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Environment: Climate Change [1]

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Tues, 10/15/96, 11-12pm



United States Department of State

Assistant Secretary of State for Oceans and
International Environmental and Scientific Affairs

Washington, D.C. 20520

W.R.P.

CLIMATE CHANGE MEETING PRINCIPALS ONLY
TUESDAY, OCTOBER 15 - 11:00 - 12:00n

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Steve Seidel	456-6546
David Sandalow	456-2170
Pete Jordan	456-9500

Attached is the agenda paper for the climate change meeting that Eileen Claussen would like to have on Tuesday, October 15 from 11:00-12:00 in Room 7835, Department of State. Please call Ms. Wiggins at 647-1554 regarding your attendance.

Thank you.

Climate Change: Next Steps

I. Decision Process

- Interagency Working Group (IWG chair: Amb. Mark Hambley, technical level staff from agencies)
Principal tasks: develop workplan, prepare analyses, develop/recommend policy options, staff U.S. delegation to Climate Convention and related negotiating sessions
- Claussen Group (chaired by A/S Eileen Claussen, A/S level from agencies)
Principal tasks: manage process; take policy decisions on most issues
- Interagency Analysis Team (IAT chair: U/S Everett Ehrlich; technical staff from analytic agencies)
Principal tasks: develop analytic toolbox to assess policy options; evaluate selected options
- Deputies Committee (co-chairs Katie McGinty and Dan Tarullo, U/S and Cabinet level)
Principal tasks: approve/modify Claussen Group decisions as appropriate, make final major policy decisions

II. U.S. Framework

Announced in Geneva at second session of convention Conference of Parties (by Tim Wirth); includes:

- legally binding target and timetable (rejecting common/harmonized policies and measures)
- medium term emissions target (rejecting short term, i.e., 2005), and long term concentration goal
- flexibility (e.g., emissions trading and/or Joint Implementation (JI))
- requirement of a compliance regime
- inclusion of developing countries

III. Negotiating Timeline

September/October:

- Claussen Group Meeting: October 15. Review proposed submission to convention secretariat
- Submission to convention secretariat (due Oct. 15): propose elements of a protocol/legal instrument, to include: JI/trading, legally binding/compliance, non-Annex 1 involvement, targets (written by IWG, cleared by Claussen Group/Deputies)

November

- U.S. positions prepared by IWG, cleared by Claussen Group and Deputies. Position to be based on elaboration of October submission, to include:
 - emissions trading/JI (including underlying principles, but no operational details)
 - developing country commitments (developing countries must take part in agreement)
 - target design (with no numbers)
 - legally binding/compliance issues
- Claussen Group Meeting: November 24. Review U.S. positions prior to December AGBM; possible agreement on demarche to other countries

December

AGBM (Geneva):

- Concept for and structure of instrument to be tabled/discussed;
- Meeting output will likely take form of outline for agreement

February /March 1997

AGBM (Bonn):

- Initial tabling of language for agreement
- FCCC Secretariat to compile bracketed text based on December discussion and interim submissions
- U.S. will need actual draft agreement language (rather than concepts) on:
 - emissions trading/JI,

- developing country commitments,
- compliance issues.
- Given short time between conclusion of December session and February opening, little new work can be anticipated in U.S. on these beyond that developed or December; however, we may be able to announce completion of some IAT results with respect to targets at this session. (IWG to draft language, IAT to prepare analyses, Claussen Group to clear)

April/May

Submission of negotiating text to FCCC:

- Submission date not yet set; however, can be anticipated to be needed to insure compliance with 6-month rule;
- Expect Secretariat to compile as single "bracketed text" on basis of submissions; U.S. will need to insure that any options we are still considering be submitted and included in this text

May/June (?) 1997

AGBM (tentative; Bonn):

- Expect a session to be held late Spring/early Summer to insure compliance with 6 month rule
- Focus on discussion of/revision to bracketed text;
- All issues at play;
- Seek resolution of least contentious matters, possibly including final clauses

October (?) 1997

AGBM (tentative; Bonn)

- Expect to need at least one Fall session prior to Kyoto/COP-3; none now scheduled, and would require additional financial support
- Focus on further resolution of bracketed text for instrument, possibly including with respect to trading, compliance and institutional issues

December 1997

COP-3 (Kyoto):

- Likely to need high level bilateral discussions prior to session to resolve final disagreements such as targets, developing country activities, and possibly Rules of Procedure
- Expect both officials' and ministerial-level session at COP-3;
- Focus at former will be to resolve all brackets – but will likely leave some issues unresolved pending arrival of ministers
- Anticipate adoption, but no formal signing ceremony in Kyoto
- May also require "interim operating agreement" – to allow for additional technical details to be resolved (e.g., on trading).

IV. Other Meetings: Timeline

September/October:

- OECD Meetings (Paris, September 30-October 3): discussion of elements of protocol/legal instrument; possible EU focus on policies and measures; additional discussion of developing countries

November

- Annex I Countries of the Asia Pacific (ACAP: US, Canada, Australia, Japan and New Zealand) (Hawaii, October 31 - November 1): all issues related to December Ad Hoc Group on the Berlin Mandate (AGBM: negotiating body for next steps)
- Developing country contact group (Paris, tentative): issues related to technology, Global Environment Facility (GEF), Article 4.1

April/May

Second Climate Action Report due to FCCC (April)

- Will require announcement of anticipated shortfall in meeting 1990 ghg emission levels by 2000, as well as anticipated additional measures being taken to reduce emissions
- IWG to draft, Claussen Group/Deputies to clear; will require financial support from agencies to prepare and publish; will be circulated internationally at Spring/Summer AGBM

September/October

IPCC to begin Third Assessment Report

THE WHITE HOUSE
WASHINGTON

October 15, 1996

AMM
RP

MEMORANDUM FOR DISTRIBUTION

FROM: Michael Warren, Executive Director
National Economic Council

SUBJECT: Climate Change Deputies Meeting

The joint NEC-CEA deputies meeting on climate change scheduled for October 16 at 6:00 pm is cancelled. We will contact you if and when it is rescheduled. We apologize for any inconvenience.

Distribution:

Charles Curtis, DoE
Ev Ehrlic, Commerce
Jack Gibbons, OSTP
Jamie Gorelick, DoJ
Jeff Lang, USTR
Jack Lew, OMB
Richard Rominger, USDA
Joe Stiglitz, CEA
Nancy Soderberg, NSC
Larry Summers, Treasury
Tim Wirth, State

ANN
Ray

THE WHITE HOUSE
WASHINGTON

October 15, 1996

MEMORANDUM FOR DISTRIBUTION

FROM: Michael Warren, Executive Director
National Economic Council

SUBJECT: Climate Change Deputies Meeting

There will be a joint NEC-CEA deputies meeting on climate change on October 16 at 6:00 pm in room 231. The meeting will be co-chaired by Dan Tarullo and Kathleen McGinty. The agenda is as follows:

1. Interagency process (McGinty/Tarullo)
2. Update
 - status of negotiations (Wirth)
 - status of analytic work (Ehrlich)
3. Schedule of upcoming events (Wirth)

Deputies plus one are invited to attend. Please call Kristen Panerali at the NEC at 456-5353 with your clearance information.

Distribution:

Charles Curtis, DoE
Ev Ehrlic, Commerce
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Nancy Soderberg, NSC
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Tim Wirth, State

***Perspectives on the Choice of Models for
Global Climate Change Analysis***

Presented by

**Roger Brinner
Executive Director and Chief Economist
DRI/McGraw-Hill**

*3 / Hagan, Hunter, Rudy
Rosen, 10/17/96, 5pm*

Perspectives on the Choice of Models for Global Climate Change Analysis

- Key Aspects of the Policy Environment
 - Huge Scale of Economic Intervention
 - Long Time Horizon
 - Short-run Impacts Politically, Environmentally and Economically important
 - Speeds of Adjustment
 - Emphasis on Price Incentives in US Discussion
 - Command/Control Policies Often Favored in Europe
 - New Technologies
 - Regime-shifts and Forward-Looking Expectations
 - Industry-Specific Responses
 - International and Regional Complexity
 - Uncertainty about the Costs of Non-Intervention
 - Economic Welfare beyond Official GDP

The Truth about Modern Macro/Energy Model Systems such as DRI's System

The serious “macro” modelers have listened to and learned from the debates of the past three decades. On the other hand, most of the academic model builders and GEQ promoters have not had access to this work and thus compare their “GEQ” models to macro models as they existed in the 1960s and 1970s.

With extensive testing, innovative structures, and appropriately constrained core coefficients, DRI's modern systems centered on macro-econometric models are, in fact, genuine general equilibrium models.

- A robust long-run growth model is at the core, reliably regulating long-run answers.
- Most key expectation structures are “rational” and “forward-looking” in a realistic, tested manner.
- An extremely detailed, forward-looking energy model is fully integrated into macroeconomic cyclical and growth scenarios.
- Microeconomic fundamentals are fully respected in constrained long-run price elasticities in both macro and energy models.
- Technological change is endogenous, driven by R&D activities with literature-benchmarked rates of return.
- International feedback loops are built in, combining good microeconomics, historical testing, and user options for sensitive parameters.
- Continuous testing against actual experience has allowed identification of robust, sustained behavior and of structural shifts that need to be endogenized or specifically managed by the analyst.
- The models have been tested in a wide range of policy applications to reduce the risk of blind spots and short circuits in any specific policy situation.
- Well-documented model allows user to anticipate basic results and to understand valuable, initially paradoxical results.
- Sophisticated software implementation allows for constraining results further on a scientific basis to match other model insights, bridge to additional resource supply and industrial or regional models, or implement command/control changes as desired.

Specific Examples of Key Lessons Embodied in DRI Macro/Energy Model System:
Tied to the Key Aspects of the Environmental Policy Environment

– Long Time Horizon

Production function with diverse capital inputs (each with appropriate rate of return and depreciation).

Careful re-specification of the role of energy inputs in intermediate and final production as substitute for capital or labor.

– New Technologies

Factor-augmenting technical progress driven by R&D. First implemented in 1976, and continuously tested, validated since then.

– Emphasis on Price Incentives in US Discussion

Neoclassical investment/cost-of-capital functions in business fixed investment, housing, and consumer durable spending models with appropriate short- and long-run elasticities.

Accelerationist wage-price models with no long-run inflation/unemployment trade-off.

Stage-of-processing price model with appropriate long-run elasticities and import price sensitivity.

– Command/Control Policies Often Favored in Europe

Software environment of model greatly facilitates matching adjustments to durable goods spending (on new technology or higher-efficiency models) and related energy consumption.

– Huge Scale of Economic Intervention &..

– ..Short-run Impacts Politically, Environmentally and Economically important

Reliable financial-real-price sector interactions, including multiple options to invoke alternative, endogenous central bank reactions.

Detailed government sector to track endogenous inflation, growth, finance budget repercussions on a short-and long-run basis.

– Speeds of Adjustment

Great care is taken during estimation to estimate the time profile of demand responses.

Specific Examples of Key Lessons Embodied in DRI Macro/Energy Model System:
Tied to the Key Aspects of the Environmental Policy Environment
(continued)

– Regime-shifts and forward-looking expectations

Linked energy model has detailed capital stock choice models for transportation, residential, commercial, and utility sectors with explicit forward-looking life-cycle costs and probabilistic selection of least cost options.

Financial market expectations based on the accelerationist model, structural deficits, and global conditions.

– Industry-Specific Responses

Detailed energy prices now feed relative prices of final demand elements driving industrial and service sector outputs by industry.

Full linkage between energy and macro model simulations.

– International Complexity

Automated, tested feedback loops involving world bond yields, oil prices, import prices, export demands.

The OECD and developing nation trade variables are entered as separate, distinct price, exchange rate, and volume inputs to U.S. export and import model equations. This will facilitate handling of differential policies and production responses,

– Uncertainty about the Costs of Non-Intervention & Economic Welfare beyond Official GDP

The GDP, Consumption, Income and price answers can be exported to other models to estimate broadly defined consumer welfare measures.

These features and improvements combine to give answers that should be respected by Keynesians, Monetarists and Neoclassical economists.

Integration of the DRI Macro, Energy, I-O and Regional Models

- The DRI Macro and I-O Models take key inputs from the Energy Model
 - fuel price by type
 - non-utility final demand for fuel use by type
 - consumer usage of energy by type
 - utility use of fuel use by type
 - energy production by type
 - energy imports and exports
 - light vehicle miles per gallon, new and weighted-average stock
- The DRI Energy Model takes key inputs from the Macro and I-O Models
 - Residential: housing starts and stock
 - Commercial: building square footage by type of construction, discount rates
 - Industrial: real output/production by 2-4 digit SIC codes
 - Utility: capital costs, wage rates, construction costs
 - Transportation: vehicle sales and stocks, prices, foreign trade (for bunker fuels)
 - All Sectors: real income, inflation components, capital costs
- DRIs U.S. Regional Model is also fully integrated into this system
 - The DRI Energy Model starts at Census and NERC regions and sums to national totals
 - For example, housing starts and stocks are distributed regionally, with differentiated energy requirements
 - National production and employment are distributed on a consistent basis across regions, states, and metro/non-metro areas---a potentially valuable political input

Problems Specific to Many “General Equilibrium” Models

- Only rough calibration to starting points and realistic base lines.
- No testing of historical validity and little testing of applicability to a broad range of policy situations, thus leaving severe blind spots and short-circuits even in their own principal policy area.
- Transition periods are ignored or handled roughly. Long- versus short-run elasticity demand and supply differences are paid scant attention.
- A central price is often set as numeraire, thus no policy guidance on inflation impact in all its dimensions.
- Simplistic, counter-factual expectation formation, not even recognizing Lucas/Sargent concept of the richness of expectation formation.
- No central bank, hence real cost of capital invariant in many circumstances where it should be expected to change substantially for a prolonged period of time.
- Full employment assumed, hence no policy guidance on job losses or gains.
- No business cycle, hence no capital formation losses or gains in very important transition periods.
- High degree of aggregation.
- Limited international feedback.
- Limited software environment to facilitate linkages to other models on a simultaneous basis.

In short and to be blunt, in contrast to their names, as a class the so-called GEQ models actually tend to be Very Partial Equilibrium Models with a penchant for elegant math and little resemblance to real world economies.

Expectations and “Regime Shift” Changes

- The phrases “rational expectations” and “perfect foresight” try to bring powerful, positive images in support of some “general equilibrium” models and, by contrast to criticize other models with different approaches. However, consider a few recent examples to see what the most reasonable and realistic interpretations of expectations should be.
- I. New monetary policy regimes:
 - Thatcher: monetarist/rational expectation promise of painless end of inflation thoroughly refuted
 - Volcker: bond markets expected sustained inflation and real credit scarcity, not immediate transition.
 - In both cases, no labor or financial market moderation occurred only after traditional information (i.e., higher unemployment and lower inflation) confirmed policy.
 - France and the EMS/EMU: French yields remain far higher than German in spite of policy change and, indeed, years of delivery on the new policy.
- II New fiscal policy regimes
 - Some evidence exists of temporary 3-6 month benefit from balanced budget announcements, followed by relapse until actual deficit reduction produced.
 - No evidence of capital spending acceleration or deceleration in response to policy changes until the change takes place.
- III New energy policy regimes
 - Capital spending decisions made with great skepticism about endurance of long-run policy, given quick changes in official preferences for nuclear, then coal, and now natural gas.
 - Consumers behave in extremely short-sighted manner with regard to auto and appliance efficiency choices.
 - Phase I of Clean Air Act: Utilities behaved as if past coal prices would persist, and thus installed scrubbers. Perfect foresight would have foreseen price reductions for low sulfur coal and avoided heavy investment in scrubbers.
 - Government efficiency standards and programs: CAFE standards, electric vehicle requirements, Montreal protocol on CFCs, etc. presumed not to be binding or to be evaded, thus technology development did not accelerate to match desired norms.
- IV. Surveys of expectations confirm backward-looking expectations with significant lags.

Therefore, the DRI model system uses appropriate, not fanciful or untested, representations of rational or forward-looking expectations.

A Set of Policy Experiments to Highlight the Theoretical Integrity and Flexibility of the DRI Macro/Energy System and the Potential Blind Spots of New “GEQ” Models

- The Fiscal Policy Experiment:
 - Substitute payroll taxes for personal and corporate income taxes
 - Target the original full-employment federal deficit
- The Monetary Policy Alternative Assumptions, highlighting the role of the central bank as a major participant in the capital markets and the financial / real / price interactions---economic elements ignored or handled poorly by newer GEQ models
 - Constant nominal reserves
 - Constant real interest rate (a la many GEQ models)
- The Labor and Goods Markets Alternative Assumptions
 - Normal reactions of individual agents as historically observed
 - “Perfect foresight” assumption such that nominal base wages are adjusted to keep price level unchanged if nonborrowed reserves are unchanged
 - Or, think of this option as the equivalent of assuming a fixed price numeraire
- Comparison of results for output, employment, capital formation, prices, wages, capital costs
 - Short-run
 - Medium- and long-run
 - Note: think of “the long-run” in many climate change scenarios as the integration of a sequence of overlapping, ever-increasing fiscal initiatives

Perspectives on the Choice of Models for Global Climate Change Analysis

- A modern macro and energy model system is calibrated to perform with robust general equilibrium properties.
- Because these models have been developed and maintained over decades with policy analysis as the key focus, they avoid the short-circuits and blind spots of recent alternatives.
- However, the best insights from new models can be incorporated into the simulations of the macro/energy system. The software environment greatly helps the user to input alternative theoretical or empirical assumptions about key parameters and then to observe the sensitivity of the key results to such assumptions.



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Thurs, 9/26/96, 1:30pm

W. R. P.
D.S.

Capital Office
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(202) 387-3500
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September 23, 1996

Alicia Munnell, Ph.D.
Council of Economic Advisors
Old Executive Office Building
17th and Pennsylvania Avenues, N.W.
Room 314
Washington, D.C. 20500

Dear Dr. Munnell:

Thank you for agreeing to meet with us on Thursday, September 26, 1996 at 1:30 p.m. on the issue of climate change. Please find enclosed materials describing our proposal for managing greenhouse gas emissions in an international context.

Sincerely,

Joseph Goffman
Joseph Goffman
Senior Attorney

Daniel Dudek
Daniel Dudek
Senior Economist

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**EMISSION BUDGETS:
Creating Rewards,
Lowering Costs
and Ensuring Results**

Daniel J. Dudek
Senior Economist
ENVIRONMENTAL DEFENSE FUND
New York, New York

paper presented

Climate Change Analysis Workshop

Springfield, Virginia
June 6-7, 1996

INTRODUCTION

Change is a dominant aspect of environmental problems. Change can come from the growth of populations, economies, or production processes. While societies have developed sophisticated institutions to manage change, few of the environmental management strategies that have been developed are dynamic in operation. Most policies are static tools which even fail to account for natural variabilities particularly as these may affect the environment's capacity to absorb emissions. More often than not, emission limitations are conservatively designed for worst case scenarios. This design deficiency is increasingly important as we consider problems with significant uncertainties either in scientific understanding of the environmental problem's mechanism or in the consequences of ineffective action. For example, the problem of global climate change has significant uncertainties as to the distribution, intensity, and timing of impacts. These uncertainties complicate the international problem of agreeing upon a set of actions to take -- whether to wait to respond for improved scientific or technical information, to simply adapt to the changes as they arrive, or to begin the process of reducing the discharge of greenhouse gases to the atmosphere.

Institutional innovations in policy have often been at the heart of resolving difficult environmental questions. In a sense, the history of environmental management has been one of institutional innovations. After all, environmental policy making itself is barely 25 years old. However, neither economic theory nor policy analysts have placed much emphasis on the role of institutional innovations in the process of transforming externalities into relevant corporate decision factors. While many policies have been straightforward, even pedestrian, in their solution of the problem, others have employed considerable ingenuity to achieve their aims. Compare for example the typical policy of setting emission limitations for individual industries with debt-for-nature swaps. The former took the time-honored path of creating laws and regulations to achieve its ends while the latter assessed the problem, the resources available and harnessed self-interest in the service of the environment. The former case imposes a legal burden on the firm while the latter creates an opportunity for mutual profit while preserving the environment.

This paper will identify, review, and assess a variety of institutional innovations in environmental policy that have evolved in the process of developing and extending the concept and practice of marketable permits. Particular emphasis is given to the analogy of marketable permits as environmental currency. The particular focus is the problem of climate change and its challenges. The message is that these challenges are not unique and that we have a reservoir of existing and evolving experiences to guide our choice of policy strategy. ***These environmental lessons have established the importance of flexibility in timing, the reward for early reductions, and geographic scope as critical determinants of both environmental and cost effectiveness.*** Using these lessons is critical as the U.S. moves into a new round of negotiations on the Berlin Mandate.

ENVIRONMENTAL INSTITUTIONAL INNOVATION: THE BANKING OF MARKETABLE PERMITS

The neoclassical view of environmental problems characterizes them as arising from market failure. In particular, environmental damage is not taken into account in the process of making production decisions. The usual policy prescription is to internalize the externality through regulation either on the firm's production process directly or indirectly on the prices paid for inputs. Most environmental policy around the world has been direct regulation in the form of emission norms frequently coupled with fees levied on the discharges. While seemingly following the economist's prescription, these policies in practice have suffered from both a lack of enforcement as well as fee levels below marginal control costs. In the latter case, any stimulus to innovate on the part of the firm to avoid the fees is completely lost. Furthermore, while this system has had some success in reducing emission loads, it has been more successful in perpetuating itself.

The Offset Policy and the Origins of Banking

Frustration with the inflexibility and cost of the command-and-control approach to environmental policy in the United States has led to a series of policy experiments to increase flexibility and performance.¹ Several fundamental insights motivated these experiments. The first was the realization that emissions reductions from one plant can be used either to augment control or as compensatory compliance for emissions at another so long as the discharges had the same environmental effect. This insight led to the development of the offset policy. Offsets were first applied in the case of new plant construction within regions in which total emissions were greater than allowed by law, so-called ozone nonattainment areas. By requiring new emission sources to purchase more reductions from existing sources than they themselves would add to the atmosphere, economic growth was harnessed as to reduce rather than increase emissions.

