FOIA Number: 2017-1095-F

FOIA MARKER

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

Collection/Record Group: Clinton Presidential Records

Subgroup/Office of Origin: Council of Economic Advisers

Series/Staff Member: Subject Files

Subseries:

OA/ID Number: 24806

FolderID:

Folder Title:
Climate Change [Binder] [4]

Stack:	Row:	Section:	Shelf:	Position:
S	21	5	4	3

ENVIRONMENTAL
DEFENSE FUND

cc: JAT
JS
TR

Capital Office
1875 Connecticut Ave., N.W.
Washington, DC 20009
(202) 387-3500
Fax: 202-234-6049

February 19, 1997

Dr. Alicia Munell
Council of Economic Advisers
OEOB - Room 315
17th Street and Pennsylvania Avenue, N.W.
Washington, D.C. 20500

Dear Dr. Munell:

The Clinton Administration's January 17, 1997 proposal for the structure of an international protocol or other legal instrument for addressing climate change marks a significant and positive step in the effort to tackle the global warming problem. In the context of the January 17 proposal, we thought you might find of interest the enclosed recent paper, "Emissions Budgets: Building an Effective International Greenhouse Gas Control System".

As the evolving policy debate on an international agreement to reduce greenhouse gas emissions moves forward, we hope you will find this paper useful in considering the development of credible compliance and enforcement mechanisms, which we believe to be fundamental to the environmental effectiveness of the agreement. At the same time, we hope that the paper may be of assistance in the effort to elaborate further a number of the key elements of the U.S. January 17th proposal.

If you or your staff have any questions or would like to discuss this paper, please do not hesitate to contact us.

Sincerely,

Daniel J. Dudek
Senior Economist

Joseph Goffman
Senior Attorney

Annie Petsonk
International Counsel

National Headquarters

257 Park Avenue South
New York, NY 10010
(212) 505-2100

5655 College Ave.
Oakland, CA 94618
(510) 658-8008

1405 Arapahoe Ave.
Boulder, CO 80302
(303) 440-4901

128 East Hargett St.
Raleigh, NC 27601
(919) 821-7793

1800 Guadalupe
Austin, TX 78701
(512) 478-5161

EMISSIONS BUDGETS

Building An Effective International Greenhouse Gas Control System

ENVIRONMENTAL DEFENSE FUND

February 1997

TABLE OF CONTENTS

EXECUTIVE SUMMARY

For over a decade, the Environmental Defense Fund (EDF) has been engaged in the design, development, and implementation of markets for environmental protection. These activities have ranged from the creation of markets for water savings from conservation investments to reduce irrigation to the acid rain allowance trading system of the Clean Air Act Amendments of 1990. Since 1985, EDF has been concerned about the problem of global climate change and has been working to develop both a scientific understanding of the problem as well as practical solutions. This paper represents our current thinking concerning a framework for an international protocol that could deliver both the environmental and economic benefits desired.

The concept of emissions budgets were first introduced by EDF at the meeting of the Ad Hoc Group on the Berlin Mandate (AGBM) in February of 1996 in Geneva at the request of the Netherlands. The fundamental strategy of emissions budgets is to establish a dynamic framework of review and learning over time by harnessing in tandem a continual process of scientific and technical review to a process of emissions control within a legally binding framework which allows parties to trade extra emissions reductions. Of course, such a system must ultimately be guaged against the goals it aims to achieve. EDF believes that credible environmental goals would include:

- a first period of emissions reductions that begins by 2005 and ends not later than 2014
- an ultimate concentration objective of 450 ppmv (CO_2 equivalent), inclusive of all greenhouse gases (GHG)
- a transient constraint to limit the warming rate not to exceed 1° C per century.

The foundation of emissions budgets are legally binding obligations for OECD nations and economies in transition established on the basis of historic emissions baselines and set as a cumulative emissions budget for 10 years. For other nations, comprehensive GHG inventories and reporting would be required. Also critical to the foundation are the transparent and verifiable annual national reports covering all gases, sources and sinks by sector and including all transacted international GHG reductions by country and vintage. The plan for this construction is given by the continuing review and evaluation process to set new budget levels which on a 10 year cycle would:

- assess the science
- review the progress of the Parties
- review the development and adoption of technologies.

The bricks resting upon this foundation are the emissions reductions produced by Parties and their transaction through international greenhouse gas emissions reduction trading. Parties' performance in meeting their emissions obligations would be durable with savings for early reductions and automatic debt carryover for any shortfalls. Performance

would be evaluated for all GHG emissions by sources, uptake by sinks, and transactions in terms of 100-year global warming potentials (GWPs). Joint Implementation, for credit, is an essential element for addressing both graduation and economic competitiveness concerns. For nations that have not taken a budget, project-by-project crediting of reduction investments with the possibility of international review would be the primary trading path. For nations with a budget, full international trading of reductions is available. In addition, for those non-Annex I Parties that opt to take an emissions budget, an explicit growth allowance should be provided. Such growth allowances would be made available under a formula by which they would decline over time so as to reward early participation.

The mortar holding the system together is the incentives for sovereigns to meet their underlying emissions commitments. These include:

- All GHG reduction obligations remain until discharged
- For Parties with cumulative net emissions greater than the budget but less than 110%:
  - all emissions greater than budget automatically deducted from next budget
  - dispremium charged on emissions over budget (e.g., 1.2 to 1.0)
- For Parties with cumulative net emissions greater than 110% but less than 120%:
  - Above **Plus** automatic discounting of the non-complier's sold GHG reductions that have not yet been used by other countries for compliance beginning in the year of first occurrence (discounting to be in proportion to amount of non-compliance)
- For Parties with cumulative net emissions greater than 120%:
  - Above **Plus** mandatory COP review of Party's noncompliance
  - Prohibition on further sales of reductions as of the date of noncompliance

Under the emissions budget approach, each nation would be free to meet its budget and earn savings in any way, consistent with its own sovereign priorities, that it chooses. Each Party would determine whether it would participate in international emissions trading and who would be empowered to do so. The approach is designed to capitalize on our greatest asset in addressing the global threat of climate change -- human ingenuity. Emissions budgets reward early adopters, innovators, savers, and cost reducers. EDF believes that emissions budgets provide a straightforward, uncomplicated policy framework with clear environmental goals and easy to measure perfomance that is sufficiently flexible to consistently capture these assets over time.

INTRODUCTION [1]

Under the "Berlin Mandate" adopted at the first Conference of the Parties (COP), signatories to the United Nations Framework Convention on Climate Change (FCCC) have committed to develop a protocol to control greenhouse gas (GHG) emissions by their third Conference, to be held in Kyoto, Japan in late 1997. In the atmosphere, these pollutants, the byproducts of fundamental economic activities like energy production, transportation and agriculture, can lead to accelerated warming resulting in dangerous changes to the earth's climate system. Analyses produced by the Intergovernmental Panel on Climate Change (IPCC) indicate that failure to limit the emissions of these gases are expected to be damaging to natural ecosystems and costly to the many human societies that have developed during the 10,000-year period of relative climate stability leading up to the present.[2]

At the same time, because of the link between GHGs and activities fundamental to both industrialized and developing economies, many anticipate, or at least fear, that the costs of limiting their emissions will be high. For the same reason, others question the capacity of any international agreement to establish a truly durable and efficacious regime for limiting these emissions. This doubt is intensified by the fact that an international GHG regime could exist only as the artifact of a voluntary agreement between and among sovereigns, often in competition with each other, and representing the widest possible diversity of economic needs and resources and political and cultural aspirations. As a result, the tools that can be used to induce or enforce compliance by sovereigns with their GHG emissions obligations may be limited – and downright meager when contrasted with those that domestic authorities can bring to bear to ensure that private firms comply with domestic emissions limitation requirements.

In view of these circumstances, an international program must meet a set of exacting tests of equity, economic efficiency and responsiveness, durability in terms of legally binding commitments, flexibility and, above all, environmental efficacy – if it is to be credible. In addition, the international regime should function as a framework that can encompass the inevitable variety of domestic policies and measures – ranging from emissions taxes and technology standards to emissions cap-and-trade systems – that

---

[1] *This paper was written by Dr. Daniel J. Dudek, senior economist, and Joseph Goffman, senior attorney, of the Environmental Defense Fund's New York and Washington offices respectively. EDF is a not-for-profit, non-governmental organization that combines science, law and economics to solve environmental problems. The authors can be reached at 257 Park Avenue South, New York 10010, telephone (212) 505-2100 or 1875 Connecticut Avenue, NW, Washington, D.C. 20009, telephone (202) 387-3500. In addition, EDF's international counsel, Annie Petsonk, can be contacted at the Washington office.*

[2] *See Intergovernmental Panel on Climate Change, Science of Climate Change; Impacts, Adaptation and Mitigation of Climate Change: Scientific-Technical Analyses, Cambridge University Press, 1996.*

each nation will adopt in the exercise of its sovereign decision-making for the purpose of meeting its international obligations. Equally important, the protocol must be designed to create a reliable mechanism of accountability for nations' performance of their GHG emissions obligations.

Finally, the FCCC itself introduced and codified a distinction between nations characterized by advanced industrial economies (denominated as "Annex I Countries" in the parlance of the FCCC) and those at all other stages of economic development. It is all but certain that this distinction, or some form of it, will inform at least the initial structure of the commitments and obligations propounded in Kyoto, with few, if any, emissions limitations imposed on the developing countries. Nevertheless, because of rapid economic growth and other conditions, the latter category of countries are expected to contribute an ever increasing proportion of global anthropogenic emissions of GHGs. Consequently, the international regime must be sufficiently dynamic to induce those nations ultimately to participate in a worldwide effort to limit GHG emissions. This inducement is key both to an environmentally effective agreement and to limiting economic advantage from non-participation.

In response to these challenges, EDF first introduced the concept of emissions budgets at the February 1996, meeting of the Advisory Group on the Berlin Mandate (AGBM) in Geneva at the invitation of the Netherlands. Emissions budgets are the building blocks both of a verifiable and legally binding protocol and an effective international emissions trading regime. This paper builds on that earlier work to elaborate particularly on the critical reporting and compliance elements of this policy approach.[3]

In July, 1996, at a meeting of the second COP in Geneva, U.S. Undersecretary of State Tim Wirth announced U.S. support for negotiations that would lead to legally binding GHG emissions limitation and reduction obligations. Because it marked a watershed shift in U.S. position, Undersecretary Wirth's statement transformed the international debate on climate change by making the prospect of success for the Berlin Mandate plausible, perhaps for the first time. At the same time, Undersecretary Wirth's statement linked acceptance of such obligations to the availability of flexible, cost-reducing mechanisms of international emissions trading and joint implementation for credit.

During the December, 1996 meeting of the AGBM the U.S. government offered a document containing a preliminary description of a system of national emissions limits and international GHG emissions trading including the option of emission budgets. The U.S. followed its December submission with proposed draft protocol language on January 17, 1997 embodying the concepts included in the earlier document, but now focusing on emissions budgets. The proposed draft language provided further detail, but contains, as

---

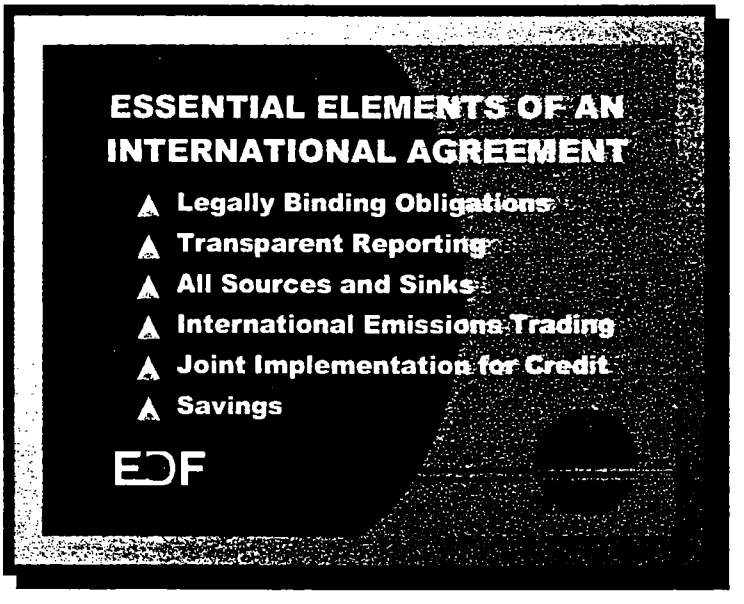
[3] *See Dudek, Daniel J.*, "Emission Budgets: Creating Rewards, Lowering Costs and Ensuring Results", Proceedings Climate Change Analysis Workshop, Springfield, Virginia, June 6-7, 1996, 18 pp.

the U.S. itself has indicated, a number of gaps that remain to be developed in order to fully develop the mechanics of a comprehensive global GHG budget and trading system.

For the COP to succeed in negotiating a viable GHG emissions protocol and for such protocol to succeed, in turn, in curbing GHG emissions such a vision is necessary. If designed in a way that included and integrated the necessary elements of accountability and flexibility, a GHG emissions budget and trading system would open the best – perhaps, the only – path to a global GHG regime that could meet the challenging array of tests confronting such a regime. However clear and well-aimed the U.S. documents have been in presenting a general outline, they also highlighted the crucial task of identifying the critical elements of such a system and of integrating those elements that must be accomplished by participants in the process leading up to and through the upcoming Kyoto Conference.

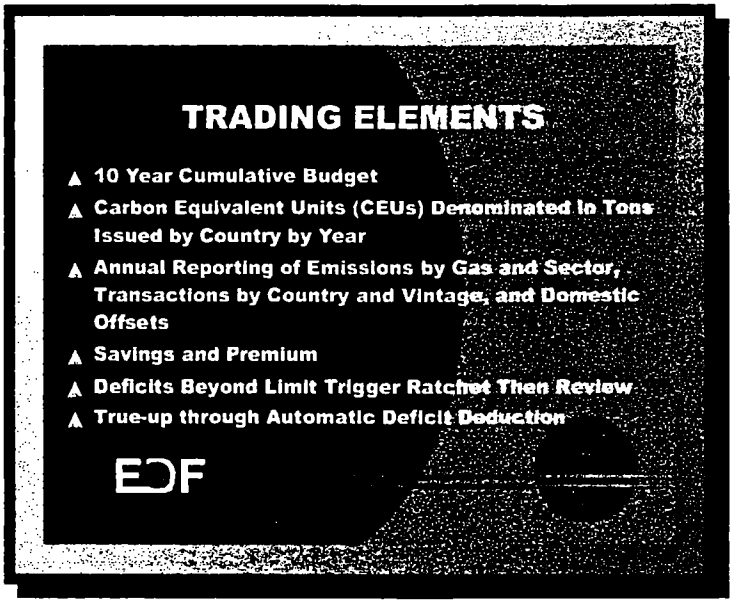
This report seeks to lay out EDF's current thinking on these critical elements and their integration. Specifically, it proposes an emissions budget and trading system for greenhouse gases that includes the following:

* **national budgets**
* **covering all sources and sinks**
* **expressed as total GHG emissions over a decade-long period**
* **and in terms of carbon equivalent units (CEUs).**



Nations could meet their decadal budget obligations by trading CEUs with each other and by "saving" CEUs whenever their decadal GHG emissions total was less than their total budget. Such CEUs could be used to offset GHG emissions in subsequent decadal periods and even earn "premiums" in the form of increases in their emissions

value.

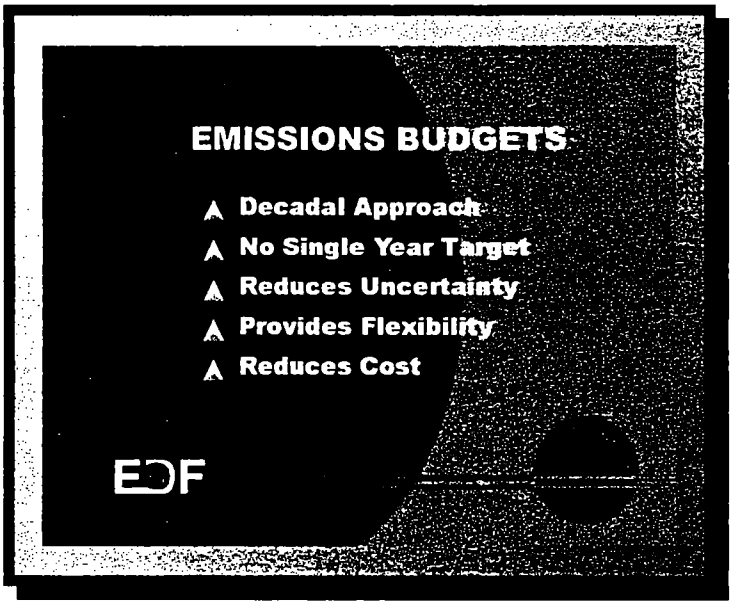


To ensure compliance, countries would be obligated to furnish detailed annual reports of their current and cumulative emissions and of the acquisition and/or sale of their CEUs. Countries exceeding their budgets would be subject to a two-pronged automatic sanction. The emissions value of any CEUs such countries had exported would be discounted upon their use by those holding such CEUs. In addition, cumulative GHG emissions in excess of a country's decadal budget -- adjusted to reflect CEUs acquired or exported by the country -- would be deducted --again, automatically – from the country's budget for the decadal period immediately following.

Finally, each decade's emissions budget for affected nations would be established during the course of an ongoing review process undertaken by the Secretariat. Emissions budgets for upcoming decades would be announced at the 5-year point of the current decadal period after assessments of the atmospheric and climate science and of technology developments as well as of the performance to date of the overall regime.

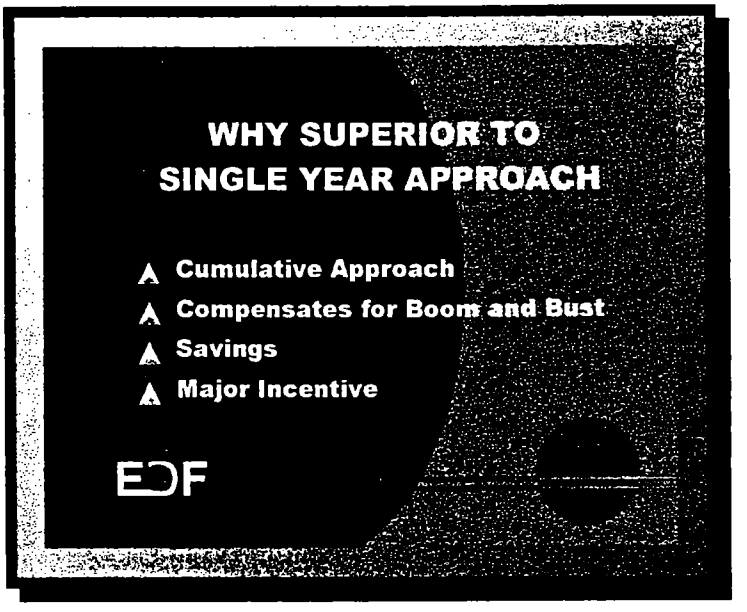
A simple exposition of these elements by itself does not reveal the underlying logic that dictates their necessary integration. Consequently, in addition to reviewing the importance of using an emissions budget and trading approach as the bulwark of an international GHG regime, one of the aims of this report is to distill the inextricable linkage between accountability and flexibility that these specific elements embody and that is indispensable to the success of a global GHG control strategy.

REVIEW OF THE EMISSIONS BUDGET POLICY FRAMEWORK

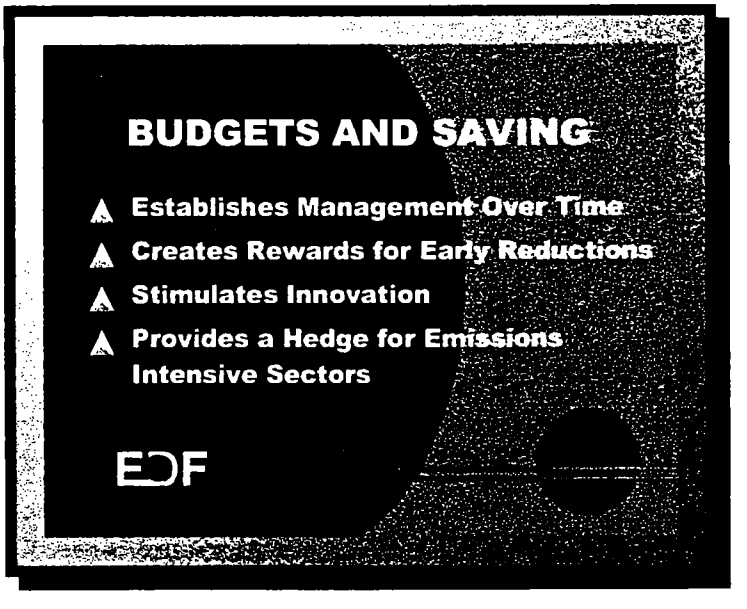


The fundamental definition of compliance -- i.e., in the form of an explicit quantity of emissions for which each nation is accountable -- parallels the experience of the U.S. under the Clean Air Act. Historically, Clean Air Act programs have imposed a variety of requirements on pollution sources, but only rarely have these made the sources directly or expressly accountable for their total emissions. As a result, these programs have tended to achieve fewer emissions reductions than intended or desired. In contrast, to combat acid rain, Congress amended the Clean Air Act to reduce emissions of sulfur dioxide from power plants. Here, each plant was held legally accountable for meeting a specific total emissions limit. This feature, together with the inclusion of emissions trading, has made this program one of the most successful of U.S. environmental policy initiatives.

Equally critical to the ultimate success of an international GHG regime is the integration of flexibility elements with express accountability on the part of each nation for meeting an explicit emissions limit. First, structuring each nation's budget as a 10-year cumulative obligation not only reflects the cumulative aspect of the effect of greenhouse gases on climate warming, but it also offers economic actors and nations' economies the temporal framework in which they can rationalize their response to the simultaneous demands of meeting their GHG emissions obligation and of inevitably dynamic economic conditions. As a result, sources and nations will be able to minimize the costs associated with budget compliance. At the same time, the 10-year budget period still creates a time horizon short enough to signal meaningful accountability so that nations and firms will feel compelled to manage their GHG emissions to meet the budget.



Second, the inherent opportunity for year-to-year "saving" of unused increments of each nation's GHG emissions budget within each decadal budget period creates an explicit incentive for early reductions. Since it is the cumulative effect of GHGs in dangerously accelerating the *rate* of warming and of resulting climatic and ecological change that represents a critical aspect of the threat posed by global climate change, honing incentives for early reductions is essential. For this reason, an effective regime should permit "savings" of unused increments of a nation's emissions budget to be carried forward for use in later periods.



To augment the value of such "savings" and thus intensify the incentives for early reductions, nations or firms that create and save unused budget increments or

CEUs should be able to earn a small premium that would increase the GHG emissions value of CEUs carried forward over time. Again, ecosystems – and human society -- are critically sensitive not only to the extent of climate warming but also to the rate at which climatic change occurs. Offering an emissions-value-increasing premium for emissions savings parallels the environmental protection value that early reductions create by slowing the rate of climatic warming and avoiding ecological damage.

In addition to direct environmental considerations, among the effects created by both the opportunity for nations and sources to manage emissions over time and the resulting incentives for early reductions is the stimulation of innovation in reducing or avoiding GHG emissions. Successful innovation not only lowers cost but it is further rewarded through the economic value garnered by traded or "saved" CEUs. Increasing investment in environmental innovation opens an ongoing flow or supply of the technologies and innovations necessary to sustain, and ensure the economic affordability and environmental efficacy, of a long-term global commitment to curb GHG emissions.

Finally, the importance of temporal flexibility embodied in both cumulative budgets and the availability of "saving" is vividly illustrated by examining their significance for the emissions-intensive sectors and activities that dominate, at least in part, most industrialized and developing country economies. Since nations will accept to make the transition to low-emissions economies only if they can do so while maintaining robust economies, the predominance of these sectors dictates that nations have the flexibility needed to manage this transition over time. Similarly, the ineradicable economic self-interest of the firms that operate in these sectors demand that they, too, be afforded the tools needed to meet their emissions obligations while remaining viable. The ability to trade and save CEUs for future use provides precisely the mechanism for accommodating continued activity by these firms and sectors while allowing nations to meet the obligations of GHG emissions budgets.

INTERNATIONAL GREENHOUSE GAS TRADING: COST-SAVING AND SOVEREIGN COMPLIANCE

Intra- and inter-budget-period savings is but one of two iterations of emissions trading. In addition to the "trading" of emissions between years and budget periods that savings allows, the budget system also permits trading between and among sovereign nations and firms in different countries. The set of benefits provided by inter-temporal trading through saving also emerges from international emissions trading. Since such trading confers an affirmative economic value upon actions that produce surplus reductions, the emissions trading market rewards environmental innovators and any firm or sovereign that overcomplies with its emissions reduction responsibility. In addition, emissions trades, almost by definition, allow the trading firms or nations to achieve the same net emissions reduction at a cost lower than that which they would

have incurred in making their reductions in the absence of the trade. That firms – and sovereigns – can resort to trading in addition to whatever other emissions reduction strategies might be available guarantees that they will enjoy increased flexibility in integrating their economic needs and their GHG compliance requirements.

At the same time, it is the economic dynamics of the emissions trading market that can provide the key to unlock the riddle of sovereign compliance with an international GHG emissions reduction protocol. Regardless of whether a protocol imposed quantitative emissions limitations or required specified technologies or taxes, the challenge of ensuring *sovereign nations'* compliance with a GHG protocol is one of the central environmental challenges in designing such a protocol.

To illustrate why this challenge is so daunting, the enforcement tools afforded the U.S. Environmental Protection Agency under the federal Clean Air Act make a revealing contrast with the remedies practically available in an international context in which the accountable party is a sovereign. For example, Title IV of the Clean Air Act, which established the emissions trading program for sulfur dioxide (SO_2) reductions requires firms to pay an *automatic* penalty of $2,000 for each ton of excess SO_2 emitted and to suffer an *automatic* deduction in their future allowable emissions. In addition, they are subject to a full panoply of civil and criminal sanctions. The availability of these remedies and the ability of enforcement officials to bring them to bear against firms reflects a widespread and highly durable consensus that permeates virtually every sector of U.S. society, a consensus, in turn, that, together with the threat of these sanctions, elicits compliance from the vast majority of regulated firms.

Similar tools are not nearly so readily available in an international context, nor is there likely to be a comparable consensus amongst sovereigns in the foreseeable future. Consequently, even with the third COP in Kyoto less than a year away, many governments and interested parties appear to be stumped by this question: if, at the end of each budget or compliance period, there are nations whose GHG emissions exceed their budgets, what happens? Environmentally, the atmosphere will continue to be subject to unacceptable levels of GHG emissions. By the same token, from the point of view of the integrity of a protocol purporting to embody "legally binding commitments", the credibility of such an agreement would be destroyed if, instead of having an ongoing obligation, those nations simply are permitted to start with a "clean account" in the next budget cycle.

At the other extreme, remedies and sanctions that excluded such nations from the GHG emissions budget and trading system or imposed general trade sanctions would, if imposed without any intermediate compliance/enforcement measures, also render any agreement non-credible on environmental grounds. Simply banishing non-compliers from the trading system would be self-defeating as a first-order sanction, since those countries would continue to emit GHGs at excessive levels. In fact, one of the key functions that the protocol's compliance strategy must serve is ensuring that countries facing difficulties in complying are provided a mechanism or path that eases

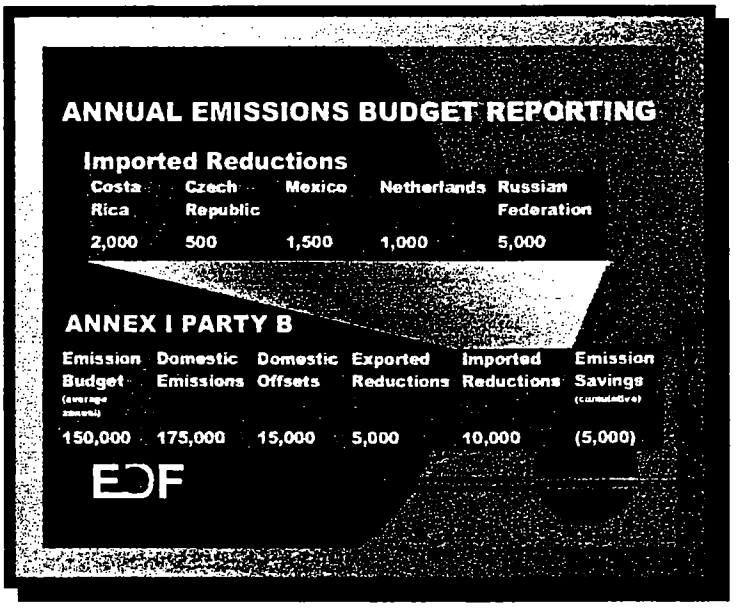
their achievement of compliance. A first-resort exclusion of these countries from the trading system would be environmentally counterproductive.

As for an approach that relied on general trade sanctions, the recent history of trade sanctions demonstrates that nations are extremely reluctant to administer such sanctions. Their imposition as a first-order measure requires a degree of political will that is unlikely to exist in the GHG context in the near term. Moreover, the environmental objectives of a protocol –not to mention the economic competitiveness concerns of nations with GHG emissions budget obligations – strongly suggest that the protocol should seek to engender a dynamic that will encourage those nations in the developing world, which initially may not be subject to legally binding GHG reductions obligations, to assume such obligations eventually. General trade sanctions, however, may discourage, rather than encourage, other parties from taking on budget obligations. It is hard to imagine that nations considering accepting legally binding GHG obligations would choose to do so if the result were to expose them, as a first-order sanction, to the economic losses created by trade sanctions.

Ultimately, such sanctions will have to be included as sanctions in a protocol, but it is hard to see them serving any role other than that of last resort. On the contrary, the effectiveness of any GHG emissions limitation regime will depend on structured, automatic and readily usable first- and second-order measures. To accomplish this, the Kyoto protocol must build a "compliance tripod" of measures, fashioned as an extension of the emissions trading and banking system itself, which would both ensure inter-temporal environmental compensation for excess emissions and create an inherent disciplinary feedback against nations' noncompliance. The three legs of the tripod are: 1) annual reporting, 2) automatic GHG emissions debiting with interest for those countries exceeding their GHG emissions budgets and 3) automatic discounting of GHG emissions reductions exported by nations that are significant violators.

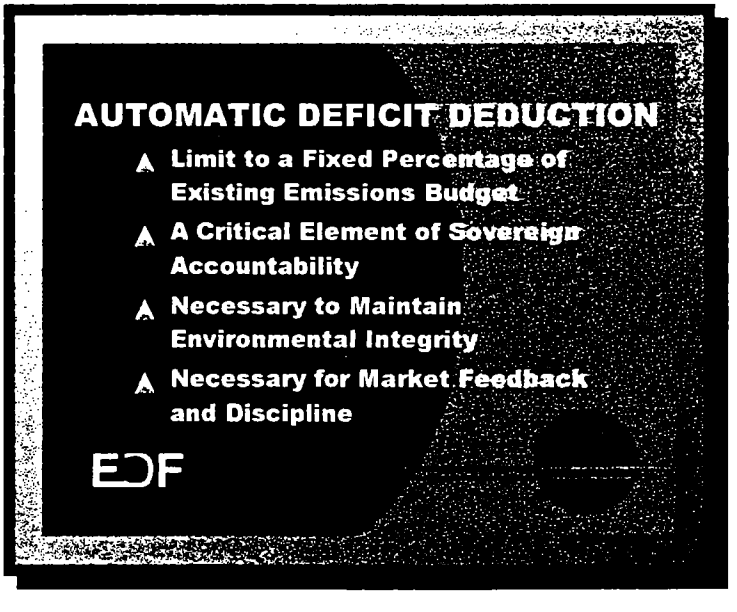
Reporting

The annual reporting of each nation's GHG emissions, internal offsets and international GHG emissions trading activity is an obvious, as well as indispensable, instrument of accounting for each nation's compliance performance. By the same token, the reporting system should also serve as the formal instrument for tracking, and therefore formally effecting, the exchange of emissions between sovereigns and each sovereign's "savings" and carrying forward of increments of its emissions budget through the achievement of early reductions. These mechanics will be discussed in more detail, in the section on "Mechanics", below.



Debt-Carryover and Discount

The concept of inter-temporal flexibility underlying banking -- which produces the benefit of early reductions -- must be applied to the likely event that some nations, including those not generally regarded as "bad actors", may simply miss their budgets. By imposing an automatic but limited debt-carryover with interest, the protocol would be able to harness that behavior by ensuring that it is environmentally compensated for -- rather than being either "forgiven" or subject to sanctions so draconian as to be unimplementable in the international context.



The debt-carryover would be implemented by automatically deducting from the ensuing period's budget the full amount of the nation's excess emissions at the conclusion of the current budget period. This automatic deduction would be augmented in size by an additional percentage of sufficient size to ensure that the mechanism itself -- which, in effect, is a form of "borrowing" an increment of a future budget and "repaying" the increment with "interest" -- would not be used as a routine compliance option. Rather, as a remedy for what would be treated as an initial instance of noncompliance, this debt-carryover would be a first-tier response, which could be followed by more stringent sanctions in the event the nation exceeded its net budget in the following period.

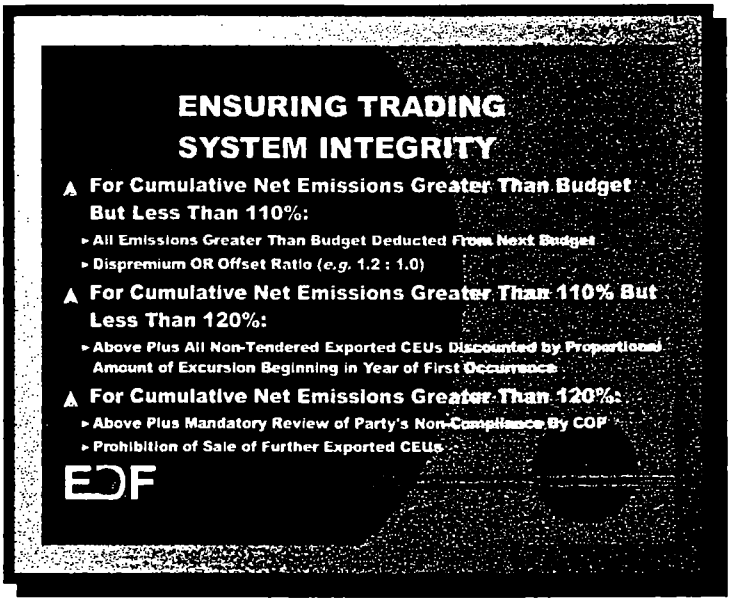
In addition to ensuring that each nation's accountability was truly continuous from budget period to budget period, the automatic debiting of nations' consecutive budgets for excess emissions would serve two other functions intrinsic to the integrity of the global GHG emissions budget and trading system. First, these debits would ensure that the environment was compensated both for the GHG emissions reductions initially lost and, through the additional "interest", for the delay in achieving those initially lost reductions. Second, in the absence of an automatic deduction for excess emissions, CEUs transferred by non-complying nations could be used to offset emissions generated by the firms or nations acquiring the CEUs notwithstanding the fact that such CEUs did not represent surplus emissions reductions. By offsetting the non-complying nation's excess emissions, however, the automatic debit would ensure that GHG emissions reductions transferred by the non-complying nation were surplus or ultimately became surplus. The automatic debt-carryover is an essential element of both the protocol's system of accountability and to its environmental integrity.

The Discount

Though indispensable, mandatory debt-carryover alone is not sufficient to reward compliers and sanction non-compliers in a credible, effective and reliable way. In fact, the debt-carryover offers a partial answer at best to the question of what it is that the protocol can use or create to compel or induce a sovereign to achieve compliance with its GHG emissions budget. Certainly the prospect of an automatic deduction, augmented by "interest", in the immediately following budget period signals nations that an "emit now, pay later" strategy for managing their GHG emissions over time would be inevitably expensive and potentially risky.

For nations whose commitment to, or capacity for, compliance is only marginal, however, the budget deduction can prove to be little more than a mere restatement of the nation's future obligation, an obligation that in itself has little credibility unless backed by something more than attenuated threats of eventual sanctions. Since, as discussed above, a compliance strategy that relies primarily on the imposition of sanctions is simply not credible in this context -- and could even be self-defeating, the protocol needs to incorporate a mechanism that will lead sovereigns to *prefer*

compliance over noncompliance even if they are not persuaded by the possibility of sanctions.



It is from the inherent economic dynamics of the GHG emissions trading market that such a preference must come. In fact, the protocol should seek to rely directly and explicitly on the emissions trading market as the mechanism for delivering that preference. To do so, the protocol should include an automatic and immediate imposition of discounts on GHG reductions exported by nations whose annual reports show that the combination of their emissions and their exported reductions is putting them over their GHG budgets. In those cases, the protocol should require that, beginning in the year – within any budget period -- in which this first occurs, governments applying those reductions to their own budgets automatically discount, by the proportion of the exporting country's excess GHG emissions, the exported reductions' tonnage value for emissions offset purposes.

This automatic discount is necessary because without it, exported GHG reductions from non-complying nations would be available to offset in full other nations' actual emissions notwithstanding the fact that the exported reductions or CEUs did not represent actual surplus reductions. Although the automatic debt-carryover addresses this issue as well, the remediation it provides does not occur until the subsequent budget period.

Equally important, this automatic discounting would force the market to value various countries' exported reductions differently based on their compliance. Reductions from compliers would earn more than those from non-compliers at least in proportion to the tonnage-value discount imposed on the latter. At the same time, firms and nations buying exported reductions would exercise preference for reductions from

complying nations, and invest effort in ensuring that reductions they acquired were from countries in compliance or on a course for compliance. Thus, by sending a market signal back to nations that fail to manage their emissions reduction obligations, this discount provision fulfills the capacity of the "compliance triangle" to impose a discipline both on these sovereigns and their firms and on their emissions trading partners.

Because one critical attribute of the automatic discount is its shifting of some risk -- and, therefore, incentive -- to buyers, the discount enhances the integrity of the emissions trading system in another way. Buyers' preference will be for reliable trading partners who can deliver CEUs that will retain their full value in offsetting emissions in the context of buyers' own compliance obligations. As a result, a preponderance of the CEUs transacted in the global emissions trading market may be those that *in the first instance* are highly likely to represent truly surplus reductions.

At the same time, in contrast to a regime in which non-compliers were excluded from the emissions trading market de jure, the fact that it would be the market, in exercising its preferences, that produced the effective exclusion of non-compliers from emissions trading comports with an overall strategy of using the market to elicit compliance. In this instance, the loss of economic opportunity resulting from this exclusion could act as a spur to drive non-compliers to take the actions necessary to achieve compliance. In fact, firms and other entities seeking to generate surplus GHG emissions reductions and sell them in the global market would become constituents for compliance within their own countries. In the face of the limitations that characterize an international enforcement regime, the protocol must rely on using the incentives inherent in a global GHG emissions trading market to mobilize constituents in favor of compliance.

From a superficial perspective, an approach, such as an automatic discount, which exposes buyers to uncertainty as to the use-value -- in this case, the emissions-tonnage value -- of their acquisition would seem to be incompatible with an active exchange market. However, a simple comparison to currency markets, or, for that matter, to any transaction involving currencies that are "foreign" to one of the parties, and which regularly fluctuate in value in comparison to the party's "domestic" currency, demonstrates that this uncertainty is a routine part of international commerce. Moreover, it is easy to imagine that transaction partners and intermediaries would find a variety of hedging or insurance instruments readily available to manage such uncertainty. Only if it resulted in the full confiscation of a CEU's offset value would a discount system fatally inhibit the development of an international emissions trading market.

In this case, no such confiscation would be necessary. The concurrent presence of the debt-carryover mechanism would render surplus, at least eventually, exported reductions, even from initially non-complying countries. Consequently, the emissions-offset value of such reductions would not have to be discounted to zero. By the same token, the discounting would be applied only for those CEUs presented for

use in meeting the buyer's compliance obligations after the selling nation's budget exceedance emerged in annual reporting. CEUs that had been used prior to that time would not be discounted, thus avoiding the imposition of retroactive liability for purchasers of a sort that could inhibit emissions trading activity.

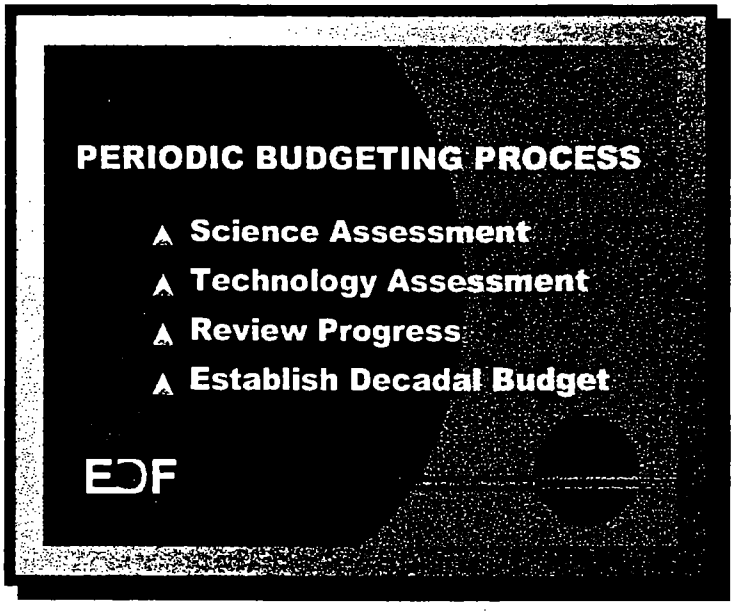
Without *both* an automatic debt-carryover to subsequent budget periods *and* an automatic discount applied within each budget period for CEUs exported by nations demonstrably exceeding their budgets, an international GHG protocol would lack adequate mechanisms for ensuring both nations' accountability for compliance and its own credibility. Without the ability to rely, in any but the most extreme circumstances, on the kinds of remedies, sanctions or other coercive measures typical of domestic pollution control laws such as the U.S. Clean Air Act or, in some instances, the general system of international commercial trade, a GHG protocol must develop a fully integrated set of incentives to motivate compliance.

That is why implementing nations' GHG emissions obligations through a system of emissions trading is so indispensable to the success of a GHG protocol. An emissions trading market is virtually the only mechanism that can provide such incentives. At the same time, the emissions trading and compliance regime must be carefully designed to hone these incentives. Just as the opportunity to create early reductions and "save" them for future use intensifies incentives for early action and for the development of environmental innovations, features like a discount applied to the GHG emissions reduction exports of non-compliers are essential to perfecting those incentives that can effect nations' -- and their firms' – preference for compliance. Moreover, such a discount does more than provide a tangible instrument for delivering such incentives. Without a discount, the emissions budget and trading regime will lack important mechanisms that can be readily usable in the first instance to perform the function -- traditionally served by penalties and similar remedies in domestic legal programs – of disciplining sovereigns that stray from the path of compliance.

THE IMMUTABLE IDENTITY BETWEEN TRADING AND COMPLIANCE

In a GHG emissions budget and trading system, the mechanics of accountability must be carefully designed. Fortunately, it is possible to create a unified system through which sovereigns can effectuate emissions trading and, at the same time, to design it so as to establish their accountability for meeting their GHG emissions budgets.

Setting the Budgets

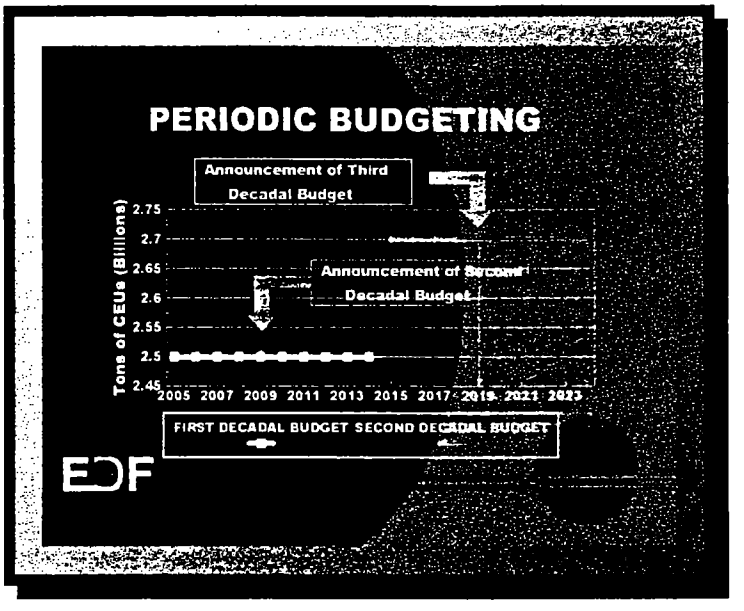


The key specification for each budget period is setting the numerical value of each nation's decadal budget. Presumably, since the initial commitments of the industrialized nations under the FCCC were expressed in terms of 1990 emissions levels, the protocol will establish each nation's initial budget as a function of its 1990 emissions. For purposes of setting the initial budget as well as each subsequent budget, the Parties should rely on the resources of international institutions such as the Intergovernmental Panel on Climate Change, under the direction of the Secretariat, to focus on three major components.

First, as the IPCC has done continuously since before the signing of the FCCC in 1992, the IPCC should provide an ongoing assessment of all scientific developments relevant to climate change. Inevitably, this will include a dual focus on tolerable concentrations of GHGs in the atmosphere and tolerable rates of climatic change. Second, technological advances and innovations are likely to progress at an accelerated pace in the wake of the establishment of a GHG protocol and in response to the incentives it engenders. These, as well as technological costs and limitations, should also be carefully assessed. Finally, nations' performance under the protocol as that performance develops needs to be assessed as well.

These assessments should inform the setting of the budget for the immediate subsequent period as well as projected reduction trajectories over a multi-budget-period horizon. An equally critical element of the budget-setting process is timing. Specifically, each budget should be established and announced no later that the end of the fifth year of the current budget period. By following this schedule, the protocol's budget-setting process will afford nations and firms the time necessary to

anticipate their upcoming compliance obligations and to integrate them with their overall economic responses.



This budget-setting schedule also contributes to the protocol's ability to establish a credible system of accountability. A five-year separation between the establishment of the ensuing period's budget and the application of remedies such as an automatic debt-carryover can help ensure that the budget-setting process will not be compromised by efforts to ease non-complying nations' obligations under the debt-carryover provision. As a result, the carryover will represent a true net deduction from a budget that is not inflated to defeat the effect of the carryover.

Mechanics of Reporting, Accounting and Trading

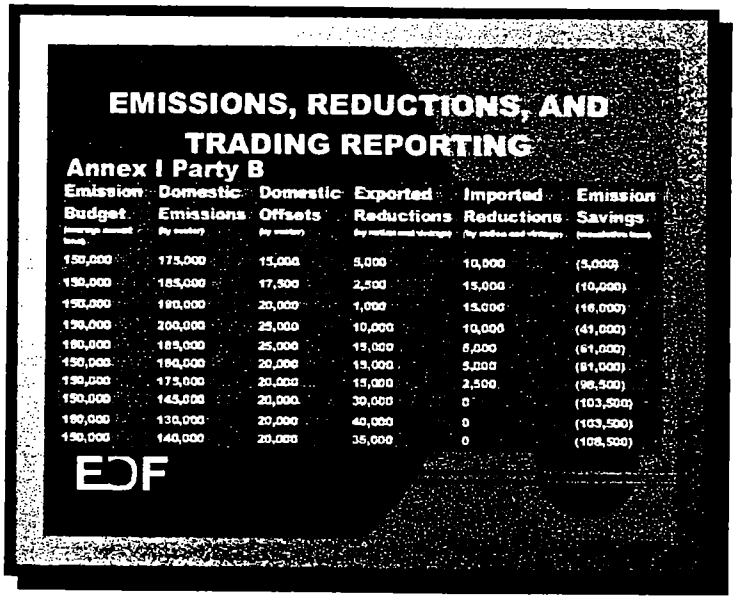
One of the innovations introduced by the SO_2 emissions trading program under the U.S. Clean Air Act was that the SO_2 emissions "allowance" served – all at the same time – as i) the currency of trading, ii) the instrument of compliance for affected sources and iii) the regulatory mechanism applied by the U.S. EPA for ensuring sources' accountability and for "tracking" emissions trades. Similarly, the protocol can establish a single, simple sovereign accounting system that performs the same multiplicity of functions for an international GHG emissions budget and trading regime. At the same time, this system would be able to succeed without relying on the allocation of emissions "allowances" or marketable permits.

This is critical, since in the context of a GHG protocol a compliance accountability infrastructure must be designed to meet several constraints as well as

the demand that it work. First, the protocol, and its compliance and trading accounting method, must be able to accommodate every possible policy approach -- e.g., pollution taxes, technology standards, research and development subsidies, marketable permits -- available to sovereigns in adopting their respective domestic strategies to meet their GHG emissions budget obligations. A system that presupposed the adoption of certain measures and the exclusion of others would be untenable to the extent that it would necessitate the forfeiting by sovereigns of at least a portion of their own policy-making prerogatives.

By the same token, reliance on the creation of elaborate or powerful new international institutions for the purpose of implementing a protocol could doom such a protocol, for, here, too, demanding that sovereigns surrender significant elements of their authority may be a prospect even more daunting than inducing them to agree to curb their GHG emissions. Finally, an international system for accounting for, and tracking trades in, each nation's GHG emissions must be simple, reliable and durable.

Fortunately, the FCCC itself already has laid the foundation for such a system in its existing requirements that countries file annual reports of their GHG emissions. To implement each nation's GHG emissions budget requirements and effectuate the application of GHG emissions trading they may have engaged in in meeting their respective emissions budgets, the protocol should require each nation to file an *annual* report with the following information:



1. Emissions Budget, expressed in annualized terms by multiplying its decadal GHG emissions budget by 0.1.

2. Actual Domestic Emissions Reported in Total and By Sector.

3. Domestic Offsets. In this category, a nation could report *surplus* GHG emissions reