ation of the U.S. position going into Buenos Aires. Accounting for Carbon Sinks \$p! The preceding discussion has emphasized the importance of trading arrangements. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. It is only net emissions to the atmosphere minus (1) #& sequestration that are to be reduced 7 percent below 1990 levels, not gross emissions. The United States plants many trees every year, and would receive credit for this activity under the Protocol. Very preliminary estimates of the implications for the United States of the Kyoto (0,%) provision on sinks indicate that carbon sinks could comprise nearly 10% of total required emissions reductions. Decreasing the required emissions reduction by 10% would likely result in cost savings greater than 10%.

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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 reduce the cost of meeting the Kyoto target by half or more, 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 amount of tree planting.) But neither we nor other analysts are yet sure exactly how to interpret the legal language of the Protocol. Because the quantitative uncertainty is so large, we do not yet have an estimate with which I feel comfortable. But we do know that the effect of fully modeling the Kyoto provision pertaining to sinks is likely to be both favorable and potentially large. Accounting for the role of technology 4

Another issue in analyzing the Kyoto protocol is the general role of technological advances and diffusion. The parameter that figures most prominently in an analysis of technological progress in the energy field 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 the technology initiative, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is far from the most optimistic outcome that might occur. Some authorities in the technology of climate change policy forecast more rapid technological progress. Estimates coming from engineering models developed by the Department of Energy predict even higher rates of AEEI improvement, and thus even lower costs. The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of tax cuts and R&D 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 improvements suggest that an increase in the AEEI from 1.0 to 1.25 would be reflected in about a 40% decrease in the permit price. Clearly, this is neither the best outcome the Nation can attain nor the best outcome the Administration expects to attain as a consequence of our climate change strategy over the next 10 years. Many energy technology experts forecast more rapid technological progress; and engineering models suggest that some energy improving technologies are available now at negative costs. (NonClimate 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. Obviously, the cost of undertaking greenhouse gas emission reductions must be compared to the benefits. As I have indicated, for various reasons it is difficult to quantify the benefits from averting climate change itself. But the literature has emphasized that any relative price shift that proves necessary to reduce emissions should produce nonclimate benefits in three areas: air pollution unrelated to climate change, traffic congestion, and highway accidents. These benefits are hard to quantify precisely but potentially significant: some estimates suggest that these three benefits could

offset 1525% of any resource cost of the climate change policy. Conclusion` p A comprehensive economic evaluation of-` h4X- the economic impact of the Kyoto agreement must integrate all of the factors described above: reliance on flexible market based mechanisms domestically; international trading among Annex I countries; the operation of joint implementation through the Clean Development Mechanism; meaningful developing country participation; the potential cost mitigating role due to the inclusion of 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 negotiations in Buenos Aires are successful in establishing effective mechanisms for international trading and joint implementation through the Clean Development Mechanism, and assuming also that the U.S. is able to achieve meaningful developing country participation, my overall assessment is that the economic cost to the United States in aggregate, and to typical households of attaining the targets and timetable specified in the Kyoto agreement, will be modest relative to the value of the insurance against climate change we are purchasing. My 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 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 my conclusion. For example, under the assumption of trading under the umbrella, joint implementation, and meaningful participation by key LDCs, estimates derived by the Administration using the SGM model, which attempt to adjust for the inclusion of six gases, suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to \$7 to \$10 billion. This implies that overall costs, excluding not only climate and nonclimate benefits, but also such cost mitigating factors as sinks and payoffs from the President's electricity restructuring and climate change initiatives, would reach roughly 0.1 percent of projected GDP. A more tangible measure of costs is the estimated effects on energy prices. Excluding the „%) impact of electricity restructuring, the SGM based estimate, corresponding to the gross resource cost estimate cited above, is an emissions price in the range of \$14 to \$18 per ton of carbon equivalent. This translates into an increase in energy prices at the household level of about 3 percent, an increase in fuel oil prices of about 6 percent, natural gas prices of 4 percent, gasoline prices of 3 percent, and electricity prices by 3 percent. A 3 percent increase in energy prices at the household level would raise the average family's energy bill by about \$80 per year in 2010. %XXV #XVX%# These estimates do not mean that household energy expenses will in fact be higher in 2010 than today, however. In the first place, energy prices fluctuate year-by-year for all sorts of reasons. They could go either up or down. But even if we leave out unpredictable fluctuations, the energy price declines from Federal electricity restructuring would be enough to offset the impact described above. By 2008-2012, the projected 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda would more than fully offset an energy price increase of the magnitude suggested by the previous model calculation, translating into an overall net reduction in energy prices in the U.S.

As highlighted earlier, estimates of the type that I am presenting are fraught with uncertainty. The estimate I just discussed is predicated on the developing country participation that we will insist upon in Buenos Aires as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol. 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 been adapted to reflect features of the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto agreement on carbon permit prices is neither the most conservative nor the most optimistic of the models that have been developed. [For example, the SGM model's forecast of the likely U.S. carbon emissions permit price consistent with attaining the Kyoto targets under a regime of full worldwide trading is about 70% higher than that of the McKibbin-Wilcoxon (Gcubed) model and about 45% below that of the Montgomery-Rutherford (MRT) model.] The predictions of the SGM model

delararobustinthesensethatvirtuallyallenergymodelsrevealthepotencyofeffective,flexible,domesticandinternationaltradingmechanismstoreducesubstantiallythecostandenergypriceimpactofmeetingtheKyototargets.Ofcourse,themostimportantfactorthat hasbeenleftoutoftheaboveassessmentisthebenefitofmitigatingclimatechangeitself. Afullcostbenefitanalysiswouldincludemitigationinthebenefitscolumn.Theonlyreason wehavenotdoneso,asIhaveexplainedrepeatedlyabove,isthedifficultyincomingupwithan umbertocapturethemonetarybenefits.ButItrustthatnobodywilllosesightofourultimate objectivekeepingourplanetthehospitablehomethatweenjoytoday.Effectsonemploymentandaggregateoutput T*# SofarIhavesaidnothingaboutjoblossesresultingfromclimate change policy. ,%) Althoughtheremaybejobgainsinsomesectorsandjoblossesinothers ,Idonotanticipateany significant aggregate effect. Some jobs could be lost in energy intensive sectors, 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. This situation might be different if a large energy shock were to hit the economy with no warning, as happened in the oil crisis of 1973-74, when the real money supply, output and employment all contracted sharply. In addition to hitting with no warning, the oil shock of the 1970s also entailed large transfers from the U.S. and other oil-importing countries to OPEC, thus depressing real income and spending in the former. A self-imposed shift in the relative price of carbon intensive energy to address global climate change, on the other hand, need not entail such a transfer of purchasing power. Thus there are critical differences between the oil price shocks and the effort to reduce carbon emissions. Our reassuring conclusion regarding aggregate output might also be different if the policy were to be implemented inefficiently (by command-and-control style regulation of the sort put in place in the oil crisis) rather than efficiently (by market mechanisms of the sort that the President has proposed to use). In conclusion, the Kyoto Agreement and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Agreement 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, and then later with a market based system of tradable permits to ensure that our objectives are achieved as efficiently as possible.³³ My overall conclusion is that the economic impact of the Protocol will be modest relative to the value of the insurance against climate change that the Kyoto agreement provides. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which relies not only on the forecasts of individual models, any one of which has its own strengths and limitations, but also on a broad variety of additional analysis and assessment. I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Agreement 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.=====

END ATTACHMENT 1 =====

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Sanders D. Korenman (CN=Sanders D. Korenman/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:18-FEB-1998 09:53:55.00

SUBJECT: Draft Benchmarking Document

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

Janet,

I responded that I would forward this to you, and that I had no comments.

----- Forwarded by Sanders D. Korenman/CEA/EOP on
02/18/98 09:53 AM -----

Ruby Shamir

02/17/98 07:58:50 PM

Record Type: Record

To: See the distribution list at the bottom of this message

cc: Ann F. Lewis/WHO/EOP

Subject: Draft Benchmarking Document

This draft represents Ann Lewis' notes from the most recent Benchmarking meeting. Since this issue is basically about technical information, please let me or Ann know if what we agreed to was misinterpreted or if you have suggestions to make it better. Thanks.

Message Sent

To:

Peter Rundlet/WHO/EOP

Richard L. Hayes/WHO/EOP

Sanders D. Korenman/CEA/EOP

Joseph J. Minarik/OMB/EOP

Sally Katzen/OPD/EOP

Robert N. Weiner/WHO/EOP

Dawn M. Chirwa/WHO/EOP

Steven L. Schooner/OMB/EOP

Edward A. Brigham/OMB/EOP

Stacie Spector/WHO/EOP

Edward W. Correia/WHO/EOP

Mark Gross @ 5148490 @ fax
Linda G. Williams/OMB/EOP

===== ATTACHMENT 1 =====

ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

Unable to convert ARMS_EXT:[ATTACH.D69]MAIL48756384N.026 to ASCII,
The following is a HEX DUMP:

President Clinton has directed his administration to consider carefully existing federal affirmative action policies, pursuant to his goal of “mend it, don't end it” and recent Supreme Court rulings, such as the Adarand decision.

In accordance with that direction, the following recommendations represent narrowly tailored policies, targeted to areas in which disparities, arising from discrimination, continue to exist:

- Develop and expand mentoring programs, encouraging large businesses across the country to partner with smaller, locally owned businesses located in distressed communities to engage in a range of activities, from advice and guidance to subcontracting;
- Streamline the SBA 8A process to be more effective and customer-friendly through the National Partnership for Reinventing Government;
- Build on the successful program operated by the Department of Defense, which enables minority firms to compete in industries in which the data demonstrate that the procurement playing field is still not even, by expanding DoD's price credits system to government wide use.

We believe that these policies, which reflect the information developed in an extensive two year review, will enable us to meet these very important goals: respecting the affirmative action principles articulated by the Supreme Court, and reaffirming the responsibility of government to ensure that all Americans have a chance to participate in our growing economy by closing the opportunity gap.

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Michele Jolin (CN=Michele Jolin/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:18-FEB-1998 11:22:39.00

SUBJECT: Response to NYT editorial

TO: Sanders D. Korenman (CN=Sanders D. Korenman/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

Please give me your comments. And then I'll get it cleared by the WH.

===== ATTACHMENT 1 =====

ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

Unable to convert ARMS_EXT:[ATTACH.D40]MAIL478034842.026 to ASCII,
The following is a HEX DUMP:

To the Editor:

I commend you for your editorial ("Black-White Income Inequalities" 2/15/98) that cites the President's Council of Economic Adviser's 1998 *Economic Report of the President* chapter on "Economic Inequality among Racial and Ethnic Groups." As you noted, this Chapter concludes that although there has been progress in narrowing economic gaps among racial and ethnic groups in the postwar period, that progress has been very uneven and substantial disparities persist. For instance, income gaps between black and white families are as large today as they were 30 years ago.

Unfortunately, your editorial may have misstated one important conclusion. In summarizing the *Economic Report*, the editorial stated that black-white income inequality is "more a problem of poor education, weak skills and the rise in single-parent families than of race." Although the *Economic Report* touches on all of these important issues, it does not argue that black-white inequality is more a function of education, skills and family structure than of race. In fact, to the contrary, the report concludes that, although it is difficult to assess the precise contribution of contemporary acts of discrimination to current differences in economic status, there is evidence of continued racial discrimination in many parts of the economy.

Janet Yellen
Chair, Council of Economic Advisers.

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:18-FEB-1998 10:04:20.00

SUBJECT: current draft is attached

TO: Michele Jolin (CN=Michele Jolin/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

----- Forwarded by Janet L. Yellen/CEA/EOP on 02/18/98
10:04 AM -----

Randall W. Lutter
02/18/98 09:23:16 AM
Record Type: Record

To: JONATHAN.GRUBER @ MS01.DO.treas.sprint.com @ inet, Peter R.
Orszag/OPD/EOP, Janet L. Yellen/CEA/EOP
cc: Adele C. Morris/OMB/EOP, Sandra F. Daigle/CEA/EOP
Subject: current draft is attached

My apologies for the transmission of yesterday without the attachment.

----- Forwarded by Randall W. Lutter/CEA/EOP on 02/18/98
09:17 AM -----

Randall W. Lutter
02/17/98 06:05:48 PM
Record Type: Record

To: JONATHAN.GRUBER @ MS01.DO.treas.sprint.com @ inet, Peter R.
Orszag/OPD/EOP, Janet L. Yellen/CEA/EOP
cc: Adele C. Morris/CEA/EOP
Subject: current draft

Janet: here is the current draft.

Jon: Janet asks that you share a copy with Secretary Summers.

I believe it reflects all the changes we discussed this pm.

In addition, I deleted one paragraph in the ancillary benefits discussion
that seemed out of place. It dealt with particulate matter and ozone, and

the benefits of reducing emissions that contribute to these. The other categories of ancillary benefits were treated more briefly, so detailed reference to this contentious issue seemed unnecessary.

I have also faxed a copy to State for transmission to Secretary Eisenstat.

===== ATTACHMENT 1 =====

ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

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CHAIR,COUNCILOFECONOMICADVISERSBEFORET

HEHOUSECOMMERCECOMMITTEEONTHEECONOMICSOFTHEKYOTOAGREEMENTMARCH4,1998}Thank

yo

u,Mr.Chairman.ThePresidenthassaidthatwecanworktoavertthegravedangersofclimatech

ange,whileatthesametimemaintainingthestrengthofoureconomy.Iampleasedtohavethiso

ppportunitytoappearbeforetheCommitteetoelaborateonthePresidentsstatement.Thein

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testimonytoday,Iwillattempttoidentifykeyelementsoftheagreement,suchaseffectivei

nternationalemissionstradingarrangements,meaningfuldevelopingcountryparticipati

on and reliance on flexible, market-based measures, that ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will explain this reasoning underlying my 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, as well as emission 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 over the next 5 years to jumpstart our efforts. 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 economists perspective, for the Kyoto Agreement. T@4

<DL!T\$&)+-0d24XT The earth's surface is 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 agreement is thus that without such an international agreement, individual nations will not have the proper incentive 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 that are likely if we fail to take any action for these costs provide the primary motivation for reducing 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 others 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 4

If growing global emissions continue unabated, the atmospheric concentration of CO₂ will likely double relative to its preindustrial level by mid-way through the next century. As a result of the increased concentration of CO₂, the IPCC estimates that global temperatures will increase by between 2.5 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 any 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 over ocean. Many models predict larger increases in evaporation than in precipitation over mid-latitude land areas, which would result in drier conditions in those regions, especially during summer in North America and Europe. Potential consequences associated with this shifting climate include 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 fresh water supplies, and damage to ecosystems and biodiversity. Economic and Monetary Damages & D # 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 forecasting 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 the costs (hurricanes, relocation costs, human amenity, construction, leisure activities, ,,%) urban infrastructure, and ecological damages such as forest loss and species loss). A subject of great uncertainty and sensitivity is the discount rate that is applied to the benefits of averting future climate change. Such a discount rate is needed if the analysis is

be expressed in monetary terms, because a dollar today is not worth the same as a dollar tomorrow. And 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 of yet, no professional consensus on the issue. A similar point concerns risk aversion. To what extent are we willing to take chances with our planet? The point applies particularly to catastrophic scenarios. Scientists have thought of many possible scenarios, most of which they are fortunately not yet prepared to pronounce as particularly likely based on current evidence, but which might be truly catastrophic for the planet if they were to occur. There is a strong argument for the Kyoto agreement as a form of planet insurance. But what numerical weight should be assigned to these catastrophic risks? In other words, what is the value of the insurance policy? It is difficult for an economist, or anyone, to know. Despite these shortcomings and potential problems, respected researchers have developed estimates of the monetary damages expected from an average world-wide temperature increase of approximately 4.5 degrees Fahrenheit (corresponding to, roughly, a doubling of preindustrial carbon dioxide concentrations). For example, William Cline, then at the Institute for International Economics, estimated that such a temperature change would impose annual damages of more than \$70 billion per year on the U.S. economy in today's terms. These damages include \$22 billion in lost agricultural production, \$13 billion in additional electricity costs, and \$8 billion in new costs to maintain the existing supply of freshwater. (Cline's original estimates are quoted in 1990 dollars. The figures given above translate those numbers into 1997 dollars using the annual GDP price index.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of carbon dioxide concentrations. He finds that the Cline estimate is in the center of three estimates for the U.S., and that the highest estimate is only 1.3 times greater than the lowest estimate. It must be noted, however, that this similarity of aggregate 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. In particular, the estimates may not fully reflect potential nonlinearities in the relationships between carbon dioxide 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 quantitative analyses (%, %) do not, and cannot, accurately reflect the small and unknown possibility of large-scale and potentially irreversible discrete events with potentially catastrophic consequences. Two such possibilities serve as illustrations. Warming of Northern tundra may release very large amounts of methane from the subarctic permafrost, thereby leading to potentially devastating acceleration of an otherwise controllable global warming process. We do not know at what point, if any, such 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 displacement of the Gulf Stream that warms Western Europe. Evidence from ocean cores samples suggests such changes of ocean currents have occurred in previous ice ages. Reductions in the risk of such catastrophic outcomes must be considered in addition to the costs and benefits that can be reasonably quantifiable. Since human beings are typically averse to risk, such possibilities 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:

- 0 The effort must be global, to address the global externality inherent in the nature of the problem.

(#)

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, greenhouse gas emissions from all other countries would continue to grow, and the risks posed by climate change would not be significantly abated. It is important to emphasize that emissions of different gases in any place 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. The first 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 a long-term objective of limiting greenhouse gas concentrations and encouraged the established 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. 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 take substantial steps to stabilize atmospheric concentrations of greenhouse gases. The Kyoto Agreement, which requires the advice and consent of the Senate, would place binding limits on industrial countries' emissions of the six principal categories of greenhouse gases: CO₂, 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 agreement, each industrial country's 1990 baseline is actually based on 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 1990 levels by the period between 2008 and 2012. To meet that target, net U.S. emissions of greenhouse gases--all emissions minus removals of CO₂ by certain forestry-related activities--must average no more than 1,484 million metric tons of carbon equivalent per year during that period. 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 his support for the Kyoto Agreement is dependent on meaningful participation from key developing countries (who are not included in Annex I). The President has also made clear that he will not submit the treaty to the Senate without such participation. There are several reasons why meaningful participation from developing countries is essential. First, developing countries are projected to contribute a majority of total emissions by 2030 under a continuation of business as usual. Without the participation of developing economies, emissions reductions by the industrialized countries will therefore not achieve necessary protection from climate change. Indeed, if developing countries do not participate in the international regime, their emissions could potentially increase by more than under their business as usual baselines. One mechanism for such an unintended consequence is as follows. As Annex I countries comply with their targets, their demand for oil will fall, which will probably work to reduce the price of oil on world markets, and perhaps to encourage nonparticipating countries to use more oil and emit more carbon than they otherwise would have. 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 by U.S. companies domestically. Again, greenhouse gas emissions have the same basic impact on the climate regardless of where they occur. So reductions in

eveloping countries have the same environmental benefits as reductions domestically. 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 on their ability to contribute to the solution. Thus even poor countries should contribute, although the existence of more pressing social needs in such countries will inevitably limit the level of their contributions. So far I have not mentioned the word competitiveness. One of the difficulties in analyzing concerns related to competitiveness is that the term itself is used to mean many different things. I have seen at least one study that uses the loss of competitiveness to refer to predictions of negative effects on the aggregate trade balance. As a professional economist, I do not accept the logic upon which that particular argument is predicated: the aggregate trade balance is determined by macroeconomic forces, the difference between saving and investment and not by our environmental policies. On the other hand, if competitiveness refers to adverse effects on a few specific manufacturing industries that are especially energy intensive, such as aluminum, paper, and chemical, the situation may be more complicated. It is difficult to undergo a significant 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 in Venezuela. Similarly, gas prices were \$3.71 per gallon in Switzerland and \$4.41 per gallon in France. Yet U.S. industry is not moving en masse to Venezuela, nor is European industry moving to the United States. Third, roughly two thirds of all emissions are not in manufacturing at all, but in transportation and buildings. I therefore believe it more accurate to say that we need developing country participation for the reasons I outlined above, than to say that we need it to avoid adverse effects on competitiveness.

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 achieve their objectives in the most efficient manner possible. The nature of the climate change problems 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, the 2,600 economists who signed 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 in some sense 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. The Kyoto Protocol incorporates this principle of when flexibility in four ways: "0 First, the cuts to be made in the first period are less severe, and the first period ends much later, than what had been proposed by many other countries, most notably the Europeans. 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 still in the prime of their operating lives, while attaining the same ultimate environmental goals.

"0 Second, under the Kyoto agreement, the emission target is not specified in terms of a specific year, but rather in terms of an average over a five year period (2008-201

2). 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.

(#(# "0Third, the

ere is allowance for banking emission reductions within the 2008-2012 period, for use in a subsequent commitment period [although the emission target of the next period has not yet been specified].

(#(# 0,%) 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 pollutant can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects. The Kyoto Protocol stipulates that countries with binding targets are expected 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 rough analysis indicates that a strategy of reducing non-CO₂ greenhouse gases by more than 7 percent below their 1990/1995 base levels while reducing CO₂ by less

than 7 percent below its 1990 level could reduce greenhouse gas emission permit prices by more than 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. Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO₂ at much lower costs than reducing emissions of greenhouse gases.

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 agreement includes three important cost-saving provisions of this nature.

First, it provides for countries that take on binding targets, at present the industrial countries, to trade rights to emit greenhouse gases with each other. This market in emissions permits will ensure that emission 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 lowering costs without affecting the level of environmental protection.

(#(# "0Second, the agreement provides for joint implementation by Annex I countries. Thus if

one industrial country does not develop a program of tradeable emission permits, U.S. firms could nonetheless implement projects for which they could receive emissions reductions credits in the U.S.

(#(# "0

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

am that is already in place in the U.S.

(#/# Detail of these provisions will be worked out in

negotiations in Buenos Aires later this year. IV. Difficulties of Economic Analysis of the Ky

oto Agreement p Now that we have a Protocol even if it is not yet fully complete nor ready f

or the President's submission to the Senate it is possible to examine it in somewhat more detail

from an economic perspective. But I wish to emphasize once again the inherent limitations to a

ny such estimates. Such limitations should not be surprising to you: economists have a diffic

ultenough 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 an

y specific results should be treated with substantial caution. The difficulties associated

ed with the economic analysis of climate change fall into three broad categories. First are the un

certainities that still remain over the terms of the ultimate treaty. Second are the inherent l

imitations of available models to analyze even short-term costs and benefits. And finally is a

topic I discussed earlier: the impossibility of putting a single monetary number on the long t

erm benefit of climate change mitigation. Uncertainties over Certain Provisions in the Int

ernational Effort to Combat Climate Change 0 The Kyoto Agreement was an historic accomp

lishment, 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 wi

ll work, there is still much that we don't know. First, as is often the case in a legal document o

f the length and complexity of the Kyoto Protocol, there are some provisions that require fur

ther clarification and interpretation. Of particular concern here is the treatment of so call

ed sinks activities that affect the rate at which carbon is removed from the atmosphere and se

questered, specifically by the planting of trees. Second, the details of a number of items p

rimarily concerning international trading and developing countries are the subject of fur

ther discussions including negotiations in Buenos ,%) Aires next fall, because they had no

t be definitively settled by the end of the last all-night session of the Kyoto talks. Final

ly, and most importantly, we have not yet negotiated international agreements to limit emiss

ions beyond the 2012 window. The emission cuts agreed upon at Kyoto are only a first step on a lon

g journey. The first step that we propose to take over the next 15 years is critical. But there as

on it is critical is not that, by itself, it will solve the climate change problem emissions d

uring any given decade are small compared to the cumulative concentrations in the atmosphere

. Rather, the first step is critical because we can't take these second and third steps until we hav

etaken the first. At the same time, any analysis is complicated by the lack of knowledge over wh

at the subsequent steps will be. Inherent Limitations of Models p` In addition to t

hese uncertainties about the details of the international effort to address climate change,

I must also note the inherent limitations of the models used to evaluate that effort. Even with

in a given model, answers depend critically on the precise nature of the question asked. For ex

ample, the costs of emissions reductions depend critically on the extent of global participa

tion and international trading that a treaty is assumed to feature. But in addition to the depe

ndence 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 illu

stration of the range of uncertainty to which we must assign the predictions of anyone individua

l model. One area in which the uncertainty is particularly large is the pace of technologica

l progress including diffusion of existing energy efficient technologies, as well as resear

ch and development of new technologies and the extent to which the pace will accelerate in resp

onse to government programs. Economics does not offer a good understanding of how technologi

cal progress is determined, in part because it is the stuff of experimentation, brainstorming,

genius, breakthroughs, perceptions and habits. Invention is largely determined by inspira

tion notwithstanding Edison, who assigned a 99 percent share to perspiration and inspiratio

n, in my experience, is difficult to fit into mathematical formulae or economic models. Model

s and expert opinion on climate change policy tend to have a wide range of disagreement on the speed wi

th which technology can be changed and the scope for speeding the diffusion of existing energy

efficient technologies than on any other single issue. Furthermore, each model has streng

ths and weaknesses; each has questions to which it is better or worse suited to answer. Some, fo

reexample, 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 have enough policy detail to distinguish alternative ways of redistributing revenues that would result if emission permits were to be auctioned. Some are capable of showing short-term macroeconomic disequilibrium. Some include a long-term carbon cycle (GtC, %) 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 are also crucial.

Benefit of Averting Climate Change

As I discussed above, it is evident that the benefits of averting climate change are potentially immense. But I have chosen not to try to quantify them in monetary terms for you, in light of the difficulties I have enumerated including the quantitative uncertainty of these benefits, and their timing and therefore the extreme sensitivity of the results to the chosen discount rate.

V. Assessing the Kyoto Agreement

H In order to evaluate the likely net economic impact of the Kyoto Agreement, 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 a way the punchline, my conclusion is as follows: the net costs of four 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 designing effective international trading and joint implementation mechanisms in Buenos Aires. That small net premium, excluding the benefit 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, we have employed a broad set of economic tools to assess the Kyoto agreement. We have drawn on the insights of a wider 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, and the staff level Interagency Analytical Team effort last year. Other tools include simple relevant statistics, meta-analyses of existing models, historical and sectoral examples, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives.

To my knowledge, as of December, no model whether used inside the government or not had been set up precisely to analyze the parameters of the agreement that was reached in Kyoto. Most model builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models. And no model is currently designed to assess sinks, or all six greenhouse gases included in the treaty. Our thinking has been informed, however, by simulations conducted with the Second (GtC, %) 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 agreement 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, sinks, a possible Annex I trading arrangement that could exclude the EU, and the Clean Development Fund. I 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 agreement 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, Energy Modeling Forum, based at Stanford University, is a long-running model comparison exercise involving many of the leading climate models. We have provided advice to the EMF on how features of the Kyoto legal language can be translated into terms recognizable to an economist and are hopeful that the group will conduct a full-scale analysis of the Kyoto protocol. Unfortunately, the Energy Modeling Forum believes that its members will need at least until mid-year to update their results.

VI. Assessi

ng the Potential Costs of Emissions Reductions \ I said in Congressional testimony last July that we can do this smart or we can do this 4 dumb. I was referring to the point that the cost of cutting emissions can be much reduced if flexible, market mechanisms are used. Our economic analysis highlighted the importance of such flexible, market based mechanisms which are reflected, at the President's insistence, in the Kyoto Agreement and our approach to the effort. Within the Kyoto agreement, this means an insistence on international trading, joint implementation, and, ultimately, on meaningful developing country participation. Domestically, this means that we implement any emissions reduction through a market based system of tradeable emissions permits, which ensure 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 \$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 credit 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 \$2,000 credit 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 X V X X X V \$2.7 billion over the next 5 years in additional research and development spending covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and crosscutting 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 consultation 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. # X V X X X V # 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. A reasonable overall estimate of the effects of adding federal electricity restructuring to the rest of the President's program to address climate change is to achieve the same environmental goals at a cost saving of roughly \$16 billion per year, given progress to date in the various States. 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 would 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 trading among Annex I countries is ,%) likely to 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

ng 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 Russia and other countries where emission reductions may be cheaper than in the United States. The dramatic reduction in costs 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 Agreement. Estimated reduction in costs from umbrella trading

One possibility that emerged in Kyoto, which none of us foresaw, was the idea that the

United States might undertake trading with a subset of Annex I countries, dubbed the umbrella. The initial list of proposed participants in the umbrella includes the United States, Australia, Canada, Japan, 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 permit trading. The motivation for this idea was that the Europeans have been reluctant to agree to the sort of international trading that we want (preferring that they achieve their goals collectively in a group of their own, called the EU bubble). It is too early to say whether the umbrella concept will in fact be accepted by the parties. But it is an important concept to consider, for three reasons. First, it is conceivable that it will be formally agreed to in future negotiations. Second, even if the final treaty does not explicitly include the umbrella, but rather allow trading among all signatories (as the United States has proposed all along), it is conceivable that umbrella countries will agree, outside the treaty, to trade only among themselves. Third, the aversion toward international trading that the Europeans have expressed suggests that they might refrain from making the trade to which they would be entitled which would mean that the umbrella would operate in practice, if not in formal international agreement. The significance of the umbrella idea in the present context is that it has the potential to further reduce costs to the United States. The reason is that if the Europeans do not bid against us for the relatively abundant, low cost opportunities to reduce emissions in Russia and Eastern Europe, then the price of emissions reductions will be even lower. Results that we have derived from various SGM simulations suggest that, relative to the situation in which there is no trading at all, the umbrella arrangement would reduce costs by an estimated 60-75 percent, depending on whether the former Warsaw Pact countries are reclassified with the EU, or are instead assumed to fall within the umbrella. Estimated reduction in costs from 33 developing country DC3 participation. The next consideration is participation by developing countries. The President has said that he will not submit the treaty for ratification without such participation which would further reduce the costs involved. The substantial potential gains from meaningful developing country (DC) participation are highlighted by the significant benefits that will likely accrue even from the limited role that the DCs have already agreed to: the Clean Development Mechanism, modeled after Joint Implementation (JI). It 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 models suggest that full participation by non-Annex I countries could cut roughly [55 percent (check)] 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. These numbers because they show the potential effectiveness of trading in reducing costs dramatically. But it is important that I repeat three caveats: First, as always, there is a wide range of uncertainty around all these estimates. Second, they apply to an idealized version of trading, one that assumes no problems of enforcement or transactions costs. Third, it seems unlikely that we will convince all of our partners to agree in Buenos Aires to the most complete

nd cost effective international trading arrangements. Nonetheless, despite these caveats, the numbers still show major savings. Moreover and I can't highlight this enough these cost saving features are fundamental tenets of the U.S. position for ratifying the Kyoto Protocol. If we don't get very solid provisions for international emission trading and 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 going into Buenos Aires. Accounting for Carbon Sinks \$p! The preceding discussion has emphasized the importance of trading arrangements. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. It is only net emission to the atmosphere minus (l) #& sequestration that are to be reduced 7 percent below 1990 levels, not gross emissions. The United States plants many trees every year, and would receive credit for this activity under the Protocol. Very preliminary estimates of the implications for the United States of the Kyoto 0, %) provision on sinks indicate that carbon sinks could comprise nearly 10% of total required emissions reductions. Decreasing the required emissions reduction by 10% would likely result in cost savings greater than 10%.

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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 reduce the costs of meeting the Kyoto target by half or more, 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 amount of tree planting.) But neither we nor other analysts are yet sure exactly how to interpret the legal language of the Protocol. Because the quantitative uncertainty is so large, we do not yet have an estimate with which I feel comfortable. But we do know that the effect of fully modelling the Kyoto provision pertaining to sinks is likely to be both favorable and potentially large. Accounting for the role of technology 4

Another issue in analyzing the Kyoto protocol is the general role of technological advances and diffusion. The parameter that figures most prominently in an analysis of technological progress in the energy field 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 the technology initiative, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual 4 Energy Outlook. That assumption is far from the most optimistic outcome that might occur. Some authorities in the technology of climate change policy forecast more rapid technological progress. Estimates coming from engineering models developed by the Department of Energy predict even higher rates of AEEI improvement, and thus even lower costs. The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of tax cuts and R&D 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 improvement suggest that an increase in the AEEI from 1.0 to 1.25 would be reflected in about a 40% decrease in the permit price. Clearly, this is neither the best outcome the Nation can attain nor the best outcome the (("% Administration expects to attain as a consequence of our climate change strategy over the next h) #& decade. Many energy technology experts forecast more rapid technological progress; and engineering models suggest that some energy improving technologies are available now at negative costs. ,.%) Non Climate Benefits ` A final factor that should be included in any comprehensive assessment of the economic 8 implications of the

eKyotoprotocolarethethebenefitsoftheagreement.Obviously,the costsofundertakinggreen housegasemissionreductions mustbecomparedtothebenefits. AsIhaveindicated,forvarious reasonsitis difficulttoquantifythebenefitsfromavertingclimatechangeitself. But the literaturehas emphasizedthatanyrelativepriceshiftsthatprovenecessarytoreduceemissions should produce nonclimate benefits in three areas: air pollution unrelated to climate change, traffic congestion, and highway accidents. These benefits are hard to quantify precisely but potentially significant: some estimates suggest that these three benefits could offset 1525% of any resource cost of the climate change policy. Conclusion` p A comprehensive economic evaluation of-` h4X-the economic impact of the Kyoto agreement must integrate all of the factors described above: reliance on flexible market based mechanisms domestically; international trading among Annex I countries; the operation of joint implementation through the Clean Development Mechanism; meaningful developing country participation; the potential cost mitigating role due to the inclusion of 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 negotiations in Buenos Aires are successful in establishing effective mechanisms for international trading and joint implementation through the Clean Development Mechanism, and assuming also that the U.S. is able to achieve meaningful developing country participation, my 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 agreement, will be modest relative to the value of the insurance against climate change we are purchasing. My 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 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 my conclusion. For example, under the assumption of trading under the umbrella, joint implementation, and meaningful participation by key 3L3DCs, estimates derived by the Administration using the SGM model, which attempt to adjust for the inclusion of six gases, suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to \$7 to \$10 billion. This implies that overall costs, excluding not only climate and nonclimate benefits, but also such cost mitigating factors as sinks and payoffs from the President's electricity restructuring and climate change initiatives, would reach roughly 0.1 percent of projected GDP. A more tangible measure of costs is the estimated effect on energy prices. Excluding the „%) impact of electricity restructuring, the SGM based estimate, corresponding to the gross resource cost estimate cited above, is an emissions price in the range of \$14 to \$18 per ton of carbon equivalent. This translates into an increase in energy prices at the household level of about 3 percent, an increase in fuel oil prices of about 6 percent, natural gas prices of 4 percent, gasoline prices of 3 percent, and electricity prices by 3 percent. A 3 percent increase in energy prices at the household level would raise the average family's energy bill by about \$80 per year in 2010. %XXV #XVX%# These estimates do not mean that household energy expenses will in fact be higher in 2010 than today, however. In the first place, energy prices fluctuate year-by-year for all sorts of reasons. They could go either up or down. But even if we leave out unpredictable fluctuations, the energy price declines from Federal electricity restructuring would be enough to offset the impact described above. By 2008 to 2012, the projected 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda would more than fully offset an energy price increase of the magnitude suggested by the previous model calculation, translating into an overall net reduction in energy prices in the U.S.

As highlighted earlier, estimates of the type that I am presenting are fraught with uncertainty. The estimate I just discussed is predicated on the developing country participation that we will insist upon in Buenos Aires as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol. Moreover, other models will yield other answers and much work remains to be done by the modelling community to test the robustness of these results. Pr

eliminary comparison of the SGM model to the few other models that have been adapted to reflect features of the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto agreement on carbon permit prices is neither the most conservative nor the most optimistic of the models that have been developed. [For example, the SGM models forecast of the likely U.S. carbon emissions permit price consistent with attaining the Kyoto targets under a regime of full worldwide trading is about 70% higher than that of the McKibbin-Wilcoxon (Gcubed) model and about 45% below that of the Montgomery-Rutherford (MRT) model.] 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, as I have explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But I trust that nobody will lose sight of our ultimate objective: keeping our planet hospitable for the joy of living here today. Effects on employment and aggregate output T*#'. So far I 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, I do not anticipate any significant aggregate effect. Some jobs could be lost in energy-intensive sectors, 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. This situation might be different if a large energy shock were to hit the economy with no warning, as happened in the oil crisis of 1973-74, when the real money supply, output and employment all contracted sharply. In addition to hitting with no warning, the oil shock of the 1970s also entailed large transfers from the U.S. and other oil-importing countries to OPEC, thus depressing real income and spending in the former. A self-imposed shift in the relative price of carbon-intensive energy to address global climate change, on the other hand, need not entail such a transfer of purchasing power. Thus there are critical differences between the oil price shocks and the effort to reduce carbon emissions. Our reassuring conclusion regarding aggregate output might also be different if the policy were to be implemented inefficiently (by command-and-control style regulation of the sort put in place in the oil crisis) rather than efficiently (by market mechanisms of the sort that the President has proposed to use). In conclusion, the Kyoto Agreement and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Agreement 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, and then later with a market-based system of tradable permits to ensure that our objectives are achieved as efficiently as possible.³³ My overall conclusion is that the economic impact of the Protocol will be modest relative to the value of the insurance against climate change that the Kyoto agreement provides. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which relies not only on the forecasts of individual models, any one of which has its own strengths and limitations, but also on a broad variety of additional analysis and assessment. I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Agreement 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. ===== END ATTACHMENT 1 =====

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Michele Jolin (CN=Michele Jolin/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:19-FEB-1998 09:34:55.00

SUBJECT: Trade statement

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

Attached.

===== ATTACHMENT 1 =====

ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

Unable to convert ARMS_EXT:[ATTACH.D72]MAIL439636943.026 to ASCII,
The following is a HEX DUMP:

The trade figures released today show that U.S. exports in 1997 remained strong. For 1997, goods exports were up almost 11 percent from 1996. Since 1993, goods exports are up a strong 54 percent, while services exports are up 43 percent. Over the past 5 years, American jobs supported by goods and services exports have increased by an estimated 2.3 million to a total of 12.1 million jobs. And, jobs supported by goods exports pay 13 to 16 percent higher than the national average.

In 1997, the U.S. trade deficit in goods and services was up only 2.4 percent, from \$111 billion in 1996 to \$114 billion in 1997 -- a modest increase given that the U.S. economy grew at a robust 3.8 percent in 1997.

Looking forward to 1998, the strong growth in U.S. exports will likely slow and the trade balance is likely to deteriorate with weaker demand in Asia. And, although it is difficult to predict the magnitude, Asia's financial woes may have a negative impact on other U.S. trading partners.

The strong performance of the U.S. economy is likely to continue in 1998, despite the deteriorating trade picture. The U.S. economy is fundamentally healthy and strong: unemployment is low, inflation is in check, and growth is robust. U.S. policy with respect to the Asian financial situation is designed to make any negative impact on the United States as small as possible.

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:19-FEB-1998 10:56:55.00

SUBJECT: Re: Trade statement

TO: Michele Jolin (CN=Michele Jolin/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

Attached is a revised version of the statement. ===== ATTACHMENT 1
=====

ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

Unable to convert ARMS_EXT:[ATTACH.D68]MAIL49620794L.026 to ASCII,
The following is a HEX DUMP:

The trade figures released today show that U.S. exports in 1997 remained strong. For the year as a whole, goods exports were up almost 11 percent over 1996. Since 1993, goods exports are up a strong 54 percent, while services exports are up 43 percent. Over the past 5 years, American jobs supported by exports of goods and services have increased by an estimated 2.3 million to a total of 12.1 million jobs. And, jobs supported by goods exports pay 13 to 16 percent above the national average.

In 1997, the U.S. trade deficit in goods and services was up only 2.4 percent, from \$111 billion in 1996 to \$114 billion in 1997 -- a modest increase given that the U.S. economy grew at a robust 3.8 percent in 1997 while growth in many of our key trading partners slowed. Over the past year, the strong dollar has worked to lower the price of imported goods, holding down both the trade deficit and inflation.

Looking forward to 1998, U.S. exports are likely to grow at a slower pace and the trade balance is projected to deteriorate as a consequence of the Asian financial crisis. An increase in the U.S. trade deficit reflects America's strength. It is a predictable consequence of robust investment and strong economic growth in the United States coupled with weaker growth in our Asian trade partners.

The Administration anticipates solid overall performance of the U.S. economy and continued job creation in 1998 in spite of the likely deterioration in the trade picture. The U.S. economy remains fundamentally healthy: job creation remains strong; inflation is in check, long term interest rates have declined toward their lowest level in several decades; and domestic demand growth remains robust.

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Randall W. Lutter (CN=Randall W. Lutter/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:20-FEB-1998 17:14:33.00

SUBJECT: Re: Janet's testimony

TO: Michele Jolin (CN=Michele Jolin/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

CC: Joseph E. Aldy (CN=Joseph E. Aldy/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

CC: Alice H. Williams (CN=Alice H. Williams/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

CC: Jeffrey A. Frankel (CN=Jeffrey A. Frankel/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

CC: Adele C. Morris (CN=Adele C. Morris/OU=OMB/O=EOP @ EOP [UNKNOWN])

READ:UNKNOWN

TEXT:

Here is the current draft.

Janet: I finally got a fax on the 3vs7% issue and am reading it now. In addition, Adele has edits on sinks that have not been incorporated.

Michele: I don't think Sandalow needs it before Janet has seen it.

===== ATTACHMENT 1 =====

ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

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T! 57.XXdXXd7TESTIMONY OF DR. JANET YELLEN d CHAIR, COUNCIL OF ECONOMIC ADVISERS
BEFORE THE HOUSE COMMERCE COMMITTEE ON THE ECONOMICS OF THE KYOTO AGREEMENT 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 President's statement. The international agreement that was reached in Kyoto this past December is a crucial first step in addressing global climate change. But it is only a first step. 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, such as effective international emission trading arrangements, meaningful developing country participation, the use of carbon absorbing activities ("sinks") and reliance on flexible, market-based measures, that ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will explain the reasoning underlying my 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 ability of sinks to offset emissions requirements and emission 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 over the next 5 years to jumpstart our efforts. 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 Agreement. T@4

<DL!T\$&)+-0d24XT4The earth's surface is 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 agreement is that without such an international (0,%) agreement, individual nations will not have the proper incentives to address the threats from global climate change. II. Costs of Climate Change (4I) In evaluating efforts to mitigate global warming, the first step is to consider the costs that are likely if we fail to take any action. These costs and they are significant provide the primary motivation for reducing greenhouse gas emissions. 4The 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 4 If growing global emissions continue unabated, the atmospheric concentration of CO₂ will likely double relative to its preindustrial level by midway through the next century. As a result of the increase in 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 latitude than in the tropics, and greater over land than ocean. Many models predict a larger increase in evaporation than in precipitation over midlatitude land areas, which would result in drier conditions in those regions, especially during summer in North America and Europe. 4 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 fresh water supplies, and damage to ecosystems and

biodiversity. '0!\$

Economic and Monetary Damages P 44 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 tough to quantify, these effects are quite demanding, and researchers have developed estimates that prompt substantial concern. & Cline, & motivate estimates worthy of William Cline, then at the Institute for International Economics', (summarizes estimate (a) that a doubling of atmospheric carbon concentrations would lead to nearly 10,000 deaths annually in the U.S., even taking into account the health benefits of warmer winters. NNO Other researchers have predicted sea level increases of about 20 inches by 2100, with substantially greater increases in subsequent years. OQODOQ [Janet: 1) The preceding comment TRs RTU on deaths U follow Ss SWV VXX Larry suggest but must rely on heroic assumptions about our knowledge about these season and location of temperature increases. 2) Inspired by Larry's comment on discounting, I have rearranged his section and tried to tighten it. JPP 4 Despite the difficulties, respected researchers have developed estimates of the monetary damages expected from an average world wide temperature increase. For example, Cline estimated that such a temperature change of 4.5 degrees Fahrenheit would impose annual damages of more than \$70 billion per year on the U.S. economy in 100 years. These damages include \$22 billion in lost agricultural production, \$13 billion in additional electricity costs, and \$8 billion in new costs to maintain the existing supply of fresh water. (Cline's original estimates are quoted in 1990 dollars. The figures given above translated those numbers into 1997 dollars using the annual GDP price index.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of carbon dioxide concentrations. He finds that the Cline estimate is in the center of three estimates for the U.S., and that the highest estimate is only 1.3 times greater than the lowest estimate. It must be noted, however, that this similarity among aggregate 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. 4 One key difficulty in interpreting and applying these estimates of monetary damages is uncertainty over the extent to which 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 safer to say that there is, as of yet, no professional consensus on the issue. 0,%) 4 As a similar difficultly with such estimates is that they may not fully reflect potential nonlinearities in the relationships between carbon dioxide 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 damage do not, and cannot, accurately reflect the value of reducing the small and unknown possibility of large scale and potentially irreversible discrete events with potentially catastrophic consequences. 4 Two such possibilities serve as illustrations. Warming of Northern tundra may release very large amounts of methane from the subarctic permafrost, thereby leading to potentially devastating acceleration of an otherwise controllable global warming process. We do not know at what point, if any, such 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 displacement of the Gulf Stream that warms Western Europe. Evidence from ocean cores samples suggests such changes of ocean currents have occurred in previous ice ages. 4 To what extent are we willing to take such chances with our planet? There is a strong argument for the Kyoto agreement 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 quantifiable. Since human beings are typically averse to risk, such possibilities 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 4 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: "04 The effort must be global, to address the global externality inherent in the nature of the &D # problem.

4 (#4 (# "04 The effort must be flexible and market based, to ensure that we achieve our objectives l) #&

in the most efficient manner possible. X* #'4 (#4 (#

Need for Global Action P 4 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 abated. It is important to emphasize that emissions of different gases anywhere in the world have very similar effects on global climate. 4 The threat of disruptive climate change has led to coordinated international efforts to reduce the risk 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. 4 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 Agreement, 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: CO₂, N₂O, methane, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. These limits \ apply to the 38 so-called Annex B countries, which are the industrialized countries, defined to include Russia, Ukraine, and most Eastern European countries.

4 Under the Kyoto agreement, each industrial country's 1990 baseline is actually based on 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 1990 levels by the period between 2008 and 2012. [Janet: I am checking this. RL] To meet that target, net U.S. emissions of greenhouse gases -- a net emissions minus removal of CO₂ by certain %X" forestry related activities -- must average no more than 1,484 million metric tons of carbon equivalent per year during that period. 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.

XX D + \$(0, %) X. X4 The President has made clear that he will not submit the Kyoto agreement to the Senate without meaningful participation from key developing countries (who are not included in Annex B).

4 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, effort by the industrialized countries to limit emissions will therefore not provide adequate protection from climate change. [Note: Janet, Todd, while acknowledging the correctness of the rest of the paragraph suggests it is unnecessary and could attract attention and hostile questions. Here recommends deleting it.] Indeed, if developing countries do not participate in the international regime, their emissions could potentially increase by more than under their business as usual baselines. One mechanism for such an unintended consequence is as follows. As Annex I countries comply with their targets, their demand for oil will fall, which will probably work to reduce the price of oil on world markets, and perhaps to encourage nonparticipating countries to use more oil and emit more carbon than they otherwise would have.

4 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. Again, greenhouse gas emissions have the same basic impact on \ the climate regardless of where they occur. So reductions in developing countries have the same environmental benefits as reductions domestically. 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.

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

4 Although some have expressed fear that the Kyoto agreement might affect competitiveness, as a professional economist, I do not believe that it will affect the aggregate trade. The aggregate trade balance is determined by macroeconomic forces: the difference between saving and investment and not by environmental policies. In particular, the aggregate trade balance is in deficit when savings are inadequate to finance investment and government borrowing, and these demands for funds lead to borrowing from abroad.

4 Evaluating how the Kyoto agreement could affect competitiveness of a few specific manufacturing industries especially those that are especially energy intensive, such as 4, %) aluminum, paper, and chemicals is more complicated. In general it is difficult

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. Yet U.S. industry is not moving en masse to Venezuela, nor is European industry moving to the United States. Third, roughly two thirds of all emissions are not in manufacturing at all, but in transportation and buildings. I therefore believe it more accurate to say that we need developing country participation for the reasons I outlined above, than to say that we need it to avoid adverse effects on competitiveness. XX.X.XX.XXX. Flexibility and Market Mechanisms \$

4 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 achieve their objectives in the most efficient manner possible. The nature of the climate change problems 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, 2,600 economists from academia, industry and government alike urged such approaches in a letter they signed last year advocating action on climate change: 04 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.

4 (#4 (# 1. When flexibility (timing) 4 First is when flexibility or timing.

Since climate change is a long-term problem, the exact timing of emissions reductions is in no sense 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.

4 As a result of U.S. leadership, the Kyoto Protocol incorporates this principle of when flexibility in four ways: "04 First, the cuts to be made in the first period are less severe, and the first period 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 still in the prime of their operating lives, while attaining the same ultimate environmental goals.

4 (

#4 (# "04 Second, under the Kyoto agreement, the emission 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 effect 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.

4 (#4 (# "04 Third, there

is allowance for banking emission reductions within the 2008-2012 \$ commitment period, for use in a subsequent commitment period [although the emission target for the next period has not yet been specified]. [State is still checking on this.]

4 (#4 (# 2

. What flexibility (gases and sinks) 4 The second type of flexibility is what flexibility, along two dimensions. X.XXX. 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 pollutant 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 have 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 rough analysis indicates that a strategy of reducing non-CO₂ greenhouse gases by more than 7 percent below their 1990/1995 baseline levels while reducing CO₂ by less than 7 percent below its 1990 level could reduce greenhouse gas emission permit prices by more than 10 percent. [I am checking this 7 vs 3% question.] 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 emission targets. We estimate that at least 3 percent of the 7 percent reduction will come from sinks. Thus together with the inclusive (0%) definition of greenhouse gases, the U.S. commitment is 3 percent or less below the stabilization proposal initially suggested by the President. [I am trying to fact check this suggestion of States, and to confirm that it is previously stated Administration policy.] Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO₂ at much lower cost than reducing emissions of greenhouse gases. X.XX X.3. Where flexibility (international) (0%) 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 agreement, because of U.S. insistence and persistence, includes three important cost-saving provisions of this nature." 04 First, it provides for countries that take on binding targets, at present the industrial countries, to trade rights to emit greenhouse gases with each other. This market in emissions permits will ensure that emission reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emission reductions in other participating countries when doing so would reduce their costs lowering costs without affecting the level of environmental protection.

4(4(# "04 Second, the agreement provides for joint implementation by Annex I countries. Thus 8 if one industrial

country did not develop a program of tradeable emission permits, U.S. firms could nonetheless implement projects abroad for which they could receive emissions reductions credits in the U.S.

4(4(# "04 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.

4(4(# Detail of these provisions will be discussed in negotiations in Buenos Aires later this year. Nonetheless, based on our experience with the sulfur dioxide trading program managed by the EPA, it is clear that international trading of emission credits is likely to lead to substantial incentives to lower the cost of reducing emissions relative to alternative means of control that did not exploit the power of market incentives. IV. Difficulties of Economic Analysis of the Kyoto Agreement # 4 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 I wish to emphasize once again the inherent limitations to any such estimates

. 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 result should be treated with substantial caution. 0,%) 4 The difficulties associated with the economic analysis of climate change fall into three broad categories. 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 a topic discussed earlier: the impossibility of putting a single monetary number on the long-term benefit of climate change mitigation, although there will clearly be economic benefits of emission reductions. Uncertainties over Certain Provisions in the International Effort to Combat Climate Change t 4 The Kyoto Agreement 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 will work, there is still much that we do not know. 4 First, as is so often the case in a legal document of the length and complexity of the Kyoto Protocol, there are some provisions that require further clarification and interpretation. A 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. 4 Second, the details of a number of items primarily concerning international trading 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 last all-night session of the Kyoto talks. 4 Finally, and most importantly, we have not yet negotiated international agreements to limit emissions beyond the 2012 window. The emissions 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. H emissions during any given decade are small compared to the cumulative concentrations in the atmosphere. Rather, the first step is critical because we cannot 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 \$! 4

4 In addition to these uncertainties about the details of the international effort to address climate change, I must also note the inherent limitations of the models used to evaluate the effort. Even within a given model, answers depend critically on the precise nature of the question asked. For example, the costs of emission 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 0,%) illustration of the range of uncertainty to which we must assign the predictions of any one individual model. 4 One area in which the uncertainty is particularly large is the pace of technological progress including diffusion of existing energy-efficient technologies, as well as research and development of new technologies and the extent to which the pace will accelerate in response to government programs. Economics does not offer a good understanding of how technological progress is determined, in part because it is the stuff of experimentation, brainstorming, genius, breakthroughs, perceptions and habits. Invention is largely determined by inspiration notwithstanding Edison, who assigned a 99 percent share to perspiration and inspiration, in my experience, is difficult to fit into mathematical formulae or economic models. Models and experts on climate change policy tend to have a wide range of disagreement on the speed with which technology can be changed and the scope for speeding the diffusion of existing energy-efficient technologies than on any other single issue. 4 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 effect 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

as concentrations in the atmosphere and their climatological effects. Some breakdown there
 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 are also crucial. Benefit of Averting Climate Change
 \ 4 As I discussed above, it is evident that the benefits of averting climate change are po-
 tentially immense. But I have chosen not to try to quantify them in monetary terms for you, in li-
 ght of the difficulties I have enumerated including the quantitative uncertainty of these be-
 nefits, their timing and therefore the extreme sensitivity of the results to the chosen dis-
 count rate, and the dependence of benefits on emissions paths after the 2008 to 2012 budget pe-
 riod specified in Kyoto. V. Assessing the Kyoto Agreement '01\$ 4 In order to evaluate the li-
 kely net economic impact of the Kyoto Agreement, excluding the benefit of mitigating climate
 change itself, we have drawn upon a variety of tools 'X*#' to assess the various possible eco-
 nomic and non-climate benefits of the Administration's emissions reduction policy. To give away
 the punchline, my conclusion is as follows: the net costs of four (0,%) policies to reduce emis-
 sions 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. That small
 net premium, even excluding the benefit of mitigating climate change, in effect, purchases
 a partial insurance policy against a serious environmental threat. 4 Because the results from
 many models must be treated with caution, we have employed a broad set of economic tools to as-
 sess the Kyoto agreement. We have drawn on the insights of a wider range of models of the energy sec-
 tor 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 cli-
 mate change, and the staff level Interagency Analytical Team analysis produced last year. One
 of the tools includes simple relevant statistics, meta-analyses including work by the World Re-
 sources Institute, models, historical and sectoral examples, and basic economic reasoning.
 Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the
 policy alternatives. 4 To my knowledge, as of December, no model whether used inside the go-
 vernment or not had been set up precisely to analyze the implications of the agreement that was
 reached in Kyoto, since this agreement is only a few months old and remains unfinished. Some
 model builders outside the government tend to take as long as several years to incorporate changes
 in policy parameters into their models. And no model is currently designed to assess sinks,
 or all six greenhouse gases included in the treaty. 4 Our thinking has been informed, howeve-
 r, 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 agreement or in-
 clude 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 accom-
 modate such special features of the agreement as the inclusion of six gases, sinks, a possible
 trading arrangement that could include as a subset of the Annex B countries [Note: State and Todd
 like this. Check this language for conformity with later decision about reference to umbrella
 and EU exclusion] and the Clean Development Fund. I 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. 4 Mindful of the limitations of any single mo-
 del, we are eager to see features of the Kyoto agreement assessed by other models to obtain a bet-
 ter feel for the range of possible effects. This work is just beginning and much of it will continue
 in the future outside the government. For example, Energy Modeling Forum, based at Stanford Un-
 iversity, is a long running model comparison exercise involving many of the leading climate mo-
 dels. We have provided advice to (0,%) the EMF on how features of the Kyoto legal language can
 be translated into terms recognizable to an economist and are hopeful that the group will conduct a
 full scale analysis of the Kyoto protocol. The Energy Modeling Forum believes that its mem-
 bers will need at least until mid-year to update their results. VI. Assessing the Potential Costs
 of Emissions Reductions 4 I said in Congressional testimony last July that we can do

this smart or we can do this is not 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 Agreement and our approach to the effort.

4. Within the Kyoto agreement, this means an insistence on international trading, joint implementation, and, ultimately, on meaningful developing country participation. Domestically, this means that we implement any emissions reduction through a market-based system of tradeable emissions permits, which ensure 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.

4. 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 \$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 credit 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 \$2,000 credit 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 spending covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and crosscutting 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 truck and heavy trucks.

4. A second responsible step entails industry by industry consultations to prepare 0,%) 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.

4. 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. A reasonable overall estimate of the effects of adding federal electricity restructuring to the rest of the President's program to address climate change is that they would make further progress to the same emission reduction goals at a cost saving of roughly \$16 billion per year, given action to date by the various States. 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

8

4. 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 would 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 an option of exporting U.S. technology would yield very large emissions reductions in these countries.

4. Estimates derived from the SGM model confirm that trading among Annex I countries

likely to reduce the cost to the United States of achieving its targets for 2008-2012 emission by about half relative to a situation in which such trading was not available. This concept of cost is meant to capture aggregate resource costs to the U.S. economy, including the cost to domestic firms of purchasing emission permits from Russia and other countries where emission reductions may be cheaper than in the United States. The dramatic reduction in costs 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 Agreement; and why it is a achievement by our negotiators in Kyoto was such a signal and important accomplishment. Estimated reduction in costs from umbrella trading \$1.4 One possibility that emerged in Kyoto, which none of us foresaw, was the idea developed thereby the U.S. delegation, that the United States might undertake trading with a subset of Annex B countries, dubbed the umbrella. Countries that have expressed interest in the umbrella include the United States, Australia, Canada, Japan, New Zealand and Russia, with 0.4% strong indications of interest from some others. This subset of Annex B countries shares a common interest in promoting market-based mechanisms, most specifically, fully flexible rules for international trading of emissions permits. [Janet: Paragraph deleted at suggestion of Todd and Victoria Greenfield.] 4 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. Result that we have derived from various SGM simulation suggest that, relative to the situation

in which there is not trading at all, the umbrella would reduce costs by an estimated 60-75 percent, depending on whether the former Warsaw Pact countries fall within the umbrella. The 8

Kyoto Protocol classifies those outside of the EU bubble for the first budget period 2008-2012. 4 Estimated reduction in costs from developing country participation

4 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. 4 The substantial potential gains from meaningful developing country participation are highlighted by the significant benefits that will likely accrue even 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. 4 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. Simulation with the SGM models suggest that full participation by non-Annex I countries could cut roughly [55 percent (check)] 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. The more developing countries who take on binding targets and trade in international permit markets, the lower will be costs. 4 [Janet: Todd suggests deleting this paragraph as unnecessary and harmful. I have edited it slightly to incorporate Victoria's comments. I believe the first is repetitive, and the third may be diplomatically difficult. RL] I offer these numbers because they show the potential effectiveness of market-based mechanisms such as trading and CDM in reducing costs dramatically. But it is important that I repeat the caveats: First, as always, there is a wider range of uncertainty around all these estimates. Second, they apply to an idealized version of trading, one that assumes no problems of enforcement or transactions costs. Third, it seems unlikely that we will convince all 4.4% of our partners to agree to the most complete and cost-effective international trading arrangements. Nonetheless, despite these caveats, the numbers still show major savings. 4 Moreover and I can highlight this enough these cost-saving features are fundamental tenets of the U.S. position. The promise of Kyoto cannot be achieved without effective emission trading. Moreover, if we do not get meaningful participation by key developing countries, we won't submit the

eaty 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 going into Buenos Aires. Accounting for Carbon Sinks \$

4 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, under instructions from the President and Vice President, 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. It is only net emission to the atmosphere minus sequestration that are to be reduced 7 percent below 1990 levels, not gross emissions. [Note: 7 vs 3 applies hereto.] The United States plants many trees every year, and would receive credit for this activity under the Protocol. Very preliminary estimates of the implications for the United States of the Kyoto provisions on sinks indicate that carbon sinks could comprise nearly 10% of total required emissions reductions. Decreasing the required emissions reduction by 10% would likely result in cost savings greater than 10%.

4 Eventhis

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 reduce the costs of meeting the Kyoto target by half or more, on top of the gains from trading among Annex I countries. (Furthermore, no model has yet ventured to take into account that government policies can help increase the amount of tree planting.) But neither we nor other analysts are yet sure exactly how to interpret the legal language of the Protocol. Because the quantitative uncertainty is so large, we do not yet have an estimate with which I feel comfortable. But we do know that the effect of fully modelling the Kyoto provision pertaining to sinks is likely to be both favorable and potentially large. Accounting for the role of technology (% 4 Another issue in analyzing the Kyoto protocol is the general role of technological advances and diffusion. The parameter that figures most prominently in an analysis of technological progress in the energy field 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 the technology initiative, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is far from the most optimistic outcome that might occur. Some

authorities in the technology of climate change policy forecast more rapid technological progress. Estimates coming from engineering models developed by the Department of Energy predict even higher rates of AEEI improvement, and thus even lower costs. [Todd is ok with this paragraph even though it excludes mention of the 5 Labs Study.] 4 The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of tax cuts and R&D 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 improvements suggest that an increase in the AEEI from 1.0 to 1.25 would be reflected in about a 40% decrease in the permit price. 4 Clearly, this is neither the best outcome the Nation can attain nor the best outcome the Administration expects to attain as a consequence of our climate change strategy over the next decade. Many energy technology experts forecast more rapid technological progress; and engineering models suggest that some energy improving technologies are available now at negative costs. [Todd recommends deleting this paragraph as an essentially editorial suggestion.] Non Climate Benefits

4 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. Obviously, the costs

undertaking greenhouse gas emission reductions must be compared to the benefits. As I have indicated, for various reasons it is difficult to quantify the benefits from averting climate change itself. But the literature has emphasized that any relative price shifts that prove necessary to reduce emissions should produce nonclimate benefits in three areas: air pollution unrelated to climate change, traffic congestion, and highway accidents. These benefits are hard to quantify precisely but potentially significant: our roughest estimates suggest that these three benefits could offset 15-25% of any resource cost of the climate change policy. Synthesis '01: A comprehensive economic evaluation of the economic impact of the Kyoto agreement must integrate all of the factors described above: reliance on flexible market based mechanisms domestically; international trading and Joint Implementation among Annex B countries; the operation of joint implementation through the Clean Development Mechanism; 0.1% 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, my overall assessment is that the economic cost to the United States in aggregate and to typical households of attaining the targets and timetable specified in the Kyoto agreement, will be modest relative to the value of the insurance against climate change we are purchasing. 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 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 my conclusion. For example, under the assumptions of trading under the umbrella, joint implementation, and meaningful participation by key DCs, estimates derived by the Administration using the SGM model, which attempt to adjust for the inclusion of six gases, suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to \$7 to \$10 billion per year in 2008 to 2012. This implies that overall costs, excluding not only climate and nonclimate benefits, but also such cost mitigating factors as sinks and payoffs from the President's electricity restructuring and climate change initiatives, would reach roughly 0.1 percent of projected GDP in 2010. A more tangible measure of costs is the estimated effect on energy prices. Excluding the impact of electricity restructuring and the ancillary benefit 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 \$18 per ton of carbon equivalent. This translates into an increase in energy prices between 2008 and 2012 at the household level of about 3 percent, an increase in fuel oil prices of about 6 percent, natural gas prices of 4 percent, gasoline prices of 3 percent, and electricity prices by 3 percent. A 3 percent increase in energy prices at the household level would raise the average family's energy bill by about \$80 per year in 2010. XX. " XX. These estimates do not mean that household energy expenses will in fact be higher in 2010 than today, however. In the first place, energy prices fluctuate year-by-year for all sorts of reasons. They could go either up or down. But even if we leave out unpredictable fluctuations, the energy price declines from Federal electricity restructuring would be enough to offset the impacts described above. By 2008-2012, the projected 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda would more than fully offset an energy price increase of the magnitude suggested by the previous model calculation, translating into an overall net reduction in energy prices in the U.S.

As highlighted earlier, estimates of the type that I am presenting are fraught with 0.1% uncertainty. The estimate I just discussed is predicated on the developing country participation that we are insisting upon in Buenos Aires as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol. Moreover, other models will yield other answers and much work remains to be done by the modelling community to test the robustness of these results.

ults. Preliminary comparisons of the SGM model to the few other models that have been adapted to reflect features of the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto agreement on carbon permit prices is neither the most conservative nor the most optimistic of the models that have been developed. [For example, the SGM models forecast of the likely U.S. carbon emissions permit price consistent with attaining the Kyoto targets under a regime of full world wide trading is about 70% higher than that of the McKibbin Wilcoxon (Gcubed) model and about 45% below that of the Montgomery Rutherford (MRT) model.] The prediction of the SGM model is 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, as I have explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But I trust that nobody will lose sight of our ultimate objective of keeping our planet hospitable for the enjoyment of today. Effects on employment and aggregate output. So far I 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, I do not anticipate any significant aggregate effect. Some jobs could be lost in energy intensive sectors, 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. This situation might be different if a large energy shock were to hit the economy with no warning, as happened in the oil crisis of 1973-74, when the real money supply, output and employment all contracted sharply. In addition to hitting with no warning, the oil shocks of the 1970s also entailed large transfers from the U.S. and other oil-importing countries to OPEC, thus depressing real income and spending in the former. A self-imposed shift in the relative price of carbon intensive energy to address global climate change, on the other hand, need not entail such a transfer of purchasing power. Thus there are critical differences between the oil price shocks and the effort to reduce carbon emissions. Our reassuring conclusion regarding aggregate output might also be different if the policy were to be implemented inefficiently (by command-and-control style regulation of the sort put in place in the oil crisis) rather than 0,%) efficiently (by market

based mechanisms of the sort that the President has proposed

touse). VII.c Conclusion < In conclusion, the Kyoto Agreement and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Agreement 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, and then later with a market based system of tradeable permits to ensure that our objectives are achieved as efficiently as possible. My overall conclusion is that the economic impact of the Protocol will be modest relative to the value of the insurance against climate change that the Kyoto agreement provides. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which relies not only on the forecasts of individual models, any one of which has its own strengths and limitations, but also on a broad variety of additional analysis and assessment. I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Agreement 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. =====

END ATTACHMENT

1 =====

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Sanders D. Korenman (CN=Sanders D. Korenman/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:20-FEB-1998 12:16:08.00

SUBJECT: Job study

TO: Rebecca M. Blank (CN=Rebecca M. Blank/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Michele Jolin (CN=Michele Jolin/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Sarah J. Reber (CN=Sarah J. Reber/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Amy N. Finkelstein (CN=Amy N. Finkelstein/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Maria J. Hanratty (CN=Maria J. Hanratty/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

TEXT:

I have just re-read the Jobs study. I feel that it is worth updating, but would it make most sense to do so when we have the February 1998 CPS data. The reason is that the jobs study relied heavily on computed changes in not-seasonally-adjusted data from the February 1994 to February 1996 CPS. Impressively, the report was issued April 23, 1996!
In sum, I think we should shoot for a redo by the end of April 1998 that would use the February 1998 CPS.

RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Randall W. Lutter (CN=Randall W. Lutter/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:21-FEB-1998 14:41:51.00

SUBJECT: With Attachment!!!

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Joseph E. Aldy (CN=Joseph E. Aldy/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Adele C. Morris (CN=Adele C. Morris/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

CC: Jeffrey A. Frankel (CN=Jeffrey A. Frankel/OU=CEA/O=EOP @ EOP [CEA])
READ:UNKNOWN

TEXT:

===== ATTACHMENT 1 =====
ATT CREATION TIME/DATE: 0 00:00:00.00

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T! 57XXdd7TESTIMONY OF DR. JANET YELLEN d CHAIR, COUNCIL OF ECONOMIC ADVISERS BEF
ORE THE HOUSE COMMERCE COMMITTEE ON THE ECONOMICS OF THE KYOTO AGREEMENT MARCH 4, 1998 T
han
kyou, Mr. Chairman. The President has said that we can work to avert the grave dangers of climat
e 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 President's statem
ent. The international agreement that was reached in Kyoto this past December is a crucial f
irst step in addressing global climate change. But it is only a first step. Since the internati
onal 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 sev
eral crucial areas are not completely resolved in the diplomatic arena, forcing analysts to m
ake a variety of assumptions about the ultimate form of the international regime. In my testim
ony today, I will attempt to identify key elements of the agreement, such as effective interna

tional emission trading arrangements, meaningful developing country participation, inclusion of land use activities that absorb carbon ("sinks"), and reliance on flexible, market based measures, that ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will explain the reasoning underlying my 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 ability 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 over the next 5 years; this package makes good sense in terms of energy policy and will jumpstart our efforts.

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 Agreement. T@4

<DL!T\$&)\+-0d24XT4 The earth's surface is warming from the accumulation of greenhouse gases from myriads of 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 agreement is that without such an international (0,%) agreement, individual nations will not have the proper incentives to address the threats from global climate change.

II. Costs of Climate Change

4 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 action to reduce greenhouse gas emissions.

4 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

4 If global emissions continue unabated, the atmospheric concentration of CO₂ will likely double relative to its preindustrial level by midway through the next century. 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. Many models predict larger increases in evaporation than in precipitation over midlatitude land areas, which would result in drier conditions in those regions, especially during summer in North America and Europe.

4 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, change in availability of fresh water supplies, and damage to ecosystems and

biodiversity. '0!\$

Economic and Monetary Damages

P 44 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. William Cline, then at the Institute for International Economics, summarizes estimates that a doubling of atmospheric carbon concentrations would lead to nearly 10,000 deaths annually in the U.S., even taking into account the health benefit of warmer winters. Other researchers have predicted sea level increases of about 20 inches by 2100, with substantially greater increases in subsequent years. [** Janet: 1) The preceding comment on deaths follows Larry's suggestion but relies on assumptions about the season and location of temperature increases. 2) Inspired by Larry's comment on discounting, I have rearranged this section and tried to tighten it.]⁴ Despite the difficulties, respected researchers have developed estimates of the monetary damages expected from an average world wide temperature increase. For example, Cline estimated that such a temperature change of 4.5 degrees Fahrenheit would impose annual damages of more than \$70 billion per year on the U.S. economy in today's terms. These damages include \$22 billion in loss of agricultural production, \$13 billion in additional electricity costs, and \$8 billion in new costs to maintain the existing supply of freshwater. (Cline's original estimates are quoted in 1990 dollars. The figures given above translated those numbers into 1997 dollars using the annual GDP price index.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of carbon dioxide concentrations. He finds that the Cline estimate is in the center of three estimates for the U.S., and that the highest estimate is only 1.3 times greater than the lowest estimate. It must be noted, however, that this similarity among aggregate 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.

4 One key difficulty in interpreting and applying these estimates of monetary 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 of yet, no professional consensus on the issue. 0,%)

4 A similar difficulty with such estimates is that they may not fully reflect potential nonlinearities in the relationships between carbon dioxide 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 small and unknown possibility of large scale and potentially irreversible discrete events with potentially catastrophic consequences.

4 Two such possibilities serve as illustrations. Warming of Northern tundra may release very large amounts of methane from the subarctic permafrost, thereby leading to potentially devastating acceleration of another otherwise controllable global warming process. We do not know at what point, if any, such unstable activity would be triggered. Second, evidence from climate models suggests that some type of climate change may lead to changes in ocean currents, including displacement of the Gulf Stream that warms Western Europe. Evidence from ocean cores samples suggests such changes of ocean currents have occurred in previous ice ages.

4 To what extent are we willing to take such chances with our planet? There is a strong argument for the Kyoto agreement as a form of planet insurance. But what numerical weight should be assigned 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 quantifiable. 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 4 The cost 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: " 04 The effort must be global, to address the global externality inherent in the nature of the &D # problem.

4 (#4 (# " 04 The effort must be flexible and market based, to ensure that we achieve our objectives l) # &

in the most efficient manner possible. X * # ' 4 (#4 (#

Need for Global Action P 4 Climate change is a global problem requiring a global solution. As I mentioned earlier, (nosingle 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. 4 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. 4 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 Agreement, 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: CO₂, N₂O, methane, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. These limits \ app ly to the 38 so-called Annex B countries, which are the industrialized countries, defined to include Russia, Ukraine, and most Eastern European countries. 4 Under the Kyoto agreement, each industrial country's 1990 baseline is actually based on its 1990 emissions of CO₂, methane, and N₂O and its choice of 1990 or 1995 level of " the other three categories of gases. The United States agreed to an emission target of 7 percent below ' wo ` the 1990 baseline by the period between 2008 to 2012. To meet that target, net U.S. emissions of greenhouse gases (all emissions minus removal of CO₂ by certain forestry-related %X" activities) must average no more than 1484 million metric tons of carbon equivalent per year during that period. onzn ooor HrsoZo sqpHpqsqhqs however, ptttuTuh target is only 3 percent below the President's October proposal, because the Kyoto agreement excludes vCOvwwwx2xwwwv removals from the base period emissions (" % y from yonz which the target is calculated. [Janet: We will have to review this. RL] 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, 0, %) the industrial countries are expected to reduce their average emissions of greenhouse gases to about 5 percent below their 1990 levels. 5XX P XX 54 The President has made clear that he will not submit the Kyoto agreement to the Senate without meaningful participation from key developing countries (who are not included in Annex B). || 4 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, ef

forts by the industrialized countries to limit emissions will therefore not provide adequate protection from climate change.⁴ 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. Again, greenhouse gas emissions have the same basic impact on the climate regardless of where they occur. So reductions in developing countries have the same environmental benefits as reductions domestically. 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.⁴ Third, principles of basic fairness suggest all countries should do their part, depending on their ability to contribute to the solution. Thus even poor countries should contribute, although the lack of resources in such countries may limit the extent of their contributions.⁴ Although some have expressed fear that the Kyoto agreement might affect competitiveness, as a professional economist, I do not believe that it will affect the aggregate trade balance. The aggregate trade balance is determined by macroeconomic forces, the difference between saving and investment, and not by our environmental policies. In particular, the aggregate trade balance is in deficit when savings are inadequate to finance investment and government borrowing, and these demands for funds lead to borrowing from abroad.⁴ Evaluating how the Kyoto agreement could affect competitiveness of a few specific manufacturing industries especially those that are especially energy intensive, such as aluminum, paper, and chemicals is more complicated. In general it is difficult to undergo 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. Yet U.S. industry is not moving en masse to Venezuela, nor is European industry moving to the United States. Third, roughly two thirds of all emissions are not in manufacturing at all, but in transportation and buildings. I therefore believe it more accurate to say that we need developing country participation for the reasons I outlined above, than to say that we need it to avoid adverse effects on competitiveness.⁵ XXX5XX5XXXX Flexibility and Market Mechanisms

\$ 4 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 achieve the objectives in the most efficient manner possible. The nature of the climate change problems 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, 2,600 economists from academia, industry and government all urged such approaches in a letter they signed last year advocating action on climate change.⁴ 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.

4 (#4 (# 1. When flexibility

ity (timing) 4 First is when flexibility or timing. Since climate change is a long-term problem, the exact timing of emissions reductions is in some sense 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.⁴ As a result of U.S. leadership, the Kyoto Protocol incorporates this principle of when flexibility in four ways: "04 First, t

he cut to be made in the first period are less severe, and the first period 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 X' \$ such as those from premature scrapping of coal-fired electricity plants still in the prime of their operating lives, while attaining the same ultimate environmental goals.

4(#4(# "04 Second, under the Kyoto agreement, the emission target is not specified in terms of a specific year, but rather in terms of an average over a five-year period (2008-2012). +\$(specific year, but rather +%) 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.

4(#4(# "04 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 next period have not yet been specified]. [State is still checking on this.]

4(#4(# 2. What flexibility (gases and sinks) 4 The second

type of flexibility is what flexibility, along two dimensions. XXXX The first is their

clusion in the agreement to fall 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 pollutant 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 then 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 cheap to achieve the same environmental benefit by eliminating one molecular unit of SF₆ than nearly 24,000 units of CO₂. 4 Some initial analysis indicates that a strategy of reducing non-CO₂ greenhouse gases by more than 3 percent below their 1990/1995 baseline levels while reducing CO₂ by less than 3 H percent below its 1990 level could reduce greenhouse gas emission permit prices by more than 10 percent. Thus allowing countries flexibility in what gases they reduce essential trading emissions reductions across gases can help lower significantly the costs of meeting their targets. 4 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 emission targets. We estimate that about 3 percent of the 7 percent reduction in emissions from the 1990 baseline will come from sinks. Thus together with the inclusive definition of greenhouse gases, the U.S. commitment is 3 percent or less below the stabilization proposal initially suggested by the President. Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO₂ 1) # & at much lower costs than reducing emissions of greenhouse gases. XXX X3. Where flexibility (international) 0, %) 4 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 agreement, because of U.S. insistence and persistence, includes three important cost-saving provisions of this nature."

04 First, it provides for countries that take on binding targets, at present the industrial countries, to trade rights to emit greenhouse gases with each other. This market in emissions permits will ensure that emission reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emission reductions in other participating countries when doing so would reduce their costs lowering costs with

thout affecting the level of environmental protection.

4(4("04 Second, the agreement

provides for joint implementation by Annex I countries. Thus 8
if one industrial country

did not develop a program of tradeable emission permits, U.S. firms could nonetheless implement projects abroad for which they could receive emissions reductions credits in the U.S.

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#4("04 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.

4(4(Detail of these provisions will be

discussed in negotiations in Buenos Aires later this year. Nonetheless, based on our experience with the sulfur dioxide trading program managed by the EPA, it is clear that international trading of emission credits is likely to lead to substantial incentives to lower the cost of reducing emissions relative to alternative means of control that did not exploit the power of market incentives.

IV. Difficulties of Economic Analysis of the Kyoto Agreement # 4 No

what 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 I wish to emphasize once again the inherent limitations to any such estimates. 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. 0,%) 4 The difficulties associated with the economic analysis of climate change fall into three broad categories. 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 a topic I 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 over Certain Provisions in the International Effort to Combat Climate Change t 4 The Kyoto Agreement 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 will work, there is still much that we do not know. 4 First, as is often the case in a legal document of the length and complexity of the Kyoto Protocol, there are some provisions that require further clarification and interpretation. A

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. 4 Second, the details of a number of items primarily concerning international trading 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 last all-night session of the Kyoto talks. 4 Finally, and most importantly, we have not yet negotiated an international agreement 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. High emissions during any given decade are small compared to the cumulative concentrations in the atmosphere. Rather, the first step is critical because we cannot 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 \$!! 4

4 In addition to these uncertainties about the details of the international effort to address climate change, I must also note the inherent limitations of the models used to evaluate the 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

4 In addition to these uncertainties about the details of the international effort to address

climate change, I must also note the inherent limitations of the models used to evaluate the 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 0,%) illustration of the range of uncertainty to which we must assign the predictions of any one individual model. 4 One area in which the uncertainty is particularly large is the pace of technological progress including diffusion of existing energy efficient technologies, as well as research and development of new technologies and the extent to which the pace will accelerate in response to government programs. Economics does not offer a good understanding of how technological progress is determined, in part because it is the stuff of experimentation, brainstorming, genius, breakthroughs, perceptions and habits. Invention is largely determined by inspiration notwithstanding Edison, who assigned a 99 percent share to perspiration and inspiration, in my experience, is difficult to fit into mathematical formulae or economic models. Models and expert opinion on climate change policy tend to have a wide range of disagreement on the speed with which technology can be changed and the scope for speeding the diffusion of existing energy efficient technologies than on any other single issue. 4 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 are also crucial. Benefits of Averting Climate Change

4 As I discussed above, it is evident that the benefits of averting climate change are potentially immense. But I have chosen not to try to quantify them in monetary terms for you, in light of the difficulties I have enumerated including the quantitative 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 periods specified in Kyoto. V. Assessing the Kyoto Agreement

4 In order to evaluate the likely net economic impact of the Kyoto Agreement, excluding the benefits of mitigating climate change itself, we have drawn upon a variety of tools X*# to assess the various possible costs and non climate benefits of the Administration's emissions reduction policy. To give away the punchline, my conclusion is as follows: the net cost of four 0,%) 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. That small net premium, even excluding the benefits of mitigating climate change, in effect, purchases a partial insurance policy against a serious environmental threat. 4 Because the results from any model must be treated with caution, we have employed a broad set of economic tools to assess the Kyoto agreement. We have drawn on the insights of a wider 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, and the staff level Interagency Analytical Team analysis produced last year. Other tools include simple relevant statistics, metaanalyses including work by the World Resources Institute, models, historical and sectoral examples, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives. 4 To my knowledge, as of December, no model whether used inside the government or not had been set up precisely to analyze the implications of the agreement that was reached in Kyoto, since this agreement is only a few months old and remains unfinished. Some model builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models. And no model is currently designed to assess sinks, or all six greenhouse gases included in the treaty. 4 Our thinking has been informed, however

r, 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 agreement 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, sinks, a possible trading arrangement that could include a subset of the Annex B countries [Note: State and Todd like this. Check this language for conformity with later decision about reference to umbrella and EU exclusion] and the Clean Development Fund. I 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 modeling efforts.

4 Mindful of the limitations of any single model, we are eager to see features of the Kyoto agreement 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, Energy Modeling Forum, based at Stanford University, is a long running model comparison exercise involving many of the leading climate models. We have provided advice to (0,%) the EMF on how features of the Kyoto legal language can be translated into terms recognizable to an economist and are hopeful 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

4 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 Agreement and our approach to the effort.

4 Within the Kyoto agreement, this means an insistence on international trading, joint implementation, and, ultimately, on meaningful developing country participation. Domestically, this means that we implement any emissions reduction 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.

4 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 \$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 \$2,000 credit 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 spending covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and crosscutting 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.

4 A second responsible step entails industry by industry consultation to prepare (0,%) 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

omprehensive effort to improve the energy efficiency of the Federal government's own operations and purchases.⁴ XXXX 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. A reasonable overall estimate of the effects of adding federal electricity restructuring to the rest of the President's program to address climate change is that they would make further progress to the same emission reduction goals at a cost saving of roughly \$1.6 billion per year, given action to date by the various States. 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 8

4 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 would 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.⁴ Estimates derived from the SGM model confirm that trading among Annex I countries is likely to 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 cost savings meant to capture aggregate resource costs to the U.S. economy, including the cost to domestic firms of purchasing emission permits from Russia and other countries where emission reductions may be cheaper than in the United States. Although these estimates reflect idealized international trading, with negligible transaction costs, the overall conclusion is clear. The dramatic reduction in costs 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 Agreement; "X" and why its achievement by our negotiators in Kyoto was such a significant and important accomplishment.

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Estimated reduction in costs from umbrella trading 4 One possibility that emerged in Kyoto, which none of us foresaw, was the idea developed thereby by the U.S. delegation, that the United States might undertake trading with a subset of Annex B countries, dubbed the umbrella. Countries that have expressed interest in the umbrella include the United States, Australia, Canada, Japan, New Zealand and Russia, with strong indications of interest from some others. This subset of Annex B countries shares a common interest in promoting market-based mechanisms, most specifically, fully flexible rules for international trading of emissions permits.⁴ 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 suggest that, relative to the situation in which there is no trading at all, the umbrella would reduce costs by an estimated 60-75 percent, depending on whether the former Warsaw Pact countries fall within the umbrella. The

L Kyoto Protocol classifies those outside of the EU bubble for the first budget period 2008-2012.⁴ Estimated reduction in costs from developing country participation 4 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.⁴ The substantial potential gains from meaningful developing country participation are highlighted by the significant benefits that will likely accrue even from the limited role that the developing countries have already agreed to: the Clean Development Mechanism (CDM), modeled after the U.S.-J

oint Implementation concept. The CDM cannot realistically be expected to yield all the gains of binding targets for developing countries, but it might save costs by roughly another 20 to 25 percent from the reduced costs that result from trading among Annex I countries.⁴ 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 models suggest that full participation by non-Annex I countries could cut roughly [55 percent (check)] 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. The more developing countries who take on binding targets and trade in international permit markets, the lower will be costs.⁴ These cost savings opportunities are fundamental tenets of the U.S. position. The promise of Kyoto cannot be achieved without effective emission 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, under instructions from the President and Vice President, 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. Accounting for projected removal of CO₂ by sinks

the Kyoto agreement specifies would count toward meeting the target reduce the required reductions in emissions to 3 percent below the 1990 baseline. The United States plants many trees every year, and would receive credit for this activity under the Protocol. Very preliminary estimates of the implications for the United States of the Kyoto provisions on sinks indicate that carbon sinks could comprise nearly 10% of total required emissions reductions. Decreasing the required emissions reduction by 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 reduce the costs of meeting the Kyoto target by half or more, 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 amount of tree planting.) But neither we nor other analysts are yet sure exactly how to interpret the legal language of the Protocol. Because the quantitative uncertainty is so large, we do not yet have an estimate with which I feel comfortable. But we do know that the effect of fully modeling the Kyoto provision pertaining to sinks is likely to be both favorable and potentially large. Accounting for the role of technology

Another issue in analyzing the Kyoto protocol is the general role of technological advances and diffusion. The parameter that figures most prominently in an analysis of technological progress in the energy field 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 the technology initiative, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is far from the most optimistic outcome that might occur. Some authorities in the technology of climate change 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 net zero resource cost.⁴ The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of tax cuts and R&D 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 improvements suggest that an increase in the AEEI from 1.0 to 1.25 would be reflected in about a 40% decrease in the permit price.⁴ Clearly, this is neither the best outcome the Nation can attain nor the best outcome the Administration expects to attain as a consequence of our climate change strategy over the next decade. Many energy technology experts forecast more rapid technological progress; and engineering models suggest that some energy improving technologies are available now at negative costs. [Todd recommends deleting this paragraph as an essentially editorial suggestion. I will add happy talk.]

Non Climate Benefits

4 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. Obviously, the costs of undertaking greenhouse gas emission reductions must be compared to the benefits. As I have indicated, for various reasons it is difficult to quantify the benefits from averting climate change itself. But the literature has emphasized that any relative price shifts that prove necessary to reduce emissions should produce non climate benefits in three areas: air pollution unrelated to climate change, traffic congestion, and highway accidents. These benefits are hard to quantify precisely but potentially significant: our rough estimates suggest that these three benefits could offset 15-25% of any resource cost of the climate change policy. Synthesis " 4 A comprehensive economic evaluation of - h4 X - the economic impact of the Kyoto agreement must integrate all of the factors described above: reliance on flexible market based mechanisms domestically; international trading and Joint Implementation among Annex B countries; the operation of joint implementation through 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 (0,%) country participation, my overall assessment is that the economic cost to the United States in aggregate and to typical households of attaining the targets and timetable specified in the Kyoto agreement, will be modest relative to the value of the insurance against climate change we are purchasing. 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 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 detail of the Kyoto Protocol are consistent with my conclusion. For example, under the assumption of trading under the umbrella, joint implementation, and meaningful participation by key DCs, estimates derived by the Administration using the SGM model, which attempt to adjust for the inclusion of six gases, suggest that the resource cost of attaining the Kyoto targets for emission reductions might amount to \$7 to \$10 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 0.1 percent of projected GDP in 2010. A more tangible measure of cost is the estimated effect 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 \$18 per ton of carbon equivalent. This translates into an increase in energy prices between 2008 and 2012 at the household level of about 3 percent, an increase in fuel oil prices of about 6 percent, natural gas prices of 4 percent, gasoline prices of 3 percent, and el

electricity prices by 3 percent. A 3 percent increase in energy prices at the household level would raise the average family's energy bill by about \$80 per year in 2010. These estimates do not mean that households' energy expenses will in fact be higher in 2010 than today, however. In the first place, energy prices fluctuate year-by-year for all sorts of reasons. They could go either up or down. But even if we leave out unpredictable fluctuations, the energy price declines from Federal electricity restructuring would be enough to offset the impact described above. By 2008-2012, the projected 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda would more than fully offset an energy price increase of the magnitude suggested by the previous model calculation, translating in to an overall net reduction in energy prices in the U.S.

As highlighted earlier, estimates of the type that I am presenting are fraught with uncertainty. The estimate I just discussed is predicated on the developing country participating on that we are insisting upon as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol. Moreover, other models will yield other answers and much work remains to be done by the modelling community to test the robustness of these results. Preliminary comparisons of the SGM model to the few other models that have been adapted to reflect features (0, %) of the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto agreement on carbon permit prices is neither the most conservative nor the most optimistic of the models that have been developed. [For example, the SGM models forecast of the likely U.S. carbon emissions permit price consistent with attaining the Kyoto targets under a regime of full world-wide trading is about 70% higher than that of the McKibbin-Wilcoxon (Gcubed) model and about 45% below that of the Montgomery-Rutherford (MRT) model.] The prediction of the SGM model is 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, as I have explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But I trust that nobody will lose sight of our ultimate objective of keeping our planet hospitable for the generations to come. Effect on employment and aggregate output: So far I 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, I do not anticipate any significant aggregate effect. Some jobs could be lost in energy-intensive sectors, 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. This situation might be different if a large energy shock were to hit the economy with no warning, as happened in the oil crisis of 1973-74, when the real money supply, output and employment all contracted sharply. In addition to hitting with no warning, the oil shock of the 1970s also entailed large transfers from the U.S. and other oil-importing countries to OPEC, thus depressing real income and spending in the former. A self-imposed shift in the relative price of carbon in energy-intensive sectors to address global climate change, on the other hand, need not entail such a transfer of purchasing power. Thus there are critical differences between the oil price shocks and the effort to reduce carbon emissions. Our reassuring conclusion regarding aggregate output might also be different if the policy were to be implemented inefficiently (by command-and-control style regulation of the sort put in place in the oil crisis) rather than efficiently (by market-based mechanisms of the sort that the President has proposed to use). VII. Conclusion: In conclusion, the Kyoto Agreement and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Agreement 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, and then later with a market-based system of tradeable permits to ensure that our objectives are achieved as efficiently

tly as possible. My overall conclusion is that the economic impact of the Protocol will be modest relative to the value of the insurance against climate change that the Kyoto agreement provides. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which relies not only on the forecasts of individual models, any one of which has its own strengths and limitations, but also on a broad variety of additional analysis and assessment. I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Agreement 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. ===== END ATTACHMENT 1
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RECORD TYPE: PRESIDENTIAL (NOTES MAIL)

CREATOR: Randall W. Lutter (CN=Randall W. Lutter/OU=CEA/O=EOP [CEA])

CREATION DATE/TIME:23-FEB-1998 17:52:22.00

SUBJECT: Here is Ray Squitieri's e-mail on prices and expenditures.

TO: Janet L. Yellen (CN=Janet L. Yellen/OU=CEA/O=EOP @ EOP [CEA])

READ:UNKNOWN

TEXT:

I am forwarding this as I promised. I think that it needs work and that you should give me til tomorrow morning to make it presentable before you spend time on it.

-RL

----- Forwarded by Randall W. Lutter/CEA/EOP on 02/23/98
05:48 PM -----

Ray.R.S.Squitieri @ MS01.DO.treas.sprint.com

02/23/98 03:04:00 PM

Record Type: Record

To: Randall W. Lutter

cc:

Subject: fact check

Date: 02/23/1998 03:50 pm (Monday)

From: Ray Squitieri

To: randy

Subject: fact check

Janet Yellin testimony on climate change

Notes on effect on average family

Treasury 10/97 calculation (spreadsheet attached) found that \$100/ton carbon tax implies 20.2% increase in direct energy expenditure at hhld level. Thus \$14 to \$23/ton carbon tax implies 3.8% increase before adjusting for price elasticity effect, or 3.4% increase after adjusting for price elasticity effect (which is about 12%).

Approximate agreement with earlier Treasury calculation done differently:

In 9/97 calculations, Treasury calculated the effect of \$100/ton carbon at \$514/hhld (\$1992) for direct energy expenditures. Yellen testimony cites permit price of \$14 to \$23/ton. So $18.5/100 \times 514 = \$95$ per hhld. In 1993, the average hhld had \$1282 in direct expenditures for energy (Stat Abstract, table 920) not including gasoline, and bought about 1000 gallons of gasoline at an average price of \$1.16 per gallon. Total direct energy expenditures were thus \$2442. Then $95/2442 = 3.9\%$.

===== ATTACHMENT 1 =====

ATT CREATION TIME/DATE: 0 00:00:00.00

TEXT:

Unable to convert ARMS_EXT:[ATTACH.D76]MAIL48393345F.026 to ASCII,

The following is a HEX DUMP:

Clinton Presidential Records Automated Records Management System [EMAIL]

This is not a presidential record. This is used as an administrative marker by the William J. Clinton Presidential Library Staff.

Hex Dump file is not in a recognizable format, has been incorrectly decoded or is damaged.

File Name: p_e5433937_cea_html_1.xls

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