While offsets represented a significant step toward the creation of markets for emission reductions, the institutional innovation that enabled this policy to practically function was the development of emission reduction credit banks. By creating the opportunity for firms to pre-certify emissions reductions with regulators, a ready supply of offsets was established. In environmental terms, this institutional change accomplished what neither regulation nor bureaucrats could achieve -- the identification of cost-effective emission control opportunities. By transforming the environmental management problem from one of punishment to reward, companies were encouraged to identify emission reductions which could be produced and sold at a profit.

The experience with banking under the set of emission trading policies focused on urban air quality has been mixed.² Each state, or in some cases local air districts,

¹ For an overview of the variety of state-based emissions trading programs see Dudek, Wade and Goffman.

² See Dudek and Palmisano for a discussion of the issues raised in the development of

developed their own set of rules and procedures. In some cases, banked emission reductions were confiscated by regulators needing to "produce" additional reductions to meet the legal requirements for attainment demonstrations. In other cases, the rules for banking were so restrictive that the supply of available offsets was similarly constrained. This varied experience left both regulators and firms frustrated with the emissions trading policy. While the banking function was introduced as a necessary element to achieve the smooth functioning of the offset policy and to reduce the drag on growth from environmental policy, it was so unevenly implemented that the first decade of emissions trading has been largely characterized by supply uncertainty.

Banking as an Integral Design Feature

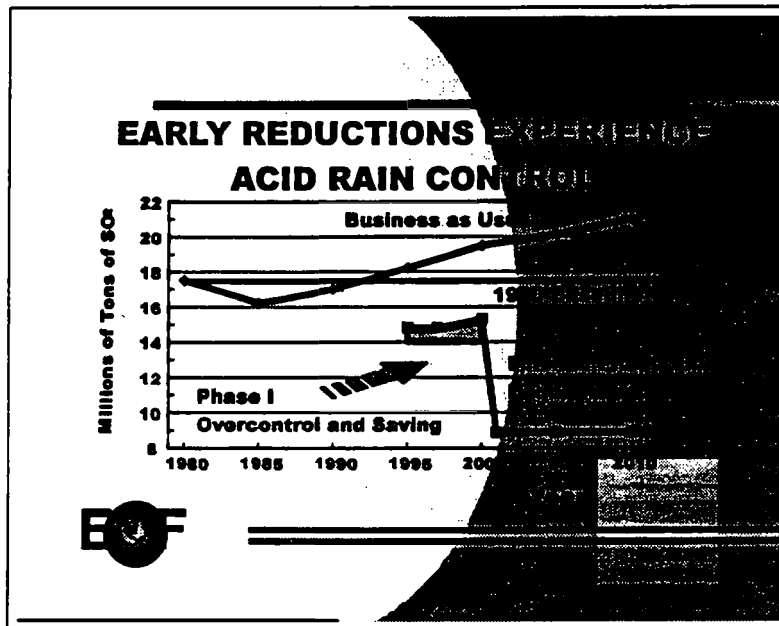
This early experience with banking laid the critical foundation for integrating banking more fully into the design of marketable permit programs. While the early experiments with emissions trading involved the introduction of optional flexibility for firms, later designs were developed to be the primary vehicle for compliance. For example, in the design of the acid rain program in the United States, the total annual discharge of SO₂ from electric power generating stations is limited. This limitation or cap is implemented by issuing each firm an annual allotments of SO₂ emission entitlements called allowances. In addition, new entrants must purchase sufficient quantities of allowances to completely offset the emissions resulting from their operations. Each firm must report its annual emissions as measured through the use of continuous emission monitoring systems. Compliance with the program is determined by the Environmental Protection Agency (EPA) by comparing the discharge reports with the number of allowances held by the firm. Under this system, the firm's legal responsibility is to hold a number of allowances greater than or equal to total discharges. In this sense, the firm's participation in the trading program is not optional since compliance is defined in terms of the program's basic design. While the firm has no choice about participation in the acid rain control program, the firm is free to decide whether it will participate in the SO₂ allowance trading market. Since compliance is defined in terms of the relationship between allowance holdings and emissions, the firm is free either to reduce emissions through conventional means or to acquire allowances from other firms.

Since the acid rain problem in physical terms is cumulative involving the depletion of natural buffering capacity from soils, this dynamic aspect of the problem was included in the basic program design. Specifically, the SO₂ allowances issued to firms have an indefinite life, i.e. they are good until used to compensate for emissions. The practical consequence of this design feature is to provide firms with the possibility of "banking" or saving extra SO₂ allowances for future use in compliance or for sale into the market at a future date. Extra SO₂ allowances can be produced by controlling emissions more than required, by purchase at the annual auction, or by purchase from other firm or broker. As shown in Figure 1, the emissions consequences of this program design element have been enormous. The EPA has estimated that overcontrol by firms could be as high as 40%. In environmental terms, this overcontrol

emissions trading.

and banking is quite significant since it is being produced early in the program at a time when the marginal benefits from control are highest in terms of relief to acid-stressed ecosystems.

Figure 1. SO₂ Allowance Banking



The banking provisions of the acid rain program have also had critical implications for the evolution of the SO₂ allowance market. As indicated above, up to 6 million tons of extra SO₂ reductions are expected in the first phase of the program. The practical result of this extensive banking has been to depress allowance prices. The March 1996 auction of approximately 250,000 allowances produced winning bids in the \$60-70 per ton range.³ These market results stand in sharp contrast to the preprogram forecasts of \$500-750 per ton for allowance values in the first phase. In fact, in debates over critical design elements of the program, independent power producers planning to construct new power plants expressed fears that allowances would not be available to them in sufficient supplies to offset their new emissions even at the \$1500 per ton level. As a result, a special Administrator's Reserve was created for administrative purchases at \$1500 per ton. From recent market values (roughly \$60 per ton), these fears seem unfounded in the extreme.

These unexpectedly low allowance prices are a direct result of the banking opportunities provided in the program and the large supply of overcontrol. The

³ One of the precedent-setting aspects of the acid rain program is its use of an auction to reallocate allowances. The novelty of this program prevented the most efficient design from adopted and it has been widely criticized. Nonetheless, the auction has provided not only a mechanism for redistribution, but also a very visible public signal concerning the operation of the program in the form of widely reported prices.

underlying economic factors contributing to the supply of allowances include intense competition between railroads from the western U.S. which has reduced freight costs for low sulfur coal and the tremendous economies of scale in coal production in the Powder River Basin. Since the program is to be implemented in two discrete phases, firms have used these cost factors to stockpile extra reductions which could be used either to delay second phase capital expenditures or to sell into the market if prices improve. In any event, the implication for the allowance market has been a large supply of available allowances, unexpectedly low prices, and relatively few inter-firm transactions compared with expectations.⁴

In contrast to the late 70's and 80's, this period of experience with emissions trading has been characterized by demand uncertainty. In part, this reluctance on the part of firms to rely on market transactions for legal compliance in the face of potential criminal penalties is understandable. Emissions trading remains a novelty and firms are unsure both of market availability and public acceptability. This problem is heightened by the fact that the electric utilities in the acid rain program are still regulated monopolies and therefore their expenditures are subject to public review prior to recovery from the public through rates.

Applying the Banking Paradigm

Throughout the development of the acid rain program it was apparent that the flexibility in control decisions would create the opportunity for firms to choose options which would simultaneously reduce several emissions at once. Of particular concern was the reduction of greenhouse gases.⁵ For example, some analysis at the time evaluated the cost-effectiveness of energy efficiency investments as pollution control options.⁶ However, it remained until after the negotiation of the Framework Convention on Climate Change (FCCC) in Rio in 1992 that firms took the problem of managing GHG seriously. After this time, strategic planning analyses by electric utilities of the implications of CO₂ control options began to be developed.

⁴ This outcome should not be surprising given the discrete nature of the two phases. The first phase of the program involves only 111 individual plants while the second will add more than a thousand sources. The significant aspect of the phases, however, is the legislatively mandated requirement for separation. Specifically, representatives of high sulfur coal mining regions concerned about employment insisted that plants to be controlled in the second phase could not enter into the program early. As a result, firms could not optimize control investments over all of their operations, except through overcontrol in phase I plants.

⁵ A primary strategic motivation for the advocacy of marketable permits for SO₂ by the Environmental Defense Fund was the fact that conventional flue gas desulfurization devices (FGD) imposed an efficiency penalty and therefore increased greenhouse gas (GHG) production. FGD was also the highest marginal cost control option. Therefore, an efficient policy like marketable permits would minimize the investment in FGD and therefore reduce the commitment to future increases in GHG.

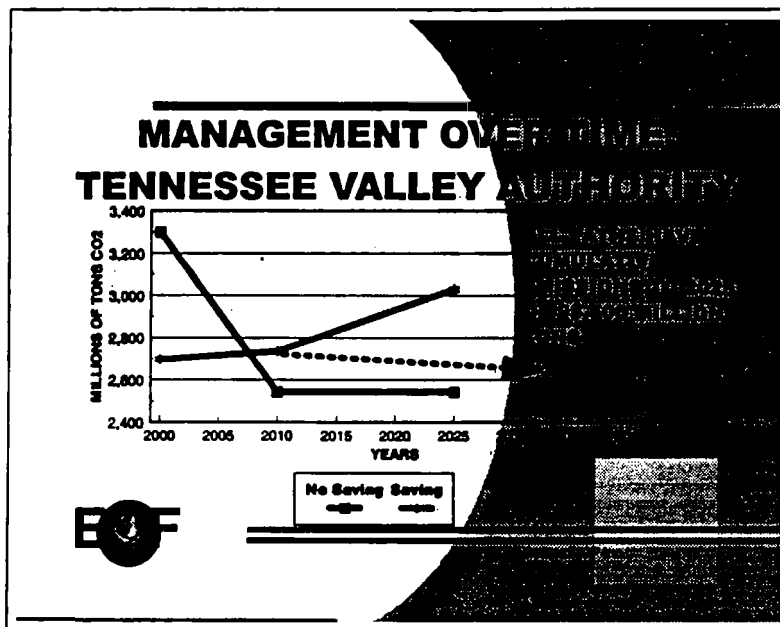
⁶ Dudek, LeBlanc, and Miller identified and evaluated a set of control options which reduced SO₂, CO₂, and NO_x.

One such study was conducted by the Tennessee Valley Authority (TVA), the fourth largest electric utility in the U.S. TVA, a publicly owned utility was prodded by Congress to evaluate the relative impact of alternative CO₂ control policies on system investments, compliance costs, and electricity rates. The study used the Dynamic Energy and Greenhouse Emission Evaluation System (DEGREES) a linked optimal control and linear program developed by ICF, Inc. A variety of scenarios and policies were developed for analysis by a peer review group which included emission cap and trade policies with:

- limited flexibility (plant by plant control)
- flexible (within system control only but trading among plants)
- flexible with offsets (including international acquisitions)
- flexible with offsets and banking (to include the banking of early reductions).

In addition, a variety of carbon tax policy options to stabilize emissions at 1990 levels by the year 2000 and to reduce 20% below 1990 levels by 2010.

Figure 2. GHG Emissions Profiles with Banking



The most interesting results from this study concerned the optimal emission profiles for the utility when the banking of early reductions was allowed (shown above in Figure 2). Without the option to bank early reductions, TVA would produce exactly the reductions required at the time required irrespective of reduction scenario. However, if the banking of early reductions was allowed the utility would generate more than 3 billion tons of early reductions. These extra reductions would be supplied by avoiding the use of FGD, fully implementing energy efficiency programs, substituting natural gas, and acquiring offsets from other sectors. Owing to computational limits and a bank

exhaustion constraint in the ICF model, the calculated trajectories imply gradual withdrawals from the bank up to the year 2025. Depending upon the path of future reduction responsibilities and future marginal costs, these withdrawals could occur more slowly over a longer period of time. In each case, however, the cumulative emissions profiles are constant at 95.5 billion tons to 2025.

Figure 3 presents the results of several policy scenarios and control levels in terms of the increases in electricity rates that would have to be charged customers in order to pay for the control investments. On system stabilization at 1990 levels would require rate hikes of 15% by 2025. However, if both banking and international reduction transfers (also known as joint implementation) were allowed, cost increases to electricity consumers would be only 8%. This level of cost reduction is very consistent with experiences under the acid rain program. Of course this analysis is conditioned on a number of critical assumptions including emission reduction responsibilities assigned to other sectors and nations, the growth of electricity demand, and the supply of international GHG offsets.

Extending the Banking Paradigm – QELROs

Despite the entry into force of the FCCC last year, international action to control GHG emissions has not matched the intensity of debate. The Rio agreement contained soft targets of 1990 CO₂ emission levels by 2000 which are likely to be met only by a few nations such as Germany and the United Kingdom. However, with the publication of the Intergovernmental Panel on Climate Change's current assessment of the problem, scientific understanding is increasingly a consensus of serious concern. At

Figure 3. Electricity Rate Increases

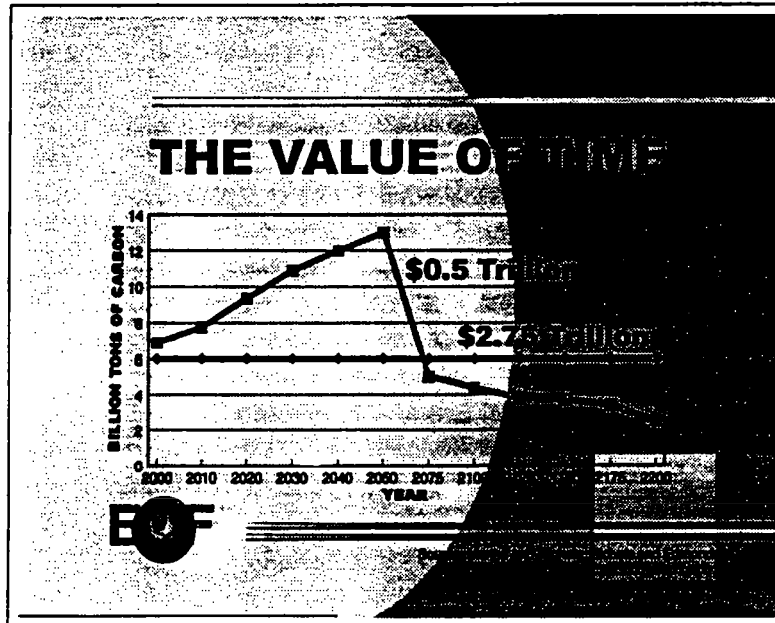
VALUE OF FLEXIBILITY

SCENARIO	ELECTRICITY RATE INCREASE IN 2010	ESTIMATED RATE INCREASE BY 2025
Stabilize at 1990 Levels by 2000	2%	15%
20% Reductions Below 1990 Levels by 2010	10%	20%
With 20% Reductions, Allow International Cooperation	3%	17%
With 20% Reductions, Allow Cooperation and Saving	1%	8%

EO

the first Conference of the Parties in Berlin last April, negotiators agreed to develop a protocol for GHG control by 1997. Discussions are presently occurring on two tracks -- policies and measures to control GHG emissions and quantitative emission limitation and reduction objectives (QELROs). The development of QELROs seems to offer much greater potential for both effective and efficient policy development.

Figure 4. The Costs of Alternative Cumulative Emission Paths



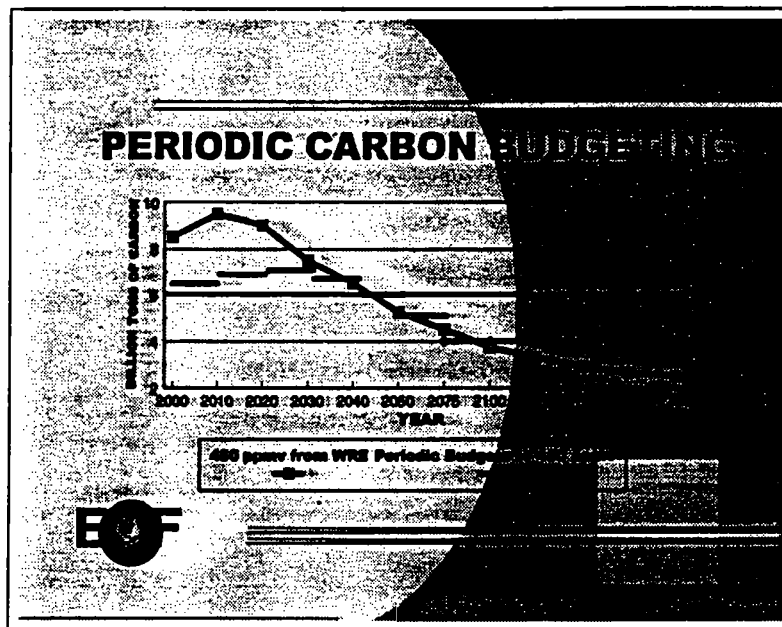
QELROs have generated substantial interest among negotiators as a result of several recent policy analyses. These analyses have been very similar to that presented for TVA above except that global emission profiles were assessed from the vantage of minimizing the cost of hitting specific atmospheric concentration limits (e.g. 450 or 550 ppmv of CO₂). One example is shown above in Figure 4. These analyses have shown very dramatic cost reductions from shifting both the timing and location of emission reductions. The graph in Figure 4 shows 2 different cumulative emissions trajectories each of which have the same cumulative emissions and result in a 550 ppmv concentration in 2200.⁷ However, there is more than a 5 fold increase in cost associated with the uniform emission profile. This result focuses attention on the critical role of the timing of reductions in determining costs. The flexible emissions trajectory allows global emissions to rise largely along a business-as-usual path until approximately 2050 at which time a low carbon intensity energy alternative is presumed to be developed and diffused over the next 25 years. Emissions would ultimately fall to roughly half present levels.

The cost differences are significant between these two emission profiles, but the critical question is how to secure the cost savings and protect the

⁷ The 550 ppmv curve is shown for illustrative purposes only. EDF believes that a 450 ppmv concentration target is required in order to meet the objectives of the Framework Convention on Climate Change.

climate. While there is much to discuss about the validity of assumptions and methodology, these modeling studies have emphasized the importance of taking an intertemporal approach to a problem with a long time horizon. This approach emphasizes the concept that a QELRO structured over a fixed period of time, e.g. as a "cumulative emissions" objective, would embed flexibility in its structure. However, QELROs can imply everything from a real regulatory constraint to no effective limitation upon emissions depending upon specification. Clearly, the specification of the QELRO depends upon both the ultimate and interim objectives needed to "prevent dangerous anthropogenic interference with the climate system" -- the objective of the FCCC.

Figure 5. Periodic Carbon Emissions Budgets



One proposal for the effective structuring of a QELRO is to specify it as a set of emission budgets for fixed periods of time in order to provide both incentives and rewards for early reductions and the critical engine for producing cost-saving innovations over time. The budgets themselves would increase transparency and ensure that the QELROs are attained. These periodic carbon budgets, shown for example in Figure 5, would result from a periodic process of assessing the state of scientific knowledge concerning the climate, an assessment of the developments in GHG avoiding or reducing technologies, and a review of the progress of Parties.

An additional aspect that we would include is a premium, i.e. an extra reward, for early reductions that would help keep us on lower emissions paths.⁸ Savings, i.e. extra reductions below the budget, would be granted a premium (i.e. an interest rate) as an incentive to produce early reductions. The environmental benefit would be slower

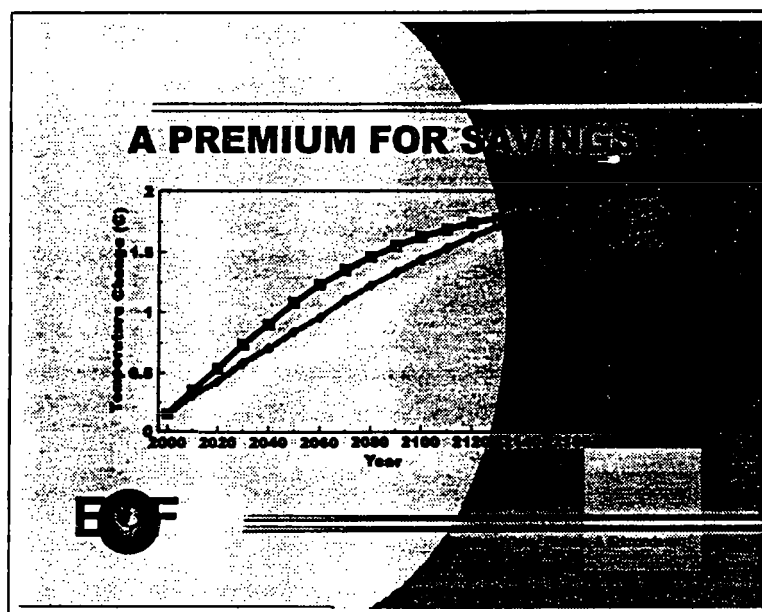
⁸ This is viewed as an extra reward since firms would likely undertake some degree of early reductions banking both to minimize costs and as a hedge against unexpectedly large future reduction requirements, poor GHG reduction investment performance, or profitable emission reduction prices.

decadal rates of temperature change which we take to be the critical damage parameter.⁹ Figure 6 depicts the reduced decadal temperature changes from lower emissions profiles. The introduction of a natural rate of interest based on avoided damages from reduced emissions would significantly extend the environmental currency and banking paradigm.

The explicit introduction of a dynamic policy structure is critical both to effectively harnessing private investment, stimulating R&D, as well as to accommodating constantly changing economies.

ENVIRONMENTAL INSTITUTIONAL INNOVATION: MATCHING MARKET SCOPE AND CONTROL AUTHORITIES

Figure 6. Premiums for Early Banked GHG Reductions



The effectiveness and efficiency of environmental policies is often constrained by the mismatch between the political boundaries for existing control authorities and the actual physical scope of the problem. This section of the paper explores the opportunities and strategies for improving coherence between the scale of solutions and problems with reference to the problem of climate change and for urban air pollution.

⁹ Most damage studies have identified ecosystems as the most susceptible to damage from rapidly changing climates. For example, extrapolations from pollen studies have evaluated the ability of forests to respond to historic climatic changes. Expected rates of climate change could exceed the ability of many forests to migrate in response to the changed environmental conditions.

Reaching Global Control through Joint Implementation

The Framework Convention on Climate Change included a controversial provision for explicit international cooperation between nations in achieving its goals. The vagueness of these provisions have led to disputes about its interpretation and application. Specifically, the issues raised have concerned eligible participants and projects, uncertainties in estimating the reductions from investments, the incentives and motivations of participants, and the distribution of benefits. Of particular concern has been the relationship between so-called Annex I countries which can be understood as the developed nations and non-Annex I nations broadly construed to be the developing nations. Developing nations have expressed the view that joint implementation (JI) would effectively transfer emissions reduction responsibilities to them from developed nations. Developed nations view JI both as an integral element of cost-effectiveness as well as a necessary ingredient to increase participation in the FCCC. Given the differentiated responsibilities between developed and developing nations in the convention and the distribution of emissions shown in Figure 7 below, expanding emissions control responsibilities beyond the developed nations is critical for the effectiveness of any international agreement to limit climate change.

Clearly, the problem of climate change is global in nature. Certainly, the effects of climate change will be felt globally. Impacts on regions and nations will vary in timing and intensity with any beneficial effects likely to be ephemeral. Given this global characteristic, reductions can be made anywhere in the world with an equal impact on slowing the growth of concentrations in the atmosphere. Unlike many other pollutants, there is currently no cost effective or feasible way to remove CO₂ from stack or tailpipe gases. However, CO₂ can be removed from the atmosphere once emitted through the action of forests that synthesize and store carbon from CO₂ in biomass and soils.

Nonetheless, there are a wide array of options for reducing or removing greenhouse gas emissions many of which provide or have the potential to provide additional economic and environmental benefits. For example, increased energy efficiency will result in less fossil fuel burned and fewer emissions of other pollutants. It will often result in lower energy costs for the same level of use and will foster the development and distribution of state-of-the-art technology. To the extent that nations can link their interests in producing reductions, reducing costs, and promoting sustainable development, we can simultaneously improve both the environment and human well-being. Joint implementation provides just such an opportunity. As the table below indicates, expected growth in energy production among the developing nations is very high. JI offers the opportunity for extra investment in more efficient and less carbon intensive development for many of these nations.

However, JI is presently held hostage in the international negotiating process and restricted to a pilot phase without the opportunity for either nations or private investors to receive credit for the results of their extra investments. ***The most serious of the issues raised in the debate about JI is the question of whether the***

incentive and enforcement structure of JI are sufficiently incompatible to either allow or encourage strategic behavior by participants.¹⁰ For example, what would prevent investing or receiving nations from overstating the carbon value of "transferred" credits? This problem is frequently hypothesized due to the lack of specific baselines for either nations or projects. In fact, the FCCC sets no binding target, but *de facto* targets have been announced in most countries. For example, in an Earth Day speech in 1993, President Clinton pledged to return the U.S. to 1990 emission levels by 2000. This ambiguity in commitments amplifies the problem of accurately reporting the results of JI investments. **Nonetheless, credibility problems of this type do have a**

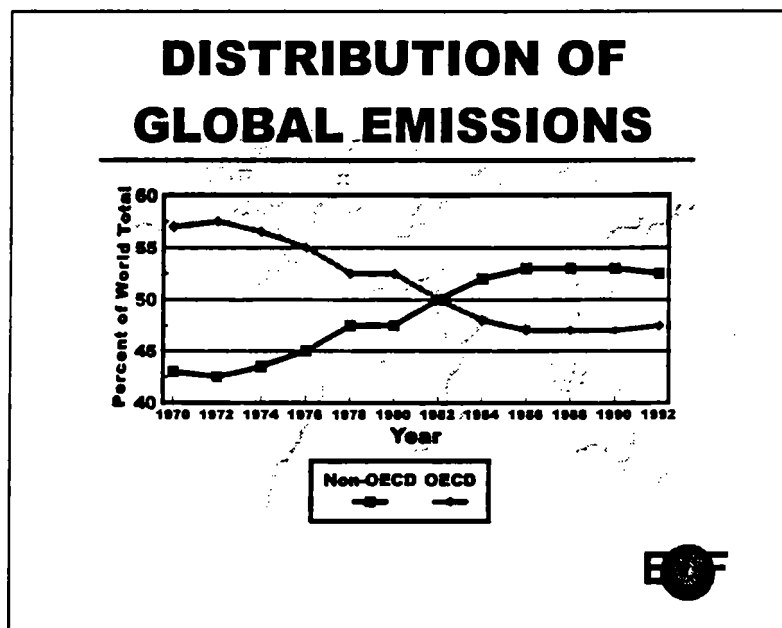


Figure 7. The Global Distribution of Emissions

variety of solutions.¹¹ For example, the validity of any transaction presented by any nation to its international peers will depend to a significant extent upon the credibility of the proposing nation itself. **If country A has an aggressive GHG reduction program backed by tough domestic regulations, the credibility of its program is likely to be transferred to any JI investments it may undertake.** JI derived credits could also be viewed as a type of currency albeit in environmental terms. These credits created by the actions of sovereign states would be valued not only by the technical aspects of the underlying investment projects, but also on the basis of the reliability of the parties to the transactions. Non-Annex I parties that establish baselines would significantly enhance the credibility of their reduction claims and transfers by in effect providing a sovereign guarantee for these credits. In this sense, reliance on markets to properly value assets is the primary source of accountability for inflated carbon claims.

It is not clear that JI will emerge anytime soon as a successful innovation and an effective policy step in the creation of an efficient greenhouse gas management policy.

¹⁰Bohm (1994).

¹¹Jones (1994) and Dudek and Tietenberg (1992).

However, *without JI it is difficult to imagine a strategy for expanding the scope of control responsibilities beyond Annex I parties.*

Creating New Regional Institutions

Matching the geographic scope of institutional control with the spatial geography of the underlying environmental problem is a common problem in designing both effective and efficient solutions. This problem has been regularly addressed in the context of resource management particularly for water resources crossing numerous jurisdictional boundaries. Both states and nations have evolved institutions to coordinate the allocation and use of these stochastic resources. However, this process is not universal as evidenced by debate over the management of the Danube River for example. So while there is a reasonable body of experience with institutions established for river basins, there is much less experience with managing airsheds. Transboundary flows of atmospheric emissions are most often managed exclusively within jurisdictional boundaries irrespective of the ability of the jurisdiction to solve the problem. Fortunately, at the global level in cases such as those involving stratospheric ozone depletion and climate change, new management institutions are evolving with the potential scope to effectively address the source of the problem.

However, there remain a class of problems largely characterized as transboundary for which no geographically corresponding management institution exists. For example, given the structure of government in the U.S., environmental legislation is generally established at the federal or national level with implementation conducted by the states. Increasingly, the gap in geographic scope between the national level and the state level which reaches its extreme in the eastern part of the country, is recognized as constraining the development of efficient control strategies. This problem has become particularly acute in the case of reducing tropospheric ozone concentrations over urbanized areas. Up until recently, this problem was conceived as one requiring local emission controls in the broad vicinity of the affected city. However, as scientific understanding of the behavior of the atmosphere has improved, the problem of tropospheric ozone is now conceived as a problem of reducing total emission loading over broad regions rather than one of localized control.

To a limited extent this problem was recognized by the Clean Air Act Amendments of 1990 with the creation of the Ozone Transport Commission (OTC) for the 12 states in the Northeast. The OTC was designed to provide an explicit institutional mechanism for the coordinated development of policies to control ozone and to bring the region into compliance with the National Ambient Air Quality Standards (NAAQS).¹² The precursors of ozone are nitrogen oxides (NO_x) and volatile organic compounds (VOCs) each of which originate from a wide variety of stationary, mobile, and area sources. The commission has adopted 2 broad control strategies. The first focused on vehicles would require the introduction of lower emitting automobiles. The complicated compromise reached with the automobile manufacturers will introduce a

¹² Cities not in compliance with NAAQS are termed nonattainment areas.

49-state car (to be sold everywhere but California) by 1998 with emissions rates lower than those mandated by the CAAA of 1990.

The second broad control approach has been to reduce NOx emissions from electric utilities through the implementation of a region-wide budget to limit emissions. The intent is to create a system analogous to the SO₂ allowance trading system for acid rain.¹³ However, increasingly both regulators and sources within the region are recognizing that even this newly formed region is too constrained to effectively grapple with the transport problem. In fact, other areas of the country, using independent modeling efforts have demonstrated the importance of considering both the quantity, timing, and chemical composition of emission flows into nonattainment areas. These are the so-called boundary conditions both for modeling as well as policy purposes. For example, the Illinois Environmental Protection Agency was able to demonstrate to the US EPA that the Chicago nonattainment area should be allowed to take NOx emission reduction actions outside the boundaries of the city upwind within the state.¹⁴ These NOx reductions would reduce the flows of both precursors and photochemically formed ozone into the city.

As indicated in the figure below, from the recognition of the importance of boundary conditions within a state to flows between states was a short step. In 1995, the Environmental Council of the States (ECOS), established the Ozone Transport Assessment Group (OTAG) consisting of the chief environmental administrators of the 37 state region east of the Mississippi to focus on super-regional transport issues, the scientific assessment of transport, and the policy opportunities and needs.¹⁵ Recommendations from OTAG to the region's governors and to EPA are due in the Fall of this year. Recently, the importance of creating a robust policy for emissions transport was highlighted by the debate over increasing competition in the electric utility industry. That debate identified the mismatch between state-based control systems and a dynamically evolving industry which could result in both increased and altered pollutant flows including CO₂.¹⁶

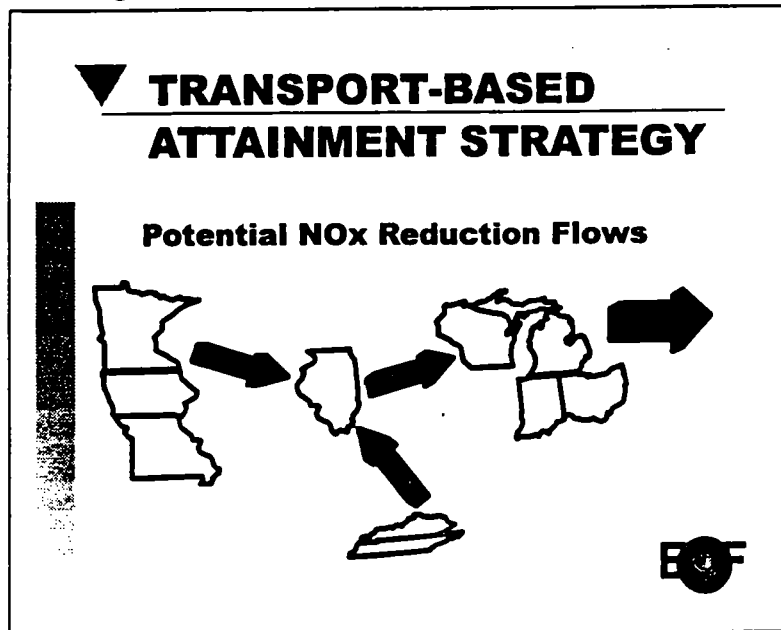
¹³ Nitrogen oxides are also acid rain precursors. However, the acid rain title of the Clean Air Act focused primarily on SO₂ control with NOx to be controlled through burner modifications at electric utilities.

¹⁴ Under the rules of the game of the Clean Air Act, states are required to develop plans consisting of control measures and their timing whose emissions reductions which when evaluated through atmospheric modeling would reduce concentrations to legally allowed levels.

¹⁵ The western states also have a atmospheric transport problem involving NOx, SO₂, and particulates which impairs visibility. This problem has been particularly acute in the Grand Canyon region. The Western Governors' Association and the Grand Canyon Visibility Commission are addressing this problem. However, the sources of these emissions are far fewer in number and less homogenous.

¹⁶ See Dudek and Goffman (1996) for a review of the issues and proposed solutions.

Figure 8. Pollutant Flows Between Regions



While the policy group has been pursuing the design of an SO₂-style cap and allowance trading system with modifications for NO_x and the physical character of the problem, the interesting institutional question will be the legal mechanism for implementing this approach.¹⁷ This question is a critical determinant of both the cost and feasibility of adopting a region-wide management approach. It is especially critical for the use of emission reduction markets which require a secure legal foundation for their operation. One possible approach under consideration is to develop an interstate compact to allocate the stochastic disposal services of the atmosphere. This approach has been used in the allocation of surface water resources and in fisheries management, but its application to atmospheric pollution problems has been much more limited.

In the international transboundary context, the recent El Paso-Juarez air quality management agreement signed earlier this year is the world's first bilateral agreement to create a local air quality management district that spans an international boundary. The El Paso-Juarez agreement provides an economically and environmentally sensible approach to cleaning up the air in a very dirty region along the U.S.-Mexico border. Developed with strong grassroots support on both sides of the border, the agreement also serves as an important model for the development of new institutions to address regional and global air pollution issues. *These new developments in atmospheric*

¹⁷ The modifications for NO_x have primarily centered on the banking provisions. Since the nonattainment problem is seasonal in nature and being redefined in terms of seasonal loads, some governor needs to be placed on emissions withdrawn from the bank, i.e. on reductions in one season being used to compensate for emissions in another. The present solution is to require sources withdrawing more than 10% of present emission entitlements to deposit 2 allowances for every ton discharged. In effect, this is a type of peak load pricing.

emissions policy illustrate the critical importance of the geographic scope of control both for environmental effectiveness and cost-effectiveness

CONCLUSIONS

Institutional innovations have played a large role in improving the performance and cost-effectiveness of environmental policy and therefore have contributed to its ultimate sustainability. However, innovation in institutions has often been ignored both in economic theory and in policy development. To be fair, innovation in general is a complex and poorly understood phenomena. All too often we resort to the *deus ex machina* of exogenous annual rates of change to represent technical change for example. Institutions themselves have been primarily studied in their behavior in the public choice setting. When economists have looked at the issue of institutional innovations, they have most often focused on changes in property rights or in the development of institutions to reduce transactions costs.¹⁸

Institutional innovations have played a large role both in achieving agreement on addressing environmental problems and in reducing costs. Of course, it is always an interesting question about whether the guarantee of cost-effectiveness is essential to agreement. Of particular note in institutional innovations has been the set of finance-like services that have developed in the context of emissions trading markets. Chief among these innovations has been the development of a banking or saving capability. Many mainstream analysts have ignored the added flexibility that banking affords firms in the management of environmental obligations. In fact, many have been skeptical about whether firms would even utilize these opportunities. Nonetheless, the banking of early extra emissions reductions has been extensively used by firms wishing to take advantage of favorable economic factors and to diversify the tools available for managing emission reduction obligations.

Institutional innovations like banking have been critical to environmental sustainability. The banking of SO₂ allowances by electric utilities in the U.S. has demonstrated the capacity of market incentives not only to operate in concert with the underlying environmental problem, but to deepen their effectiveness. This experience has helped to build public support for the use of markets to solve environmental problems. ***To the extent that present and future environmental challenges involve diffuse emission sources and costly control investments which require public support, cost reducing innovations such as banking are critical to the solution of these problems.*** In addition, the opportunity for the banking of early reductions can produce information concerning costs and help to build the necessary constituency for policy action. This strategy is particularly critical in the case of global climate change.

¹⁸ While transactions costs have typically been used as a catchall term for the various frictions of doing business, in this context they are taken to be comprised of search, negotiation, approval, monitoring, enforcement and insurance costs.

As marketable permits continue to evolve, they are being provided with the same array of services developed to facilitate commodity and currency transactions. At the present, these have principally involved brokerage and insurance services. As these environmental management tools are increasingly fungible, they are being deployed as a part of more complex business strategies. For example, one coal mining company in the U.S. sells its high sulfur coal bundled with SO₂ allowances to create a product whose net environmental impact (and cost) is reduced. As the currency analogy for marketable permits is exploited more deeply, banked emissions reductions could earn a premium (interest rate) based upon the incremental benefit of early reductions. In the case of greenhouse gases, this benefit is the reduced environmental damage from slower decadal rates of temperature change. The currency model may also be extended to the problem of monitoring and enforcing sovereign transactions in greenhouse gas reductions (Dudek and Tietenberg).

Dynamic institutional changes of the sort discussed in this paper – budgets, banking, and premiums – are necessary if environmental and economic sustainability are to coexist. In order to secure their advantages, however, we need credible domestic policy actions by large sources such as the U.S. and agreement on international cooperation for reductions by developing nations.

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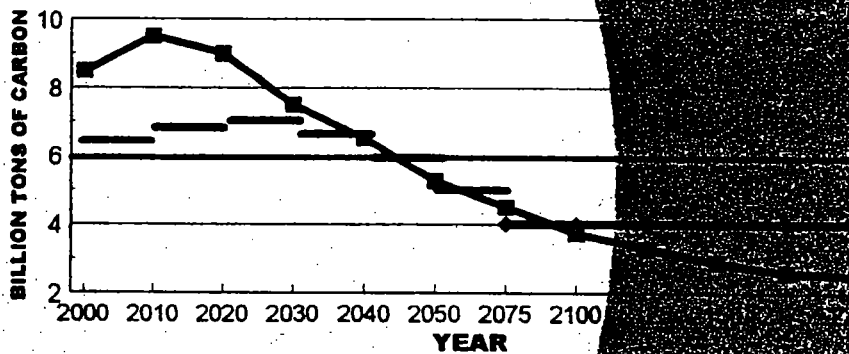
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PERIODIC BUDGETING

- ▲ Science Assessment
- ▲ Technology Assessment
- ▲ Review Progress
- ▲ Establish Decadal Budget

EOF

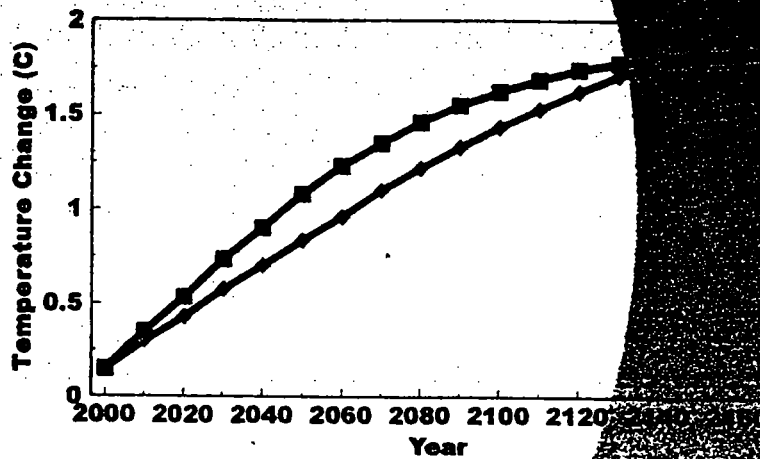
PERIODIC CARBON BUDGETING



450 ppmv from WRE Periodic Budgeting

EOF

A PREMIUM FOR S



EDF

Woods, Walter, Rabele, & Edmonds

CRITICAL ELEMENTS OF ANY INTERNATIONAL AGREEMENT

- ▲ **Transparent Tracking and Reporting**
- ▲ **Joint Implementation**
 - ▶ including non-Annex I nations
 - ▶ including full crediting
- ▲ **All Sources and Sinks**
 - ▶ intergas trading
 - ▶ carbon sequestration and release
- ▲ **Banking**

EDF

CONCLUSIONS

- ▲ **Intergenerational Problem**
 - ▶ **Intertemporal Framework**
 - ▶ **For an Effective Solution**
 - ▶ **For a Low Cost Solution**
- ▲ **Innovation is a Primary Engine for Cost Reductions Over Time**
 - ▶ **Expectations about the Future are Critical**
 - ▶ **Policy Framework Conditions, Expectations**
 - ▶ **Opportunity and Reward Key to Individual Actions**

EDF

MEMORANDUM

COUNCIL OF ECONOMIC ADVISERS

R. Prince
(Climate Change)

August 12, 1996

TO: JOE STIGLITZ, ALICIA MUNNELL ✓
FROM: RAY PRINCE
SUBJECT: UPDATE ON WORKPLAN FOR EV EHRlich'S ECONOMIC ASSESSMENT GROUP

A group of people from White House agencies met on Aug 6 to develop an workplan for Ev's assessment group that would be consistent with the concerns expressed in Aug 2 Principal's meeting at State. Those attending the Aug 6 meeting were Elgie Holstein (NEC), Mark Mazur (NEC/CEA), Dave Sandalow (NSC/CEQ), Steve Seidel (CEQ), Rosina Bierbaum (OSTP), Jerry Melillo (OSTP), Dave Sundig (CEA) and myself. The workplan identifies seven topics that need to be analyzed to determine the economic impact of climate change policies: Revenue reflow, Modeling, Identifying winners and losers, Implementation, Technological innovation and diffusion, International linkages, and Targets.

There was unanimous agreement that analysis of revenue reflow and targets should be put on hold for the near term. On the other hand, the group sentiment was inclined to having some work continue on the five other topics in order to build up the stock of expertise that will eventually be required to conduct policy analysis but that the work be done on a selective basis. For example, on the modeling topic it was felt that it is appropriate to continue efforts to identify the best models and resolve questions about the assumed value of key parameters, but that no actual simulations should be made. Below is a brief description of the near-term activities under the four other topics.

Identifying winners and losers - Summarize available information into sector-specific reports with review by government experts by early Sept.

Implementation issues - Develop discussion papers on the choice of regulatory regimes, which gases should be covered, whether sinks should count toward meeting goals, alternative definitions a target (emissions per GDP or per capita, annual or moving average, etc.), and advantages and disadvantages of banking and borrowing.

Technological innovation and diffusion - Develop discussion papers on what determines rates of technological change, diffusion and capital stock turnover as well as the potential importance of no-regrets policies.

International linkages - Discussion papers on the potential role of joint implementation, and the pros and cons of international emissions trading.

c: M. Mazur
D. Sundig

ECONOMIC IMPLICATIONS OF STABILIZING CO2 EMISSIONS AT 1990 LEVELS BY AUCTIONING CO2 PERMITS AND RECYCLING REVENUES

1990 LEVEL OF CO2 FROM ANTHROPOGENIC SOURCES - 1,336 million metric tons per year (USG p. 6)

MARKET CLEARING PRICE OF PERMITS TO STABILIZE EMISSIONS AT 1990 LEVEL - \$60-125 per metric ton (USG p. 12)

REVENUES IF AUCTIONED - \$80 - 167 billion per year

CORPORATION INCOME TAXES IN 1994 - \$140 billion
PERSONAL INCOME TAXES IN 1994 - 543 billion (ERP '96, p. 370)

REDUCTION IN TAXES SCENARIO (60% REDUCTION IN CORPORATE, 40% REDUCTION IN PERSONAL) (USG p. 10)

CORPORATION - \$48-100 BILLION (34-71% decrease)
PERSONAL - \$32 - 67 BILLION (6-12% decrease)

- industry will be consulted
- our commitments will
- we will not deregulate

7835-

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Summer
Climate
(by)

Climate Change. 8/8/96

- Geneva
- process to date
- process going forward -

Geneva -

examines well-received internationally

International Schedule:

Working Group

Dec., Feb., July, & October
before final

Dec '97 meeting in Japan
No need to be finalized at the
first Oct. of '96.

- ① we have said flexible target -
& throw out possible
targets in Dec.
- ② spell out funding system.
- ③ Global pact implementation
when we mean by this
- ④ binding, explicit, compliance
regime - need to put on table

• incomes & what it looks
different.

⑤ need to determine participation

Copy to Prime

Concerns re: Interagency Analysis Team on Climate Change

- 1. Options under analysis have not been checked for political feasibility or consistency with tax policy in general

EPA analysis gets favorable results in large part because carbon tax revenues are used to reduce taxes on corporations, which leads to a lot of investment (in the DRI model), which increases the growth rate of the economy. In some cases, the corporate income tax is eliminated entirely; this doesn't seem likely in this Administration.

- 2. Leaks could be a big problem. Players on both sides have incentives to leak talk of \$100 billion carbon tax:

industry would like to discredit Administration proposal before it's out of the chute

enviros would like to cement the President into a hard-line position

- 3. EPA model results claim to show that we can have our climate cake and eat it too -- i.e. that big carbon reductions can be achieved at no cost to gdp, as long as a large part of the revenues are used to reduce taxes on investment. This result requires dynamic scoring, which we have rejected in many other contexts. Do we really want to reopen the door to dynamic scoring in other areas as well?

(By the way, in a memo ^{to Rubin} last night, Tax Policy recommends against any consideration of new taxes by the IAT, and recommends moving oversight of the IAT to the NEC).

Post-It® Fax Note		7671	Date	8/1	# of pages	1
To	Alexa Nunnel		From	Ray Sautter		
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U.S.G. ANALYSES OF PROPOSALS FOR CLIMATE CHANGE PROTOCOL

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1. INTRODUCTION

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

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

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

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

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

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

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

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

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

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

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

DRAFT

- 3 -

June 3, 1996 (1:38pm)

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

2. PRELIMINARY LESSONS LEARNED FROM ANALYSES

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

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

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

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

[TEXT ON MONETIZED IMPACTS FORTHCOMING FROM EPA/OPPE]

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

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

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

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

4. GREENHOUSE GAS EMISSION TRENDS

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

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

Figure 1: Relative growth within OECD

Figure 2: Long-term emissions trends

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

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

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

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

5. DOMESTIC TECHNOLOGICAL COSTING ANALYSES

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

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

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

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

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

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

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

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

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

Figure 10 (OAR graph labeled 8)

6. DOMESTIC MACROECONOMIC ANALYSES

Mc...
CGE vs M...

[DOE TO PROPOSE ADDITIONAL MODIFICATIONS TO THIS SECTION]

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

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

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

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

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

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

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

Energy sector models constrain greenhouse gas emissions either by limiting the supply of fossil fuels or by directly increasing their price. Given these constraints, the models forecast changes in fossil fuel energy prices and consumption, and related changes in behavior. In addition, higher fuel prices result in higher revenues that circulate through the economy. These revenues can be redistributed to ameliorate the negative impact of price inflation on economic growth.

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

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

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

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

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

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

In addition, we analyzed two distinct allocation scenarios:

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

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

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

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

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

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

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

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

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

Figure 7 Impact of potential GDP stabilization for stabilization scenario.

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

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

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

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

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

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

Figure 8. Price elasticity sensitivity analysis.

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

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

Figure 9. Comparison with EPRI analysis.

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

7. INTERNATIONAL ANALYSES

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

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

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

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

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

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

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

8. LESSONS FROM PREVIOUS POLICIES

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

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

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

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

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

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

[9. THE ROLE OF ADVANCED ENERGY TECHNOLOGIES

[DOE PROPOSES FOLDING THIS SECTION INTO SECTION 8]

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

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

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

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

emissions mitigation.]

10. NEXT STEPS: FROM ANALYSIS TO POLICY

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

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

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

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

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

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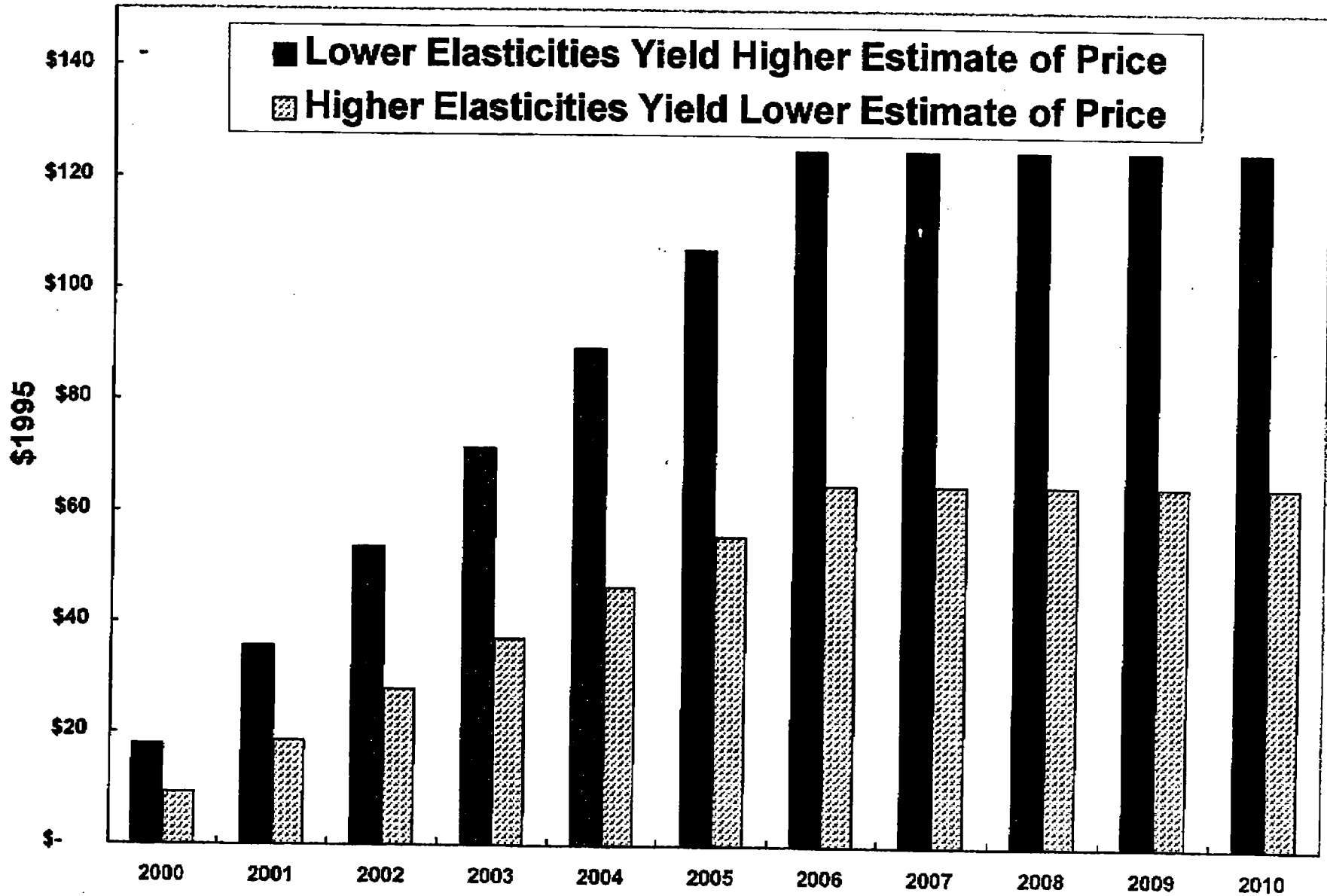
- 17 -

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

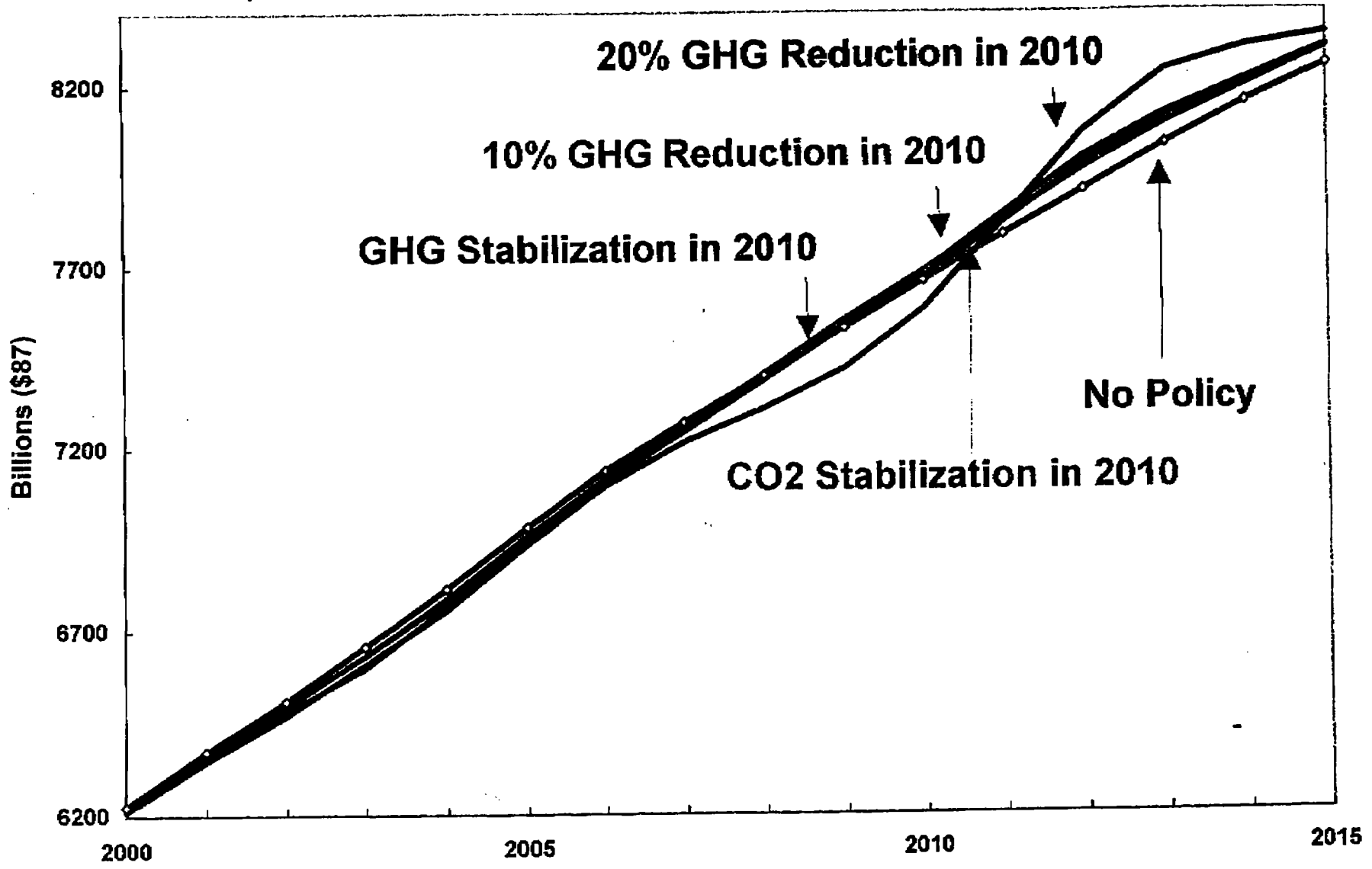
The U.S. Government recognizes the need for further refinement of its continuing analytic work. This paper marks the beginning, not the end, of a process of analysis, assessment and development of climate change response strategies. The U.S. Government intends to rely on a range of experts and stakeholders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

Permit Price Needed to Stabilize GHG Emissions in 2010



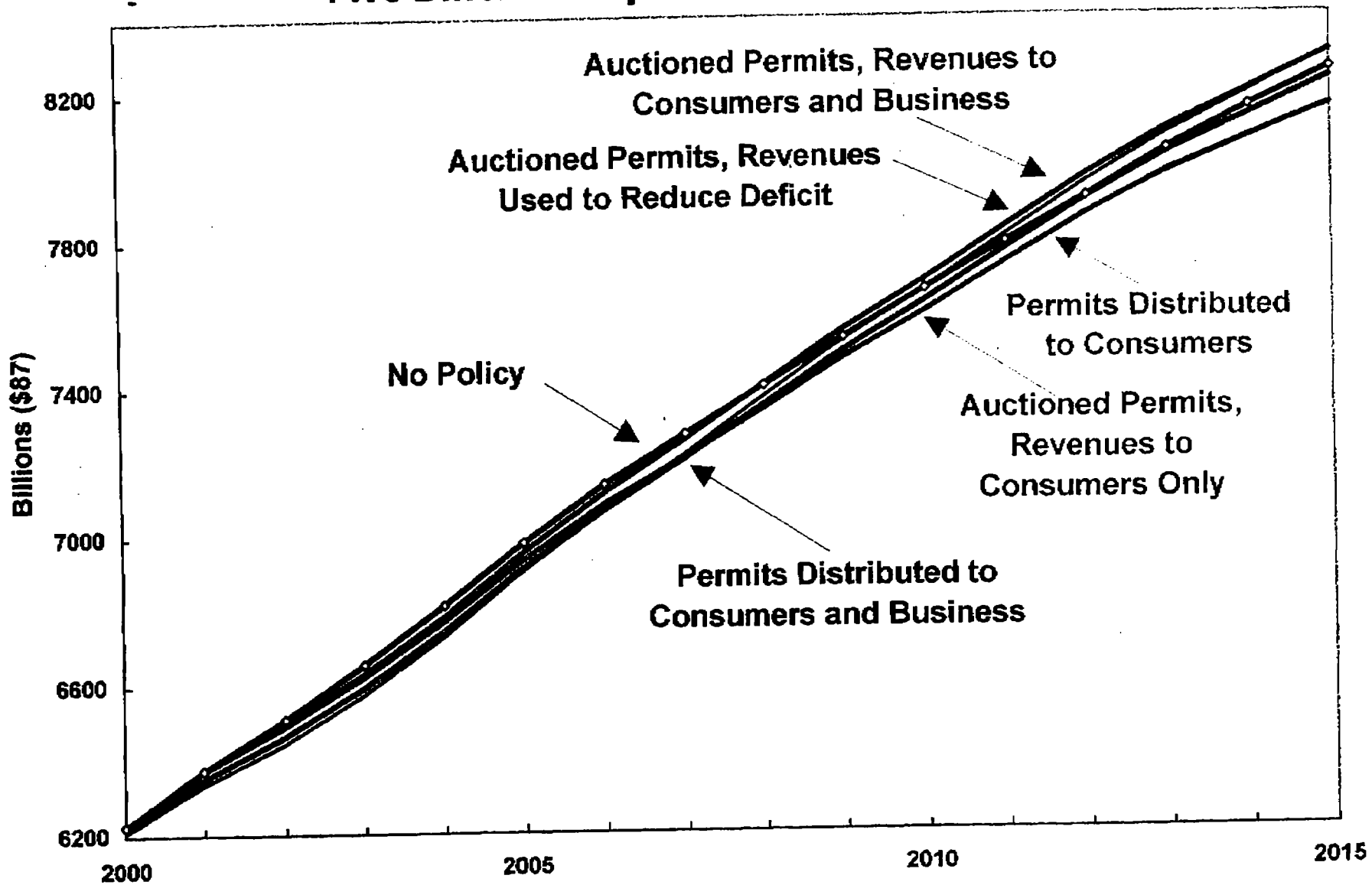
Chen 10/10

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



GDP Impact of GHG Stabilization in 2010

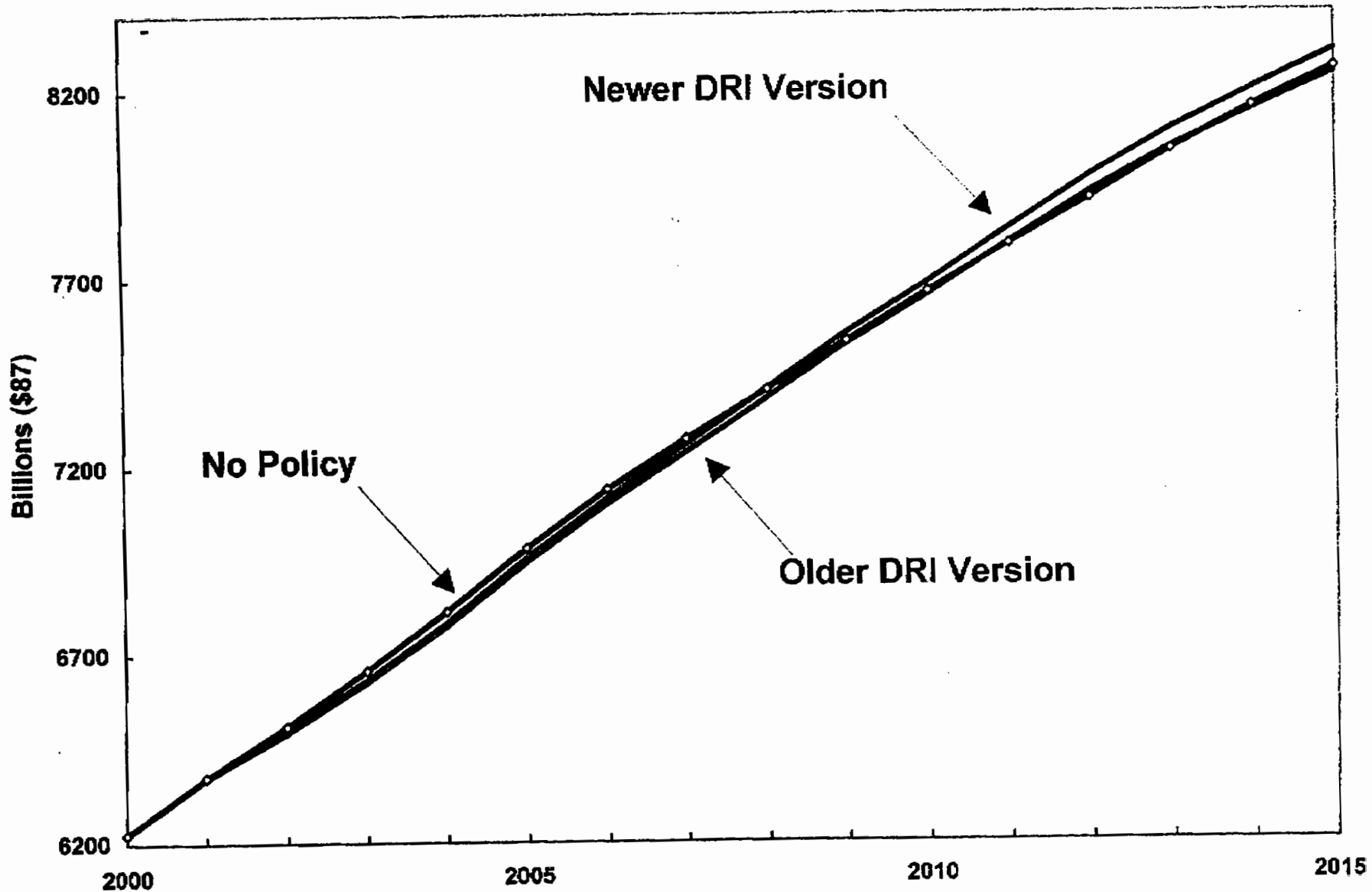
Five Different Implementation Policies



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GDP Impact of GHG Stabilization in 2010

Different Model Versions w/ Permit Auction, 60/40



Climate Change Financing

ECONOMIC IMPLICATIONS OF STABILIZING CO2 EMISSIONS AT 1990 LEVELS BY AUCTIONING CO2 PERMITS AND RECYCLING REVENUES

1990 LEVEL OF CO2 FROM ANTHROPOGENIC SOURCES - 1,336 million metric tons per year (USG p. 6)

MARKET CLEARING PRICE OF PERMITS TO STABILIZE EMISSIONS AT 1990 LEVEL - \$60-125 per metric ton (USG p. 12)

REVENUES IF AUCTIONED - \$80 - 167 billion per year

CORPORATION INCOME TAXES IN 1994 - \$140 billion

PERSONAL INCOME TAXES IN 1994 - 543 billion (ERP '96, p. 370)

REDUCTION IN TAXES SCENARIO¹⁰ (60% REDUCTION IN CORPORATE, 40% REDUCTION IN PERSONAL) (USG p. 10)

CORPORATION - \$48-100 BILLION (34-71% decrease)

PERSONAL - \$32 - 67 BILLION (6-12% decrease)

- 5. Domestic Technological Costing Analyses**
Past Studies: National Academy of Sciences and Office of Technology Assessment
Domestic Institutional, Organizational and Technological Analyses
- 6. Domestic Macroeconomic Analyses**
Four Emissions Reduction Scenarios
General Outline of Model
Implementation Timing
Five Modeled Permit Allocation Policies
Results of Domestic Macroeconomic Models
- 7. International Analyses**
GDP impacts
Carbon emissions leakage
Where and When Flexibility
- 8. Lessons from Previous Policies**
Sulfur Dioxide Allowance Trading
CFC Phase-out
- 9. The Role of Advanced Energy Technologies**
- 10. Next Steps: From Analysis to Policy**

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June 3, 1996 (1:44pm)

U.S.G. ANALYSES OF PROPOSALS FOR CLIMATE CHANGE PROTOCOL

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1. INTRODUCTION

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

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

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

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

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

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

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

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

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

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

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

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

2. PRELIMINARY LESSONS LEARNED FROM ANALYSES

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

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

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

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

[TEXT ON MONETIZED IMPACTS FORTHCOMING FROM EPA/OPPE]

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

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

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

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

4. GREENHOUSE GAS EMISSION TRENDS

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

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

Figure 1: Relative growth within OECD

Figure 2: Long-term emissions trends

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

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

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

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

5. DOMESTIC TECHNOLOGICAL COSTING ANALYSES

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

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

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

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

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

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

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

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

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

Figure 10 (OAR graph labeled 8)

6. DOMESTIC MACROECONOMIC ANALYSES

*Mt-500 5000
CGE vs M + G*

[DOE TO PROPOSE ADDITIONAL MODIFICATIONS TO THIS SECTION]

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

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

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

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

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

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

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

Energy sector models constrain greenhouse gas emissions either by limiting the supply of fossil fuels or by directly increasing their price. Given these constraints, the models forecast changes in fossil fuel energy prices and consumption, and related changes in behavior. In addition, higher fuel prices result in higher revenues that circulate through the economy. These revenues can be redistributed to ameliorate the negative impact of price inflation on economic growth.

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

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

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

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

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

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

In addition, we analyzed two distinct allocation scenarios:

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

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

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

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

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

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

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

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

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

Figure 7 Impact of potential GDP stabilization for stabilization scenario.

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

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

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

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

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

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

Figure 8. Price elasticity sensitivity analysis.

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

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

Figure 9. Comparison with EPRI analysis.

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

7. INTERNATIONAL ANALYSES

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

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

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

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

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

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

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

8. LESSONS FROM PREVIOUS POLICIES

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

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

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

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

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

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

9. THE ROLE OF ADVANCED ENERGY TECHNOLOGIES

[DOE PROPOSES FOLDING THIS SECTION INTO SECTION 8]

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

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

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

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

emissions mitigation.]

10. NEXT STEPS: FROM ANALYSIS TO POLICY

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

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

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

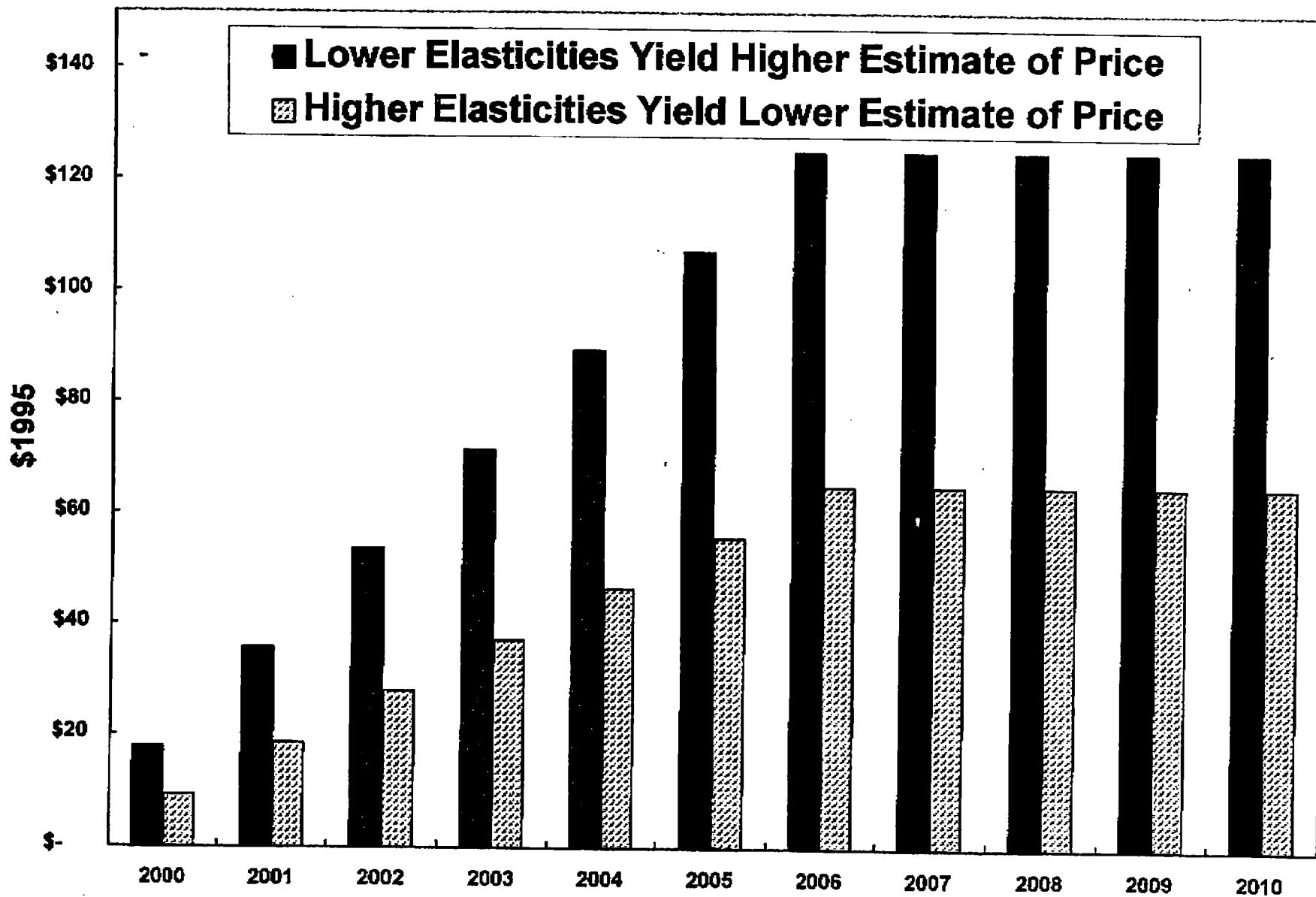
Analysis and assessment together constitute an evolutionary process that informs policy development. Together, these two functions account for the costs and benefits -- both economic and environmental -- associated with alternative policy strategies. Analysis provides a neutral picture of the range of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

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

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

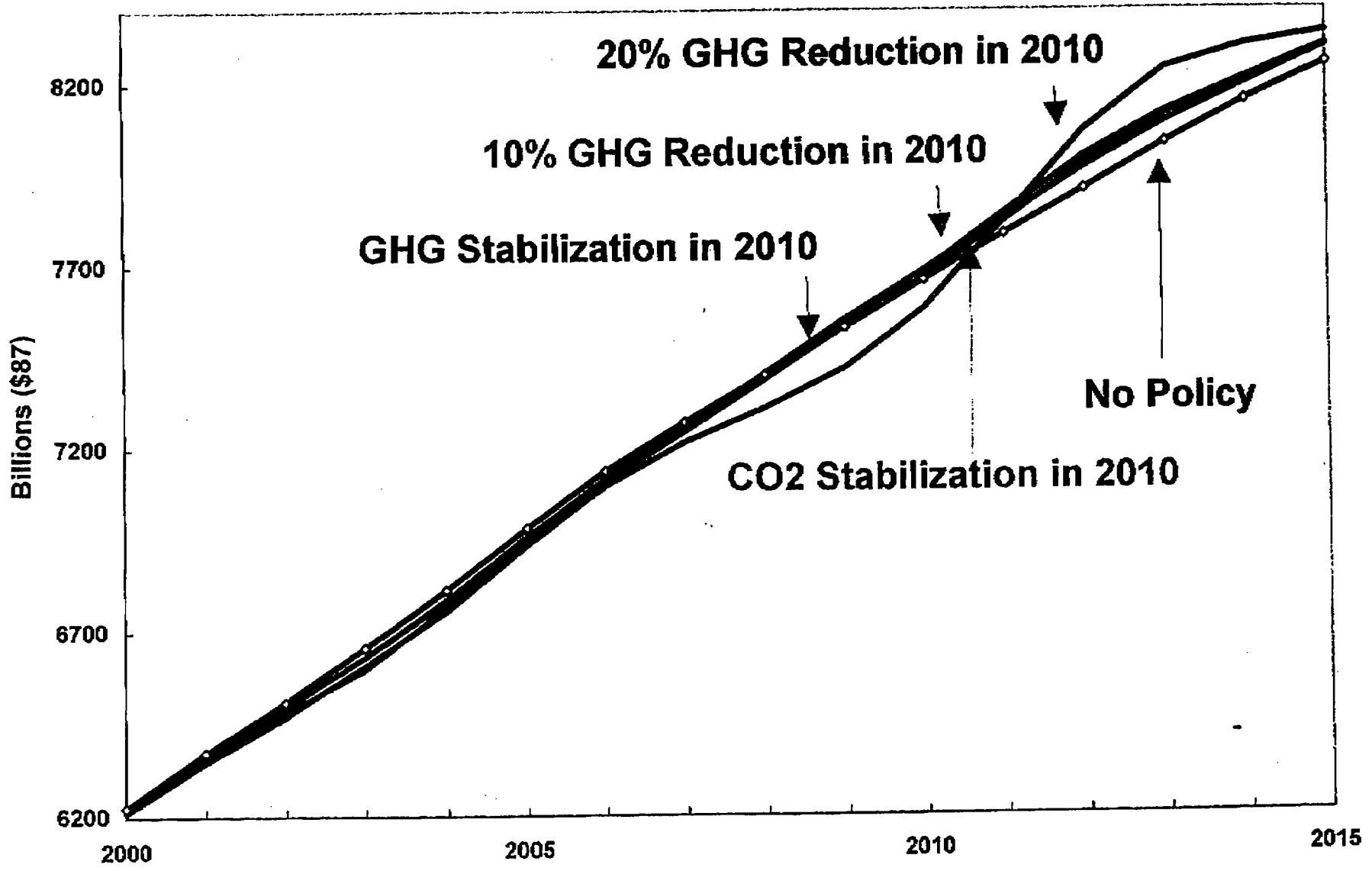
The U.S. Government recognizes the need for further refinement of its continuing analytic work. This paper marks the beginning, not the end, of a process of analysis, assessment and development of climate change response strategies. The U.S. Government intends to rely on a range of experts and stakeholders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

Permit Price Needed to Stabilize GHG Emissions in 2010



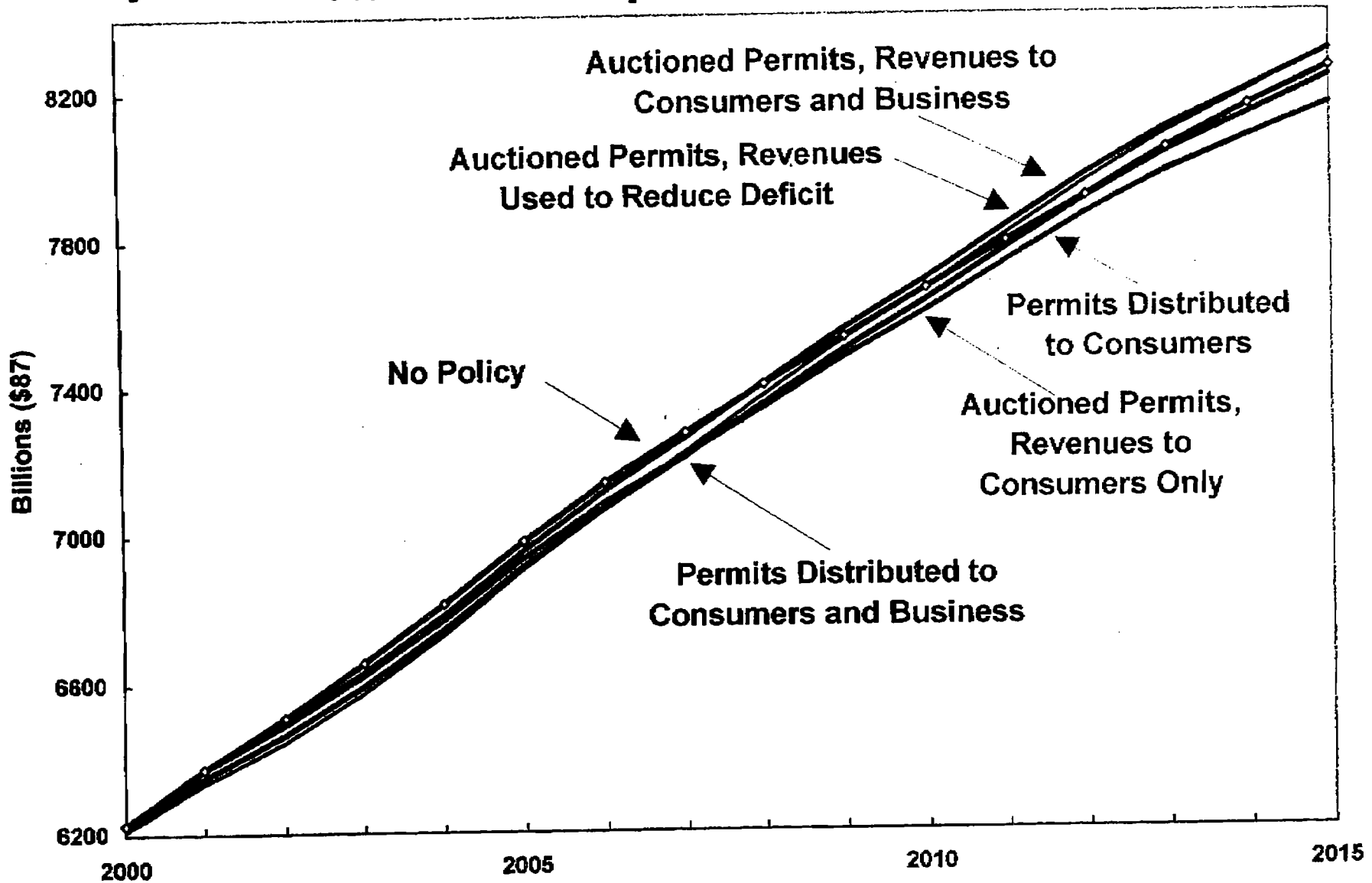
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GDP Impact of Different GHG Targets (Permit Auction, Consumer/Business Recycling)



GDP Impact of GHG Stabilization in 2010

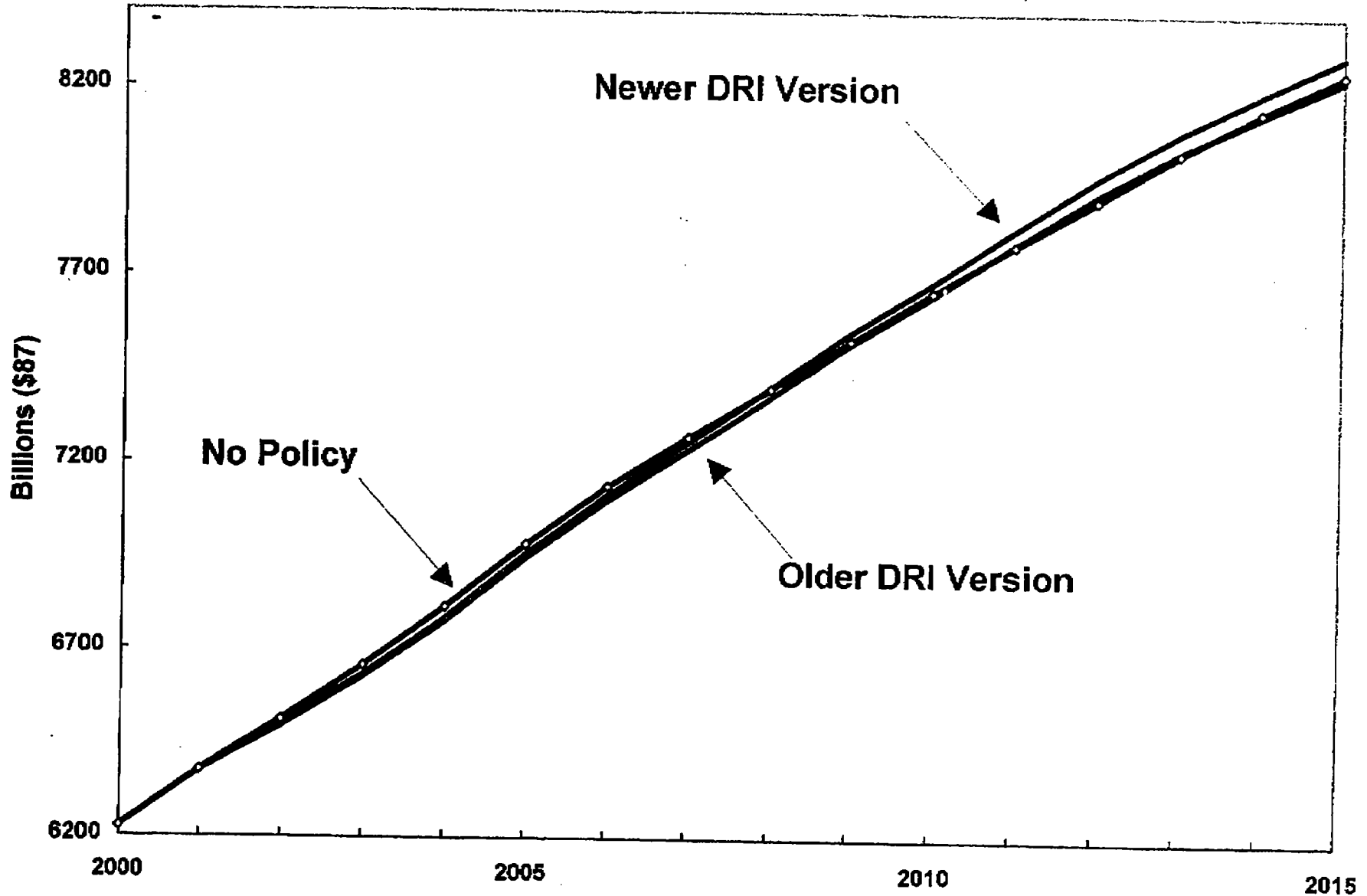
Five Different Implementation Policies



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GDP Impact of GHG Stabilization in 2010

Different Model Versions w/ Permit Auction, 60/40





United States Department of State

Bureau of Oceans and International
Environmental and Scientific Affairs

Washington, D.C. 20520

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TELEPHONE: _____ FAX: _____

OFFICE: _____

FAX FROM: Lilly R. Roots-Wiggins

TELEPHONE: 647-1554 FAX: 647-0217

OFFICE: _____

MESSAGE:

There will be another Climate Change Meeting with Eileen Claussen on Thursday, February 15 at 2:00. Please RSVP to me. The meeting will be at the Dept. of State in Room 7835.

2/12
called
accept

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Concerns re: Interagency Analysis Team on Climate Change

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- 1. Options under analysis have not been checked for political feasibility or consistency with tax policy in general

EPA analysis gets favorable results in large part because carbon tax revenues are used to reduce taxes on corporations, which leads to a lot of investment (in the DRI model), which increases the growth rate of the economy. In some cases, the corporate income tax is eliminated entirely; this doesn't seem likely in this Administration.

- 2. Leaks could be a big problem. Players on both sides have incentives to leak talk of \$100 billion carbon tax:

industry would like to discredit Administration proposal before it's out of the chute

enviros would like to cement the President into a hard-line position

- 3. EPA model results claim to show that we can have our climate cake and eat it too -- i.e. that big carbon reductions can be achieved at no cost to gdp, as long as a large part of the revenues are used to reduce taxes on investment. This result requires dynamic scoring, which we have rejected in many other contexts. Do we really want to reopen the door to dynamic scoring in other areas as well?

(By the way, in a memo ^{to Rubin} last night, Tax Policy recommends against any consideration of new taxes by the IAT, and recommends moving oversight of the IAT to the NEC).

Post-It [®] Fax Note		7671	Date	8/1	# of pages	1
To	Alexa Munnel	From	Ray SQUIVER			
Co./Dept	CEA	Co.	Treasury			
Phone #		Phone #	622-1301			
Fax #	395-6947	Fax #	-1294			

MEMORANDUM to David Sandalow
Wes Warren
Elgie Holstein
Ray Prince
Alicia Munnell
Joe Stiglitz
Diane Regas
Linda Lance

Handwritten notes:
L
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From: Rosina Bierbaum

Subject: Global Climate Change U.S. Government Public Information Packet

FYI, we are sending you the U.S. Government Public Information Packet developed for the ongoing conference of parties meeting on climate. We will also send copies to members of Congress next week.

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State of Knowledge

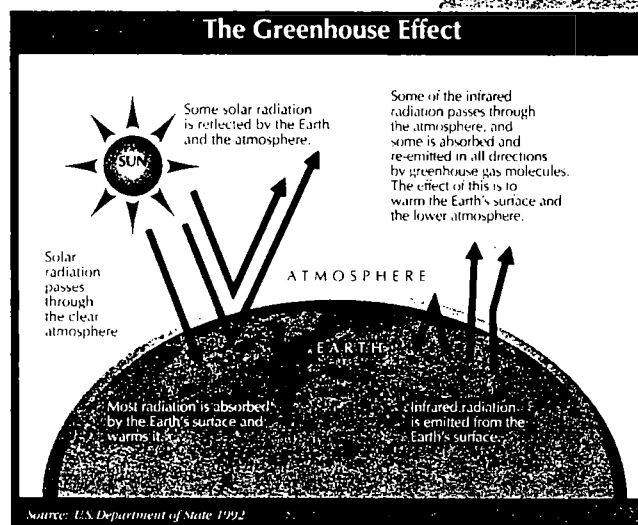
The Earth's climate is predicted to change because human activities are altering the chemical composition of the atmosphere. The buildup of greenhouse gases—primarily carbon dioxide, methane, nitrous oxide and chlorofluorocarbons—is changing the radiation balance of the planet. The basic heat-trapping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

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

The Climate System

A natural greenhouse effect keeps the Earth about 33°C (91°F) warmer than it otherwise would be. Without this greenhouse effect, life as we know it would not be possible. Water vapor, carbon dioxide and other trace gases trap heat as it is re-radiated from the Earth back to space. However, since pre-industrial times, human activities have added to the natural greenhouse effect by releasing additional greenhouse gases to the atmosphere. The burning of fossil fuels (coal, oil and gas) for energy is the primary source of emissions; changing land-use patterns through agriculture and deforestation also contribute a significant share. Current global emissions of carbon dioxide from energy use are approximately 6 gigatons of carbon (GtC) per year.

Future greenhouse gas emissions are sensitive to changes in demographic, economic, technological, policy and institutional developments. By the year 2025, world emissions could range from 8 to 15 GtC per year. In the year 2100, world emissions are projected to range from 5 to 36 GtC per year, depending on energy use, populations, technologies and other factors. The United States and the rest of the OECD countries currently



contribute about 40 percent of global carbon dioxide emissions. Future growth in emissions from OECD countries is predicted to be significantly smaller than growth in developing countries and countries with economies in transition.

Since the pre-industrial era, atmospheric concentrations of carbon dioxide have increased by nearly 30 percent, methane concentrations have doubled and nitrous oxide concentrations have risen by 15 percent. These increases result in a radiative forcing or heat-trapping of energy equivalent to about 2.8 watts per square meter (Wm^{-2}). About half of the radiative forcing may have been masked by increased levels of traditional air pollutants—sulfates and carbonaceous aerosols, particularly in the northern hemisphere—which cool the atmosphere by reflecting incoming solar radiation and altering the reflective properties of clouds. Aerosols are short-lived and vary regionally, hence they should not be regarded as a simple offset to greenhouse gas forcing. In addition, due to their health effects, buildup will likely be limited. Calculations suggest that the projected increases in atmospheric concentrations of greenhouse gases alone will result in an additional radiative forcing of about 3-8 Wm^{-2} by 2100. For a given concentration of greenhouse gases, the resulting increase in radiation can be predicted with precision; but the resulting impact on climate is more uncertain.

Model calculations, based on plausible ranges of future emissions and climate sensitivities, suggest that the global surface temperature could increase an average of 1.0 - 3.5°C (1.8-6.3°F) by 2100, with significant variation by region. This estimate accounts for the offset from aerosols, which has lowered earlier estimates somewhat. Global-average temperature changes of this magnitude would be greater than

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

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

Key findings of the IPCC can be briefly summarized:

Regional and global climate and sea level

Human activities are increasing the atmospheric concentrations of carbon dioxide and other greenhouse gases that tend to warm the atmosphere and, in some regions, of aerosols that tend to cool the atmosphere.

The Earth's climate is changing. The surface temperature this century is as warm or warmer than any other century since at least 1400 AD; the temperature has increased by 0.3 to 0.6°C (about 0.5 to 1°F) over the last century; the last few decades have been the warmest this century; sea level has risen 10 to 25 cm (about 4 to 10 inches); and mountain glaciers have retreated world-wide this century.

Models that account for the observed increases in the atmospheric concentrations of greenhouse gases and sulfate aerosols are simulating the recent history of observed changes in surface temperature and its vertical distribution with increasing realism.

The balance of evidence suggests that there is a discernible human influence on global climate.

Without specific policies that reduce the growth of greenhouse gas emissions, the Earth's average surface temperature is projected to increase by about 1 to 3.5°C (about 2 to 6.5°F) by 2100, a rate faster than anything observed over the last 10,000 years.

- The reliability of regional-scale predictions is still low, and the degree to which climate variability may change is uncertain.
- Sea level is projected to rise by 15-95 cm (6-38 inches) by 2100.
- The long atmospheric lifetime of many greenhouse gases, coupled with the thermal inertia of the oceans, means that the warming effect of anthropogenic emissions will be long-lived.
- Even with a stabilization of greenhouse gas concentrations in the year 2100, temperatures would continue to increase for several decades, and sea level would continue to rise for centuries.

Potential health and environmental consequences of climate change

- Human-induced regional and global changes in temperature, precipitation, soil moisture, and sea level add important new stresses on ecological and socio-economic systems that are already affected by pollution, increasing resource extraction, and non-sustainable management practices.
- Most systems are sensitive to both the magnitude and rate of climate change.
- The projected changes in climate include potentially disruptive effects that will affect the economy and the quality of life for this and future generations:
 - **Human Health** will be adversely affected through an increase in the rate of heat-related mortality and in the potential for the spread of vector-borne diseases such as malaria, dengue, yellow fever, and encephalitis and non-vector-borne diseases such as cholera and salmonellosis.
 - **Food Security** will be threatened in some regions of the world, especially in the tropics and subtropics, where many of the world's poorest people live, even though the effects of

The U.S. Climate Change Action

50 programs and 5,000 partners

Buildings

- ENERGY STAR Buildings 1-888-782-7937
- Rebuild America 1-800-363-3732
- "Cool Communities" Program (202) 586-6501
- ENERGY STAR Office Equipment 1-888-782-7937
- ENERGY STAR Product Labeling 1-888-782-7937
- Enhanced Appliance Standards (202) 586-7140
- Home Energy Rating Systems and Energy Efficient Mortgages (202) 586-9204
- Upgrade Residential Building Codes and Standards (202) 586-0517
- ENERGY STAR Homes (202) 233-9786
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- Technology Introduction Partnerships (202) 586-5253

Energy Sector

- Climate Challenge (202) 586-2588
- Commercialize High-Efficiency Gas Technologies (301) 903-2832
- Promote Integrated Resource Planning (202) 586-1491
- Improve Hydroelectric Generation at Existing Dams (202) 586-5659
- Energy Efficient Electric Transformers (202) 586-8119
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- Promote Seasonal Gas Use for Control of Nitrogen Oxides (NOx) (202) 260-2784
- Renewable Energy Commercialization (202) 586-2588
- Reduce Electric Generation Losses Through Transmission Pricing Reform, Office of Electricity Policy (202) 586-4871

International, State and Local Programs

- U.S. Initiative on Joint Implementation (202) 426-0072
- State and Local Outreach Program (202) 260-4314
- U.S. Country Studies Program (202) 426-0072

Forestry Sector

- Reduce Depletion and Accelerate Tree Non-Industrial Private Forests (202) 260-4407
- Promote Recycling and Pollution Prevention Paper Industry (202) 205-1565

Industrial Sector

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- Accelerate Source Reduction, Pollution Recycling 1-800-EPA-WISE
- NICE³ 1-800-363-3732
- WasteWiSe 1-800-EPA-WISE
- Motor Challenge 1-800-862-2086
- Industrial Assessment Centers (202) 260-4408
- Reduce Pesticide Use (202) 720-7173

Transportation Sector

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- Transportation Efficiency Strategy (202) 260-4408
- Promote Telecommuting (202) 366-4408
- Develop Fuel Economy Labels for Tires (202) 260-4408
- Clean Cities (202) 586-1885

HFC, PFC, and NOx Emissions

- Create Partnerships to Eliminate HFC (202) 233-9061
- Voluntary Aluminum Industrial Partnership (202) 233-9061
- Improve Efficiency of Fertilizer Nitrogen (202) 233-9061
- Narrow Use of High GWP Chemicals Through Product Stewardship to Reduce Emissions (202) 233-9061

Methane Reduction and Recovery

- Natural Gas Star (202) 233-9044
- Landfill Rule and Landfill Methane Outreach Program (202) 233-9631
- Coalbed Methane Outreach Program (202) 233-9631
- RD&D for Methane Recovery from Coalbed Methane (202) 233-9041
- RD&D for Methane Recovery from Landfills (202) 233-9041
- AgStar Program (202) 233-9041
- Ruminant Livestock Methane Program (202) 233-9041

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

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1996

Climate Challenge

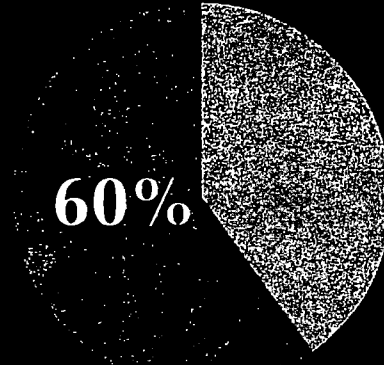
Climate Challenge is a joint initiative of the U.S. Department of Energy (DOE) and the U.S. electric utility industry to obtain voluntary commitments by utilities to undertake actions to reduce, avoid or sequester greenhouse gas emissions. DOE provides technical information and support, and public recognition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

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

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

Mark DeMichele
President and CEO
Arizona Public Service

U.S. Electricity Generation by Climate Challenge Partners



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

E. Linn Draper, Jr.
Chairman
American Electric Power

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

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

Current number of Climate Challenge participants: 581.

Climate Change

CLIMATE WISE

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

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

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

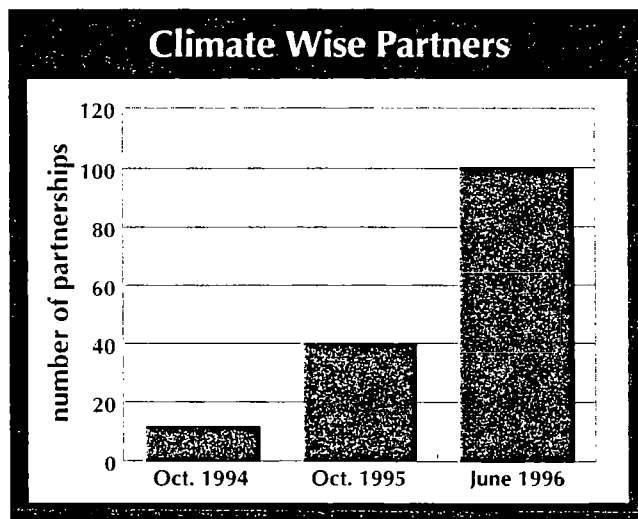
Fetzer Vineyards has committed to:

- Reduce power demands by 50 percent, even with projected growth, by the year 2005.

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

General Motors has committed to:

- Launch a supplier outreach program to inform of the benefits of resource conservation and pollution prevention practices and of the CLIMATE WISE program.



- Accelerate a benchmarking project designed to audit the 10 least energy efficient facilities, audit the operations, and identify identified actions.
- Accelerate power plant evaluation studies at 50 facilities in 1996 seeking to identify opportunities for down or convert boilers to cleaner fuels and for providing heat through more efficient conversion.
- Work with the DOE Laboratories to identify additional cost-effective energy efficiency

Facts and Figures

CLIMATE WISE Partners to date: 100
U.S. industrial energy use represented by current CLIMATE WISE partners: more than 6 percent
States with pilot state CLIMATE WISE programs: Nebraska, New York, North Carolina, Ohio, Pennsylvania and Wisconsin.
Cities/Counties with Pilot Industrial Demonstration Programs*: Austin, TX; Berkeley, CA; Dade County, FL; Denver, CO; Portland, OR; Pittsburgh, PA
* A partnership initiative with the State and Local Government Program

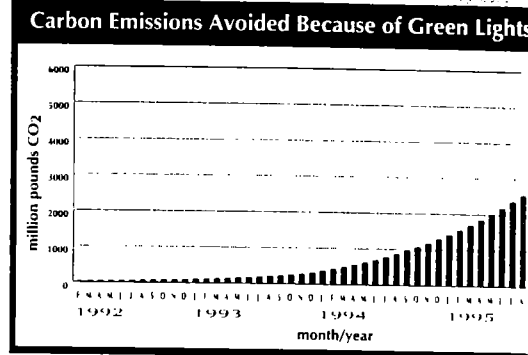
Climate Change

Green Lights & ENERGY STAR Buildings

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

Green Lights

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



ENERGY STAR Buildings

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

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

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

"Green Lights is an excellent example of good partnership between business and government. By encouraging and helping businesses to upgrade lighting, EPA has shown that improving the environment is sound business."

Flavio Rodrigues
Engineering Manager, PepsiCo, Inc.

Fact and Figures

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

Climate Change

July
1996

ENERGY STAR Product Labeling

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

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

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

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

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

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

Facts and Figures:

1996 Benefits include more than \$300 million in energy savings

Current Participation:

More than 500 manufacturers, offering 13,000 qualifying product models

More than 20 million ENERGY STAR computers in use

More than 70 home builders, committed to building 10,000 ENERGY STAR Homes

Climate Change

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Climate Change

July
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Green Lights

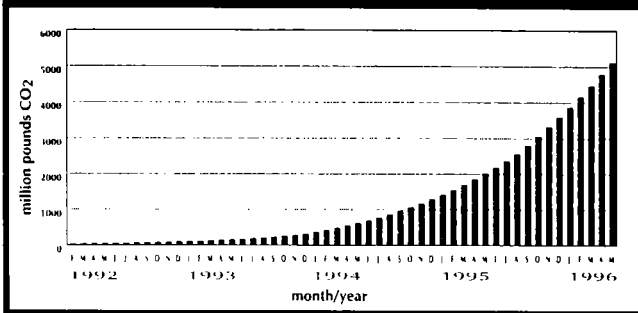
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Flavio Rodrigues
Engineering Manager, PepsiCo, Inc.

Carbon Emissions Avoided Because of Green Lights Upgrades



ENERGY STAR Buildings

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Facts and Figures

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21,000 tons SO₂, 9,000 tons NO_x
Partner Energy Bill Savings: \$300 million
Net U.S. jobs created, 1995: 6,000

Climate Change

July
1996

Landfill Rule and Landfill Methane Outreach Program

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

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

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

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

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



LANDFILL METHANE OUTREACH PROGRAM

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

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

Facts and Figures

Allies include:

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

Climate Change

July
1996

Motor Challenge

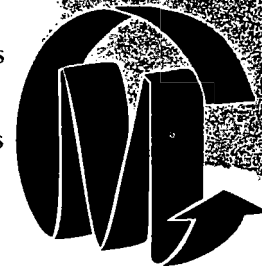
Motor Challenge is a voluntary partnership program between the U.S. Department of Energy (DOE) and U.S. industry to increase the use of energy-efficient electric motor systems. U.S. industry spends more than \$30 billion annually on energy for motor systems. Electric motors and motor-driven equipment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

"The Motor Challenge serves as a model for public and private teamwork to accomplish shared goals in the energy and environmental arenas."

David Buzzelli
VP and Corporate Director Environmental
Health and Safety and Public Affairs
The Dow Chemical Company

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

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



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

Facts and Figures

Number of Motor Challenge partners: 1,375

Climate Change

Natural Gas STAR

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

The Natural Gas STAR program was launched in March 1993 with transmission and distribution companies. In 1995, the program was expanded to include the production sector. EPA provides guidance on cost-effective best management practices for companies to employ to reduce methane emissions. In addition, EPA provides partners with public recognition and works to remove regulatory barriers to STAR program practices. Companies submit an implementation plan and annual progress reports to EPA after becoming a program partner.

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

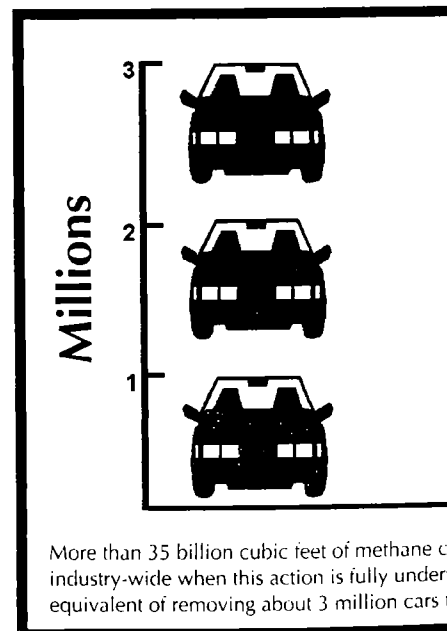


"Involvement in Natural Gas inspires new cost-effective methods. These ideas translate into operating costs and help protect the environment. Natural Gas STAR program. We can cost-effectively reduce losses of methane to the environment and increase system efficiency."

*Deanna Haines
Environmental Engineer
Southern California Gas Company*

Facts and Figures

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



Climate Change

July
1996

NICE³

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



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

Select NICE³ program partners include:

- Beta Control Systems, Inc. of Beaverton, Oregon, which plans to develop an on-site hydrochloric acid recovery system for galvanizers and small- to medium-sized steel manufacturers. The technology will avoid acid waste transport and disposal costs and the associated long-term liability in addition to saving an estimated 5 billion Btu's each year.

- Damage Protection Products is substituting pallets used for freight transport (normally produced from 100 percent virgin wood) with postconsumer paper waste with varying amounts of mixed paper wastes. Every ton of postconsumer waste substituted for virgin wood fiber in the paper production process would save 50 percent of the water and 60 percent of the energy used to make the paper.
- Pegasus Technologies has developed a prototype neural network system for improving the thermal efficiency of large, coal-fired utility plants. For less than \$250,000, Pegasus Technologies can install the NeuSIGHT for Heat Rate Improvement system to control combustion of nitrogen oxides, carbon dioxide and sulfur dioxide emissions from pulverized-coal-fired boilers.

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

*David Jones, California Energy Commission,
Sacramento, California.*

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

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

Facts and Figures:

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

Climate Change

July
1996

Rebuild America

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

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

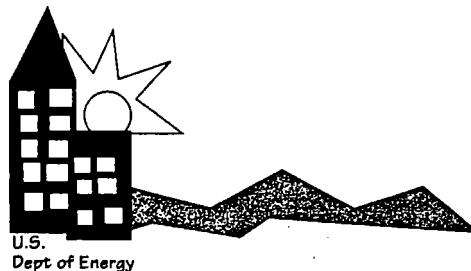
- **Design Programs.** Partners design specific activities to expand significantly the reach and effectiveness of existing programs for energy retrofits.
- **Form Teams.** Partners obtain commitments from key leaders of local government and industry and form teams to carry out partnership programs.
-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

Rebuild America is working with more than 40 national community partnerships to improve commercial and multi-family building energy efficiency. Rebuild America

Percentage of U.S. carbon emissions caused by building energy use: 35 percent
Expected cost savings in 2000: \$650 million/year
Community Partnerships: 46

partnership commitments made by the year 2000 are expected to save \$650 million each year. 1995 Rebuild America partnerships are expected to leverage non-federal investments in these communities by 70:1 and are creating 3,000 jobs.

Rebuild Colorado Communities, led by the Governor's Office of Energy Conservation, anticipates FY 1995 private-sector and local government investments of about \$175 million as a result of DOE's \$200K award to the partnership to renovate 122 million square feet of commercial space and multifamily housing.



Rebuild America

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

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

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

*Linda Smith
Rebuild Colorado Coordinator*

Climate Change

Renewable Energy Commercialization

July
1999

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

Potential buyers of renewables are encouraged to work directly with the renewables industry and the Department of Energy to form market-pull partnership consortium to advance common goals toward accepted commercialization targets. Buyer-led groups work directly with their respective renewable energy industry, with DOE cost-sharing at appropriate stages, such as hardware demonstration projects. Two programs, Wind and Photovoltaics, support a Design Assistance Center at National Laboratories. These centers provide technical assistance to local governments, other federal agencies, electric utilities, private companies and occasionally other countries.

Assistance may include supporting feasibility analyses, structuring Request for Proposals and assisting in development of selection criteria.

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

Wind:

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

Photovoltaics:

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

Biomass:

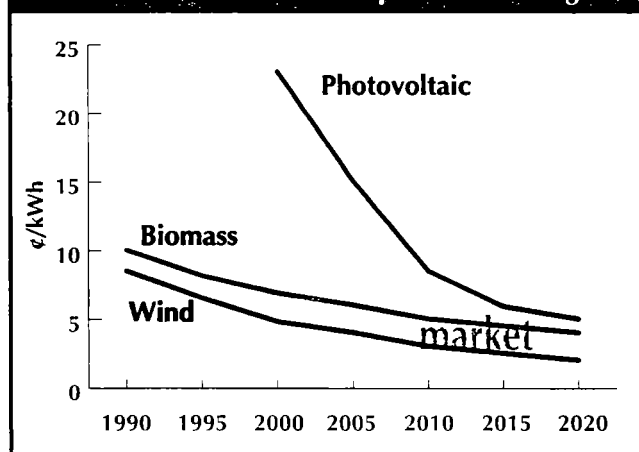
The Vermont Biomass Gasifier Project will provide a term demonstration of high efficiency biomass gasification/gas turbine systems and will produce 10 megawatts of generating capacity to Burlington Electric's existing 50 megawatt wood-fired McCall Station. A collaborative DOE/USDA solicitation "Biomass Power for Rural Development" is aimed at demonstrating integrated use of energy crop production and power production.

Geothermal:

As part of the "National Earth Comfort Program" DOE is helping the industry meet the goals of achieving 100,000 Geothermal Heat Pump sales of 55,000 to 100,000 annually. DOE is providing collaborative technical assistance by sponsoring national teleconfer-

ences and by partnering with International Geothermal Source Heat Pump Association Experts.

Renewables Enter the Competitiveness Range



Climate Change

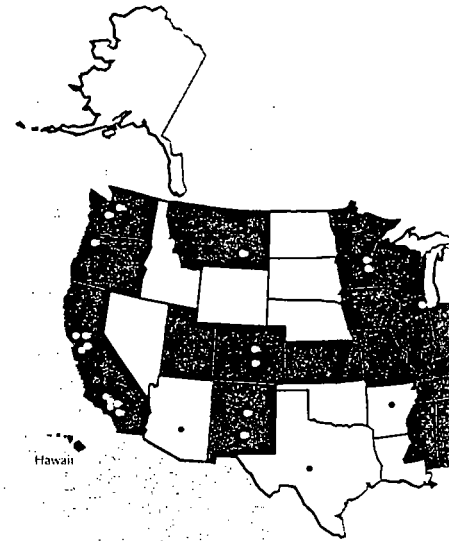
The State and Local Climate Change Outreach Program

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

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

Facts and Figures

States working on greenhouse gas emissions inventories: 29 (including Puerto Rico)
States developing mitigation plans: 14
States that have completed or are completing innovative GHG reduction demonstration projects: 12
Cities in the U.S. participating in the *Cities for Climate Protection Campaign*: 54



Albuquerque, NM; Atlanta, GA; Austin, TX; Berkeley, CA; Broward County, FL; Burien, WA; Burlington, VT; Chittenden County, VT; Chula Vista, CA; Dade County, FL; Durham, NC; Little Rock, AR; Los Angeles, CA; Minneapolis, MN; Missoula, MT; Mount Rainier, WA; Oakland, CA; Orange County, FL; Overland Park, KS; Pittsburg, KS; Portland, OR; Saint Paul, MN; San Francisco, CA; Santa Fe, NM; Santa Monica, CA; Sunnyvale, CA; Tucson, AZ; West Hollywood, CA

Among the strategies identified in the state plans are: emission cap and trade, energy efficiency, green mortgages, revised building codes, incentive programs, efficient vehicle purchase, afforestation programs.

At the local level, the Outreach Program partners with the International Council for Local Environmental Initiatives (ICLEI) to assist local governments. ICLEI operates two programs: the *Green Fleets* program and the *Cities for Climate Protection Campaign*. *Green Fleets* focuses on reducing energy use and the development of incentives to reduce local demand for travel. The *Cities for Climate Protection Campaign* engages local governments in climate change abatement policy. The campaign strengthens local commitments to reduce greenhouse gas emissions, develops and disseminates technical information to build local capacity, and encourages energy efficiency practices.

Climate Change

July
1996

U.S. Country Studies Program

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

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

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

- Built human, technical and institutional capacity in 55 developing and transition countries to conduct climate change assessments through training, analytical tools and reference materials provided to more than 1,000 country analysts.
- Catalyzed the establishment and strengthening of intergovernmental climate change committees in the 55 countries and helped these countries identify opportunities to implement climate change responses that will contribute to their sustainable development objectives.

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

Participating Countries



- Disseminated the study results (representing one of the most comprehensive international assessments to date) in more than 20 major synthesis reports and workshop proceedings in collaboration with the U.S. Global Change Research Program (USGCRP), the Intergovernmental Panel on Climate Change (IPCC) and others.
- Created a technical assistance program that is often cited as a model of effective cooperation between OECD and developing and transition countries and helped guide the design of GEF support for enabling activities.
- The 9 countries currently receiving CSP support for the preparation of their plans have already identified specific mitigation and adaptation measures (including technology projects) they wish to implement. Where appropriate, the CSP and the U.S. Agency for International Development are assisting countries with the development of these measures and their integration with other sustainable development plans and programs.
- More than 30 additional countries have expressed interest in preparing climate change action plans that will provide the basis for their national communications.

Climate Change

July
1996

USIJI

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

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

USIJI Program Accomplishments:

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

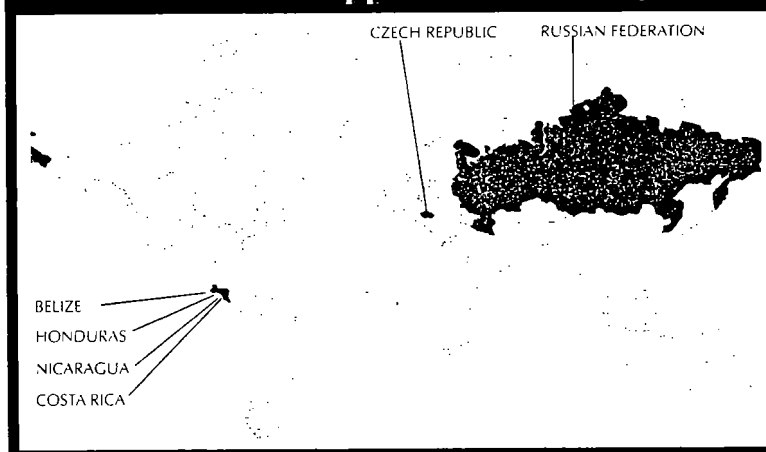
USIJI projects include a wide variety of technologies and practices, including: wind, geothermal, hydroelectric and solar energy; coal to natural gas fuel switching; methane

gas capture; and sustainable forest management and preservation.

When fully implemented, investments from the 15 approved USIJI projects are estimated to exceed \$200 million.

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

Countries with Approved USIJI Projects



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

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

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

Facts and Figures

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

Climate Change

July
1996

Voluntary Aluminum Industrial Partnership

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

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

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

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

94%



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

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

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

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

Alumax, Inc.

Climate Change

July
1996

WasteWi\$e

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

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

WasteWi\$e partners also reported expanding or improving ongoing company recycling programs by educating employees, performing community outreach and collecting new materials. The materials recycled in the highest amounts were corrugated containers and boxes, ferrous materials, and aluminum and other non-ferrous metals. Production and consumption of these materials generate substantial greenhouse gas emissions. By reducing, reusing and recycling, WasteWi\$e partners are helping to reduce emissions of greenhouse gases.



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

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

"The WasteWi\$e program has the most comprehensive information on waste prevention for businesses."

*Nancy Hirshberg, Environmental Coordinator
Stonyfield Farm Yogurt*

Facts and Figures

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

DRAFT 7/19

Handwritten:
-c
Climate
Chry

Mr. John F. Smith
Chairman, CEO and President
General Motors Corporation

Dear Mr. Smith:

I appreciate hearing your views and those from other business leaders in your July 8th letter concerning the negotiations on possible further international actions to limit global climate change.

This is an issue I believe we have a fundamental responsibility to address. The scientific community has given us a clear warning. According to its most recent assessment, if uncontrolled, future emissions of greenhouse gases will lead to unprecedented changes in global climate with potentially far reaching adverse impacts for human health and the environment. This is simply not an experiment that, in good conscience, we can allow to unfold with the hope that the advice from our best scientists proves to be wrong.

At the recent Conference of the Parties of the Climate Convention, we announced a position that addresses many of your concerns. First, we stated our support for a new framework for the negotiations. We rejected the existing proposals on the table, as you suggested in your letter, and instead called for an agreement that was based on "realistic, verifiable and binding" targets. We also supported the use of market-based mechanisms including trading among nations to achieve cost-effective reductions. At the same time we rejected the use "one-size-fits-all" harmonized policies and measures and clearly stated that, while developed countries must lead this effort, developing countries must step up and shoulder a share of the responsibility for reducing emissions.

We were able to put forward this framework based on extensive analysis and assessment that has been on-going during the past year. However, because we share your concern that more work needs to be done on the economic impacts of any specific proposal, we did not put propose a specific target or timetable. Once that work is completed and we are in a position to offer a more detailed proposal, I can assure that we will not take any actions that jeopardize United States competitiveness or continued economic prosperity.

Finally, you state your support for accelerated research and development on alternative technologies and on climate change causes and effects. I could not agree more that research in these areas is critical to our national interest. Unfortunately, the Congress has targeted exactly these areas for substantial

reductions. In Fiscal Year 1996, they reduced my proposed levels of funding in each of the following areas: global change research cut by ____; money saving voluntary actions under the Climate Change Action Plan cut by almost 50 percent; the Global Environmental Facility which encourages actions by developing countries cut by ____; and Partnership for the Generation Vehicle cut by _____.

Ultimately, it will be the creativity of businesses such as your own that develops and implements the solutions that reduce greenhouse gases emissions. We need and want your support in this effort and look forward to working with you in addressing this critical environmental issue in a manner that assures continued economic prosperity.

Sincerely,

Attachment: Climate Change Information Packet

JUL 8 1996

July 8, 1996

The President
The White House
1600 Pennsylvania Avenue, N.W.
Washington, DC 20500

Dear Mr. President:

U.S. State Department officials have announced that they will begin UN-sponsored negotiations on post-2000 climate change commitments this month. It is critical that an analysis and assessment of the impacts of any such commitments on the U.S. economy be completed before these negotiations proceed.

We are deeply concerned that such negotiations may lead to premature agreements that will severely disadvantage the U.S. economy and U.S. competitiveness simply to meet an arbitrary deadline.

While there is reason for concern about global climate change, the models that are relied upon to make climate change projections are evolving and there remains great uncertainty about the extent, timing and effects. Each time the models have been improved, the estimates of the potential environmental impact have been significantly scaled back.

*Climate
models*

The U.S. must take care to avoid commitments that will cost U.S. jobs, retard economic growth or damage U.S. competitiveness. Moreover, given the long-term nature of the issue, there is time to determine optimum strategies -- that are economically sound, comprehensive, market-based and can be adjusted over time as new data and technologies become available. For example, a policy of accelerated research and development efforts leading to breakthrough technologies may achieve the same or better results with less cost and economic disruption than near-term strategies aimed at incremental reductions in greenhouse gas emissions.

*Research
costs
Research*

The U.S. should not accept other nations' agendas. This is a global issue that needs to be addressed on a global basis. Agreements cannot exempt developing nations, which are expected to be the major contributors to greenhouse gases in the 21st Century. Policies, instead, should encourage activities in developing nations to help them limit future greenhouse gas emissions. At the same time, care must be taken to avoid a one-size-fits-all strategy or acceptance of unilateral obligations. The U.S. has the most to lose and will pay the highest cost for many of the proposals currently on the negotiating table.

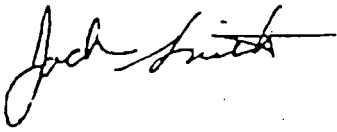
JB

We urge you to ensure that the U.S. negotiating team recognizes that the unique needs of the U.S. economy are of the utmost priority and to adopt a negotiating position that protects U.S. interests. The U.S. should support accelerated research on climate change causes and effects. The U.S. should demand time for a thorough study of all proposals with respect to their cost effectiveness and economic, social and international competitiveness impacts. The U.S. should not agree to any of the three proposed protocols presently on the negotiating table.

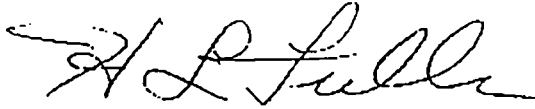
*Study
costs
Research*

Your leadership on this issue is critical to assuring a continuing strong U.S. economy.

Sincerely,



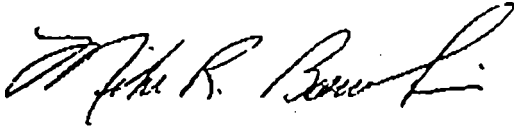
John F. Smith, Jr.
Chairman, CEO & President
General Motors Corporation



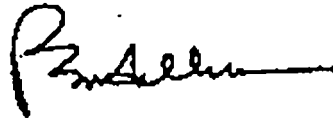
H.L. Fuller
CEO & Chairman
Amoco Corporation



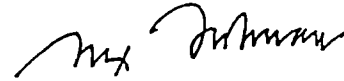
Curtis H. Barnette
Chairman & CEO
Bethlehem Steel Corporation



Michael R. Bowlin
Chairman and CEO
ARCO Corporation



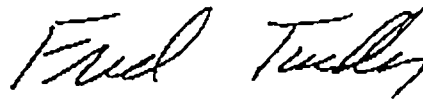
Peter Hellman
President and Chief Operating Officer
TRW, Inc.



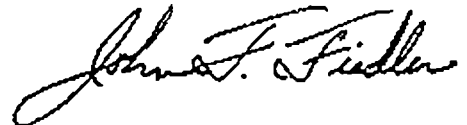
Alex Trotman
Chairman, President & CEO
Ford Motor Company



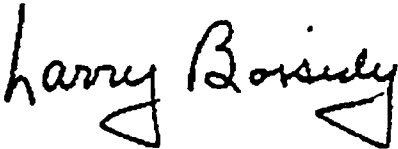
Drew Lewis
President & CEO
Union Pacific



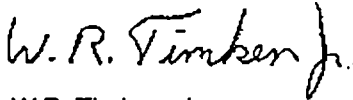
Fred Tucker
Executive V.P. and General Manager
Motorola, Inc.



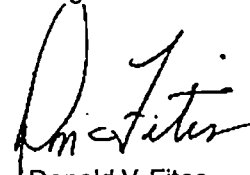
John F. Fiedler
Chairman & CEO
Borg-Warner Automotive, Inc.



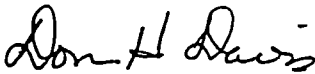
Lawrence A. Bossidy
Chief Executive Officer
AlliedSignal



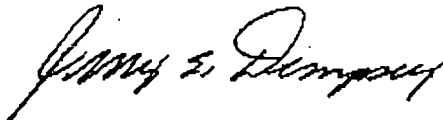
W.R. Timken, Jr.
Chairman
The Timken Company



Donald V. Fites
Chairman and CEO
Caterpillar Inc.



Don H. Davis
President and Chief Operating Officer
Rockwell International Corporation



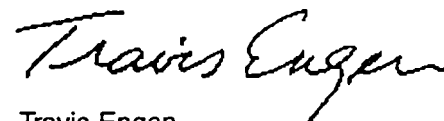
Jerry E. Dempsey
Chairman and CEO
PPG Industries, Inc.



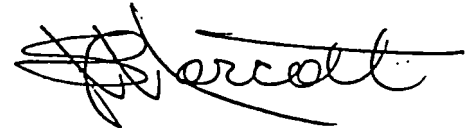
Frank Shrontz
Chairman of the Board
The Boeing Company



Robert J. Eaton
Chairman & CEO
Chrysler Corporation



Travis Engen
Chairman, President & CEO
ITT Industries



Southwood J. Morcott
Chairman & CEO
Dana Corporation



R. Barry Uber
Vice President
Ingersoll Rand



Richard A. Snell
President & CEO
Tenneco Automotive



David Whitwam
Chairman and CEO
Whirlpool Corporation

Lee R. Raymond
Chief Executive Officer
Exxon Corporation

Kenneth L. Way
Chairman & CEO
Lear Corporation

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

James F. Hardyman
Chairman & CEO
Textron, Inc.

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

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

Stanley C. Gault
Chairman
Goodyear Tire & Rubber Company

David H. Hoag
Chairman & Chief Executive Officer
LTV Corporation

J.J. Mulva
President
Phillips Petroleum Company

Hans W. Becherer
Chief Executive Officer
Deere and Co.

Victor G. Beghini
President
Marathon Oil Company

Barry J. Galt
Chairman & CEO
Seagull Energy Corporation

Ray L. Hunt
Chairman & CEO
Hunt Oil Company

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

Philip J. Carroll
President & CEO
Shell Oil Company

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

Lucio A. Noto
President, Chairman & CEO
Mobil Corporation

James E. Declusin
Chief Operating Officer
California Steel Industries

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

Claiborne P. Deming
President & CEO
Murphy Oil Corporation

Ken Derr
Chairman & CEO
Chevron

Ron W. Haddock
President & CEO
FINA

Keith Bailey
Chairman, President & CEO
Williams Companies

Thomas E. Petry
Chairman & CEO
Eagle-Picher Industries, Inc.

Heinz Prechter
Chairman
ASC, Inc.

Frank A. McPherson
Chairman & CEO
Kerr-McGee Corporation

Fred C. Schulte
Chairman, CEO, and President
Elgin National Industries, Inc.

Robert H. Campbell
Chairman, President & CEO
Sun Company, Inc.

Ralph Cunningham
President & CEO
Citgo Petroleum

C.E. Bryant, Jr.
Chief Executive Officer
Continental Conveyor & Equipment Co.

Peter I. Bijur
Chief Executive Officer
Texaco, Inc.

John D. Ong
Chairman and CEO
BF Goodrich Company

M. Anthony Burns
Chairman, President and CEO
Ryder Systems, Inc.

B.E. Douglas
President
Truax-Harris Energy

Roger C. Beach
Chairman and CEO
Unocal Corporation

John W. Snow
Chairman, President and CEO
CSX Corporation

Thomas J. Usher
Chairman & CEO
USX Corporation

James W. Boyd
President
John T. Boyd Company

Sherwood H. Smith, Jr.
Chairman and CEO
Carolina Power and Light Co.

L.O. Ward
President
Ward Petroleum Corporation

Jack B. Critchfield
Chairman and CEO
Florida Progress Corporation

Jerry R. Davis
President and CEO
Southern Pacific Rail Corporation

B.E. Cooper
Chief Executive Officer
Kennecott Corporation

Thomas V. Falkie
President
Berwind Natural Resources
Corporation

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

Robert M. Smith
Chief Executive Officer
Barrick Gold Corporation

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

Stephen D. Bennett
President and CEO
Acme Metals Incorporated

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

B.R. Brown
Chief Executive
Consol, Inc.

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

Edwin A. Lupberger
Chairman and President
Entergy Corporation

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

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

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

Paul M. Tellier
President and CEO
Canadian National

Andrew Aloe
Chairman and CEO
Shenango Inc.

R. Gene Dewey
Chief Executive Officer
Molycorp, Inc.

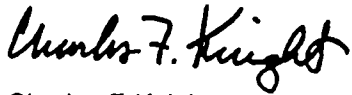
J.L. Jackson
Chairman and CEO
Global Industrial Technologies, Inc.

J.D. Lefler
President and CEO
Gulf States Steel, Inc.

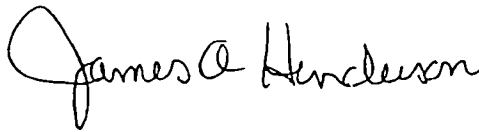
Robert J. Darnall
Chairman, President & CEO
Inland Steel Industries, Inc.

Irl F. Engelhardt
Chief Executive Officer
Peabody Holding Company, Inc.

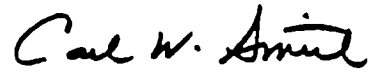
R. Thomas Green, Jr.
President, Chairman & CEO
Oglebay Norton Company



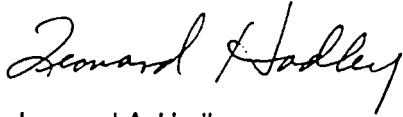
Charles F. Knight
Chairman, President & CEO
Emerson Electric Co.



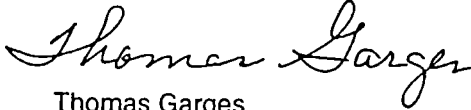
James A. Henderson
Chairman & CEO
Cummins Engine Company, Inc.



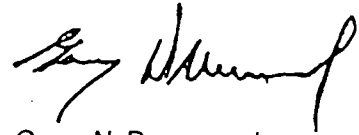
Carl W. Smith
Chairman & CEO
AMVEST Corp.



Leonard A. Hadley
Chairman & CEO
Maytag Corporation



Thomas Garges
President & CEO
Rochester & Pittsburgh Coal Co.



Garry N. Drummond
President & CEO
Drummond Company, Inc.



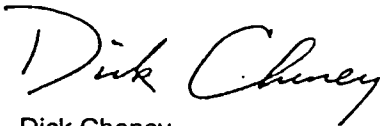
William Carr
President & Chief Operating Officer
Jim Walter Resources, Inc.



Arthur Brown
President & CEO
Hecla Mining Company



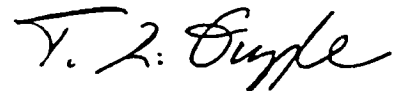
G.R. Spindler
President & CEO
Cyprus Amax



Dick Cheney
Chairman, President & CEO
Halliburton Company



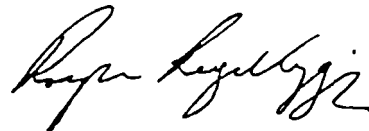
Bruce R. Clark
President
Lake Shore Mining Equipment, Inc.



T.L. Guzzle
Chairman & CEO
Teco Energy, Inc.



Harry M. Conger
Chairman & CEO
Homestake Mining Company



Roger R. Regelbrugge
Chairman & CEO
GS Industries, Inc.

cc:

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

Honorable Warren Christopher,
Secretary of State

Honorable Mickey Kantor,
Secretary of Commerce

Honorable Hazel O'Leary,
Secretary of Energy

Honorable Carol Browner,
*Administrator, Environmental
Protection Agency*

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

U.S. Senate

U.S. House of Representatives

Ralph Fifield
President
USS/Kobe Steel Co.

James T. Rhodes
President and CEO
Virginia Power

Martin D. Walker
Chairman and Chief Executive Officer
M.A. Hanna Company

Edward R. Caine
President and CEO
WCI Steel

Richard G. Holder
Chief Executive Officer
Reynolds Metals Company

William C. Payne
CEO and Chairman
Ashland Coal, Inc.

A.W. Dahlberg
Chairman and CEO
The Southern Company

Michael T. Poskarich
President
Cravat Coal Co.

Larry D. Haab
Chairman, President & CEO
Illinois Power

David A. Arledge
President and CEO
The Coastal Corporation

David J. Tarasevich
President and CEO
Tuscaloosa Steel Corporation

W.R. Holland
President and CEO
Ohio Edison Company

John Nils Hanson
Chairman and CEO
Harnischfeger Industries, Inc.

Steven F. Leer
Chief Executive Officer
Arch Mineral Corporation

Robert G. Spencer
President & CEO
Hepburnia Coal Company

Frederic C. Hamilton
Chairman, President & CEO
The Hamilton Companies

Edward Watson
Vice Chairman
Texas Utilities Electric Company

Alan J. Noia
President & Chief Executive Officer
Allegheny Power System, Inc.

Paul E. Glaske
Chief Executive Officer
Blue Bird Corporation

E. Linn Draper, Jr.
Chief Executive Officer
American Electric Power

T.F. Gundlach
Chairman & CEO
T.J. Gundlach Machine Company

Joe
Annie

Steve proposed the following
for the Q/A
RAY

EXECUTIVE OFFICE OF THE PRESIDENT

15-Jul-1996 02:58pm

TO: Raymond Prince
FROM: Stephen R. Seidel
Council on Environmental Quality
SUBJECT: Draft Questions on Key assumptions

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

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

July 16, 1996

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Copp
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MEMORANDUM

SUBJECT: Background Materials on U.S. Policy at Climate Change Negotiations

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

TO: Joseph Stiglitz/Alicia Munnell, CEA
Jack Gibbons/Rosina Bierbaum, OSTP
T.J. Glauthier/Bob Tucillo, OMB
Laura Tyson/Elgie Holstein, NEC
Jennifer Haverkamp, USTR
Leon Fuerth/Pete Jordan, OVP
David Sandalow, NSC/CEQ
Charlie Rawls, USDA
Marc Chupka/Dirk Forrister, DOE
David Gardner/Mary Nichols, EPA
Ev Ehrlich/Jeffrey Hunker, Commerce
Rafe Pomerance, State
Josh Gottbaum, Treasury
Frank Krusei, DOT
Lois Schiffer, Justice
Brooke Yeager, Interior

Attached are Undersecretary Wirth's Ministerial Statement and related background material for your information. The statement is embargoed until after it is delivered this Wednesday morning, July 17 at about 11 am in Geneva. Press inquiries can be directed to Nick Burns at State Dept.

**TALKING POINTS
STATEMENT TO INDUSTRY/NGOs ON U.S. INTERVENTION
AT CLIMATE CHANGE NEGOTIATIONS**

- This morning, the United States will make a significant statement outlining future directions for the climate change negotiations that will take place over the next 18 months.
- Under the 1992 Framework Convention on Climate Change (signed by the Bush Administration) the major industrialized nations agreed to a non-binding greenhouse gas emissions reduction target. Today, at the Second Conference of the Parties to the Convention, the U.S. will propose that negotiations for post-2000 emissions reductions focused on realistic, binding commitments that will produce real environmental benefits.
- Arriving at the decision to propose this kind of framework -- and deciding upon specific targets in the future -- is the result of extensive on-going analysis and assessment by the Clinton Administration. In response to last Spring's agreed Berlin Mandate, the Administration has embarked on an ambitious analytic review and outreach effort.
- These efforts have included extensive analysis by the major technical agencies and experts -- including the Department of Energy, EPA, Commerce, CEA and others. We also have held a major workshop on analysis and assessment, which included presentations from more than 50 experts from inside and outside of government about technical issues associated with our emissions trends and capability to reduce emissions in the next century. Complementing these efforts have been a series of roundtable discussions that Assistant Secretary Eileen Claussen has hosted with industry, NGOs and other experts.
- Internationally, analysis and assessment that has been undertaken by the Organization for Economic Cooperation and Development (OECD). Ongoing efforts have also been underway in other institutions, such as the IEA.
- Together with the on-going international scientific process, our analytical efforts have led us to today's decision to call for a new direction in the structure of emissions reduction targets under the Convention. Let me touch briefly on our rationale behind our decision.
- The first and foremost reason for launching this new direction is the science. The recently issued second assessment report of the Intergovernmental Panel on Climate Change has reinforced the strong concerns already established by the international scientific community about likelihood and implications of climate change, as well as the role of human activities in influencing such changes.
- Second, the existing framework of non-binding targets has failed. Most developed nations, including the US will not achieve the goal

set for the year 2000. If we want to be serious about reducing emissions in the future, we have to face up to the fact that the current structure has been largely unsuccessful and that we need to adopt a new course.

- Third, non-binding goals lead to uneven results. Countries treat non-binding goals with varying degrees of effort, seriousness and success. Clear, realistic and agreed objectives are needed to ensure that all nations will honor their commitments to reduce emissions. This is important for environmental and competitiveness reasons.
- In view of these points, we are calling for a shift in the Climate Convention's framework -- from one based on rhetorical, non-binding goals, to one based on realistic, binding commitments that produce real environmental benefits. We believe decisions about the most appropriate measures required to meet the agreed targets should be left to individual governments. We are calling for the maximum use of cost-effective and flexible policies (including emissions trading among nations) to achieve the greatest reductions at the lowest cost; while opposing rigid, binding policies and measures.
- We are convinced that the target must be both realistic and binding because it is only through the surety of a commitment of this nature that governments will take their obligations seriously and the only way we can be assured of progress.
- We are also convinced that it is the target that should be binding, not the individual measures, thus allowing maximum flexibility in implementation. Continued use of non-binding targets that are not met makes a mockery of the treaty process. It leaves the impression that rhetoric is what counts rather than real emission reductions -- an outcome that is both unacceptable and counterproductive.
- We have not yet proposed a specific target and timetable, but intend to do so following the completion of on-going analysis and assessment. It is important to note, however, that our analysis has determined that some of the proposals containing targets and timetables that have been tabled to date (e.g. the AOSIS protocol) are unrealistic and unsupportable. Furthermore, we are not wedded to the current target and timetable structure. A target must set a clear and binding commitment, but it could be defined in a number of ways (for example, as a multi-year rolling average).
- Finally, let me take this opportunity announce that in order to coordinate the intensive effort that we anticipate in the weeks and months ahead, we are pleased that the Undersecretary of Commerce for Economic Affairs, Dr. Everett Ehrlich, has agreed to chair the interagency analytic effort. U/S Ehrlich brings extensive public and private sector experience to this task and we are fortunate to have him.

PRESS GUIDANCE

July 17, 1996

Geneva Climate Change Negotiations

Q: What are the new elements of United States climate change policy announced in Geneva today by Undersecretary Wirth?

A: -- UNDER THE 1992 FRAMEWORK CONVENTION ON CLIMATE CHANGE, SIGNED BY THE BUSH ADMINISTRATION, THE MAJOR INDUSTRIALIZED COUNTRIES AGREED TO A NON-BINDING GREENHOUSE GAS EMISSION REDUCTION TARGET. TODAY, AT THE SECOND CONFERENCE OF THE PARTIES TO THE CONVENTION, THE UNITED STATES PROPOSED STRENGTHENING THAT EARLIER AGREEMENT BY SHIFTING THE FRAMEWORK FROM NON-BINDING COMMITMENTS TO BINDING ONES.

-- WE HAVE ALSO CALLED FOR THE MAXIMUM USE OF COST-EFFECTIVE AND FLEXIBLE POLICIES TO ACHIEVE THE GREATEST REDUCTIONS AT THE LOWEST COST AND HAVE OPPOSED THE USE OF RIGID REGULATORY APPROACHES.

-- THIS ROUND OF NEGOTIATIONS IS SCHEDULED TO REACH A NEW AGREEMENT IN THE FALL OF 1997.

Q: Why did the United States call for binding targets for future emissions reductions?

A: -- THE EXISTING FRAMEWORK (A NON-BINDING TARGET OF RETURNING EMISSIONS TO 1990 LEVELS BY THE YEAR 2000) HAS BEEN LARGELY UNSUCCESSFUL. MOST DEVELOPED NATIONS, INCLUDING THE UNITED STATES, WILL NOT ACHIEVE THIS GOAL. A BINDING, YET REALISTIC TARGET, WILL REQUIRE A GREATER COMMITMENT BY NATIONS TO REDUCE GREENHOUSE GAS EMISSIONS.

-- THE MOST RECENT SCIENTIFIC REPORT, WITH PARTICIPATION FROM 2,500 OF THE WORLD'S LEADING CLIMATE EXPERTS, REINFORCES THE VALIDITY OF THE CLIMATE CHANGE THREAT AND DEMONSTRATES THAT A STRONGER COMMITMENT TO REDUCE EMISSIONS IS NEEDED.

-- A FAILURE TO TAKE MEANINGFUL ACTIONS NOW WOULD SUBJECT FUTURE GENERATIONS TO UNACCEPTABLE ECONOMIC COSTS, HUMAN HEALTH PROBLEMS, AND ENVIRONMENTAL HARM.

Q: Aren't there still a lot of questions in the scientific community about whether climate change is a legitimate threat?

A: -- NO. THE SCIENTIFIC FINDINGS FROM THE WORLD'S CLIMATE EXPERTS ARE CLEAR: HUMAN BEINGS ARE ALTERING THE EARTH'S NATURAL CLIMATE SYSTEM.

-- WHILE A FEW SKEPTICS WOULD ARGUE CLIMATE CHANGE WILL BE TOO SMALL TO MATTER, THEIR CASE HAS FOUND LITTLE CREDIBILITY AMONG INDEPENDENT SCIENTISTS.

Q: Why is it that the U.S. proposal would place additional obligations on our industry while exempting developing countries who will soon be responsible for over half of global greenhouse gas emissions?

A: -- WE HAVE SAID THROUGHOUT THAT WHILE THE RESPONSIBILITIES OF DEVELOPED AND DEVELOPING COUNTRIES ARE DIFFERENT, ALL NATIONS MUST TAKE STEPS TO REDUCE GREENHOUSE GAS EMISSIONS. ADDRESSING CLIMATE CHANGE IS A GLOBAL CHALLENGE REQUIRING THE PARTICIPATION OF EVERY NATION.

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-- GIVEN OUR FAR GREATER RESOURCES AND TECHNOLOGICAL KNOW-HOW, DEVELOPED COUNTRIES MUST TAKE THE LEAD IN REDUCING GREENHOUSE GAS EMISSIONS.

-- AT THE SAME TIME, EVEN THE EXISTING REQUIREMENTS OF THE CLIMATE CONVENTION DO NOT GIVE DEVELOPING COUNTRIES A FREE RIDE -- THEY TOO MUST DEVELOP PLANS AND TAKE ACTIONS TO REDUCE THEIR EMISSIONS.

Q: Is it true, as some claim, that U.S. proposals will cause a large increase in energy costs to consumers and reduce GDP growth by several percent?

A: -- WHILE THE U.S. HAS PROPOSED A FRAMEWORK FOR THE NEGOTIATIONS, WE HAVE NOT PROPOSED A SPECIFIC TARGET OR TIMETABLE BECAUSE WE HAVE NOT YET COMPLETED OUR ONGOING ANALYSIS AND ASSESSMENT PROCESS.

-- THUS, ANY ESTIMATES OF COSTS ARE SIMPLY EXAMPLES OF SPECIAL INTERESTS "CRYING WOLF." WE ARE CURRENTLY CAREFULLY ANALYZING COST IMPACTS AND BELIEVE THAT COST-EFFECTIVE ACTIONS ARE POSSIBLE THAT WILL RESULT IN SUBSTANTIAL LONG-TERM BENEFITS WITHOUT HARMING THE ECONOMY.

final draft 7/15/96 12:00 noon

The Honorable Timothy E. Wirth
on behalf of the United States of America

Second Conference of the Parties
Framework Convention on Climate Change

Geneva, Switzerland
July 17, 1996

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

Since Berlin, our deliberations have benefitted from the careful, comprehensive and uncompromised work of the Intergovernmental Panel on Climate Change, whose efforts serve as the foundation for international concern and whose clear warnings about current trends are the basis for the sense of urgency which my government holds in these matters. We are not swayed by and strongly object to the recent allegations about the integrity of the IPCC's conclusions. These concerns were raised not by the scientists involved in the IPCC; not by participating governments, but rather by naysayers and special interests bent on belittling, attacking and obfuscating climate change science. So let's take a false issue off the table, there can be no question but that the IPCC's findings meet the highest standards of scientific integrity.

In the ongoing scientific effort, Mr. Chairman, I want to note that the United States is proud of the more than \$1 billion annual investment it has been making in recent years on global change research. This is a cost we have taken on in order to enhance our own and the world's understanding of the Earth's atmospheric, oceanic and biological systems and represents not only the seriousness with which we view these matters, but also the willingness of President Clinton and the American people to help pioneer progress on behalf of the environment.

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

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

In turn, the best scientific evidence indicates that human-induced climate change, if allowed to continue unabated, could have profound consequences for the economy and the quality of life of future generations:

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

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

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

nations in either the developed or developing world have been fully successful in meeting their commitments under articles 4.1 and 4.2 of the Convention. We have to do better.

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

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

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

sectors everywhere. Climate change is a serious problem and will require sustained long-term investment and the full creativity of the marketplace to be addressed successfully.

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

Based on these principles -- encompassing environmental protection, economic prosperity, flexibility, fairness and comprehensiveness -- the United States recommends that future negotiations focus on an agreement that sets a realistic, verifiable and binding medium-term emissions target. We believe that the medium-term target must be met through maximum flexibility in the selection of implementation measures, including the use of [measures such as] reliable joint implementation and trading mechanisms. In addition, our view is that it will be necessary to continue working toward a longer-term concentration goal (e.g. for the next 50-100 years), as set out in the Convention's objective, recognizing that scientific understanding and technology will improve over time. Working toward such a goal would better establish the long-term, global nature of the problem.

Having outlined in broad terms the basic components of an agreement we could support, I want to underscore the expectation of the United States that the agreement be realistic and achievable. Our preliminary analysis of the targets that have been tabled for consideration to date suggests that these proposals are neither realistic nor achievable -- either because they would compromise other important principles, such as the need for flexibility in time and place of implementation, or because they involve timeframes and objectives that are not consistent with national and international prosperity. Our job in the months ahead is to search for agreement on a next step that will produce results that are consistent with our environmental and economic aspirations.

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

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

In summary, we have come to the conclusion that the current structure of the Convention is less than ideal. Performance under the current regime -- or lack thereof -- suggests that a new model must be considered. Next steps must be structured in a way that will help produce the desired results -- not just more rhetoric. We believe that circumstances warrant the adoption of a realistic but binding target, leaving it to individual governments to decide the most appropriate measures needed to meet the agreed target. We are convinced that the target must be both realistic and binding because it is only through the surety of a commitment of this nature that governments will take their obligations seriously and the only way we can be assured of progress.

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

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

Draft 7/16

CLIMATE CHANGE NEGOTIATIONS
BACKGROUND QUESTIONS AND ANSWERS

BINDING TARGET

Q. Why did the U.S. propose that any emission target be binding?

A. Our proposal called for setting a realistic binding target and timetable for reductions. We think the current framework, which relies on a non-binding aim, inevitably leads to more rhetoric than action and therefore does not effectively advance the goals of reducing the health and environmental risks from climate change.

Q. Why should a binding target make any difference?

A. Many environmental and other related international agreements contain binding commitments (e.g., Montreal Protocol, CITES, London Dumping, etc.). Given the latest scientific evidence, which supports the need for stronger action, we believe a change in the Convention's framework to a binding commitment would shift the discussion from what might be done to what can realistically and will be done.

Q. Won't a binding commitment hurt US competitiveness?

A. No. The idea behind a binding agreement is to encourage compliance. Non-binding agreements may be viewed differently by different countries. We want all developed countries to face a clear commitment and to play by the same rules. We think this will ultimately work to the benefit of U.S. competitiveness and the environment.

Q. How would a binding commitment be enforced? Would it entail penalties?

A. Environmental agreements employ a number of measures from political and moral persuasion to the use of penalties. We need to carefully balance our desire to encourage others to comply, with our interests in maintaining flexibility at home. We do not at this time have a specific position on which compliance measures would be most appropriate.

DEVELOPING COUNTRIES

Q: Why were developing countries "exempt" from any requirements under the Berlin Mandate?

A: Developing countries do not get a "free ride" under the terms of the Berlin Mandate. They must take steps to "advance" their commitments under Article 4.1 which specifically calls on them to take actions to limit greenhouse gas emissions.

Q: But the Berlin Mandate makes clear any "new" commitments would apply only to developed countries. This would include the U.S. proposal to make any target binding. Won't this just make the competitiveness problems worse?

A: Developed nations have both greater resources and technological know-how to deal with concerns about climate change, and the U.S. is still the largest single emitter of greenhouse gas emissions. For example, carbon dioxide emissions from the U.S. auto fleet alone are larger than total emissions of carbon dioxide from energy from the entire continent of Africa. Per capita emissions of carbon dioxide from energy from the U.S. are: 8 times greater than China; 20 times greater than those from India; and 14 times greater than Brazil. We have to lead in addressing this problem. The failure of most developed countries to meet their 2000 goal of stabilization sends exactly the wrong signal about the seriousness of this problem. How can we expect the developing countries to take actions until we demonstrate that we are willing to act?

We think shifting to a binding aim will demonstrate our increased concern and political commitment to take realistic action. We will make certain that U.S. economic interests, including our competitiveness, are fully protected in the context of setting a specific target and timetable and insuring that maximum flexibility is permitted in meeting those limitations.

Q: What do we expect developing countries to do under their existing commitments?

A: Positive steps are being taken in four areas:

1. Convention Requirements: all nations are required to report on inventories of greenhouse and to adopt policies and measures that reduce emissions of greenhouse gases.

2. Bilateral efforts: the U.S. has established its Country Studies program to provide technical support to developing countries in preparing their country studies and action plans. AID, DOE and EPA all have active bi-lateral programs in developing countries aimed at reducing greenhouse gas emissions.

3. The Global Environmental Facility has been supporting projects and institutional building in developing countries aimed at facilitating actions under the Convention. Unfortunately, Congressional funding for the GEF has been 70% below the Administration's request.

4. We have been supporting efforts by U.S. industry in the area of export promotion of greenhouse friendly technology -- a win-win for the economy and the environment. As part of this effort, we have established an extensive pilot program on joint implementation.

Q: Since developing countries will soon be responsible for over half of total global emissions, how can we solve this problem without their full cooperation?

A: We cannot. That is why it is so critical that steps be taken to continue to engage them in the process and overtime to encourage greater use of greenhouse friendly technologies. But we cannot expect them to take this issue seriously unless and until we demonstrate leadership.

MISCELLANEOUS QUESTIONS

Q: Given that over 100 CEOs from industry wrote to the President urging a "go-slow" policy to avoid actions that could harm the economy, isn't the Administration concerned about the costs of moving forward?

A: The Administration believes that inaction at this time, in light of the growing scientific evidence of climate change, would be inexcusable. Instead, the Administration supports a framework for progress based on realistic binding actions that can be achieved consistent with continued economic prosperity.

Q: Seventeen Republican Senators wrote the President urging that we suspend the negotiations until scientific and economic issues have been resolved? Doesn't that make sense?

A: Some Senators have taken many extreme views during the past year against common sense actions to protect the environment. This letter demonstrates that while they may be trying to change their tune, the substance of what they want has not changed. They would want to base climate policy on the views of a handful of skeptics largely supported by global fossil fuel interests while turning their back on the view held by the vast majority of the 2,500 climate scientists that forms a strong basis for further action.

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

A: The United States has cautioned that any target should be realistic, based on a clear view of what can be achieved.

Furthermore, we have urged in our proposed framework, that flexible, cost-effective approaches be fully utilized including such possibilities as joint implementation, verifiable banking and trading, and targets defined as rolling multi-year averages. Combining realistic targets with flexible implementation should provide adequate safeguards against unintended impacts of meeting a binding target.

Q: It's now a year into analysis and assessment. Why isn't the U.S. prepared to propose a specific target and timetable? What, if anything has the U.S. learned during this time?

A: The June analytical workshop included the presentation of over 50 studies related to next steps under the Berlin Mandate. These analyses are now being reviewed and further refined. Based on our work to date we have developed some tentative conclusions including:

-- the current framework based on a non-binding aim has not proven equal to the task of achieving a serious political commitment to reducing emissions;

-- flexible approaches over considerable cost-effective opportunities that should be incorporated into any future agreement;

-- a target and timetable offers greater prospects for success than any harmonized sector specific controls.

Q: What do we mean by a target? Does this mean a specific emission limitation in a specific year?

A: Not necessarily. We believe that a target must set a clear and binding objective but that it could be defined in a number of potentially attractive cost effective and flexible ways. For example, a target could be a multi-year rolling average to minimize concerns about short-term variations due to weather or economic conditions. It could be met through trading of reductions over time (e.g., through banked reductions) or through verifiable reductions in another country.

Q: ARE DEVELOPING COUNTRY COMMITMENTS CONTINGENT UNDER THE CONVENTION ON ANNEX I COUNTRIES PROVIDING MONEY AND TECHNOLOGIES AS DEVELOPING COUNTRIES SEEM TO CONTEND?

A: No. In Article 4.7 of the convention, it is acknowledged that the extent to which developing countries can effectively implement their commitments depends on the effective implementation, by developed countries, of their commitments mentioned in the Convention with regard to financial assistance and technological

transfer.

Obviously, our support for the Global Environment Facility and our on-going Country Studies Program will serve as incentives for developing countries which might not otherwise have the resources or the administrative wherewithal to carry out their commitments under the convention.

Q: WHAT CONSIDERATION HAVE YOU GIVEN TO THE TYPE OF INSTRUMENT THAT SHOULD BE REPORTED BY THE AGBM?

A: We have given considerable thought to the various options for the type of instrument that might emerge from the AGBM process. At this point, we have not foreclosed options as among possible legal instruments, with the exception of an annex. As may be recalled, it was the United States that insisted that the Berlin Mandate leave open the question whether the process should lead to a protocol or other type of legal instrument.

NO.	COM	PAGES	FILE	DURATION	X/R	IDENTIFICATION	DATE	TIME	DIAGNOSTIC
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06	OK	001	112	00:00'52	RCV	202 6220294	JUL-11	13:31	0150270A37000
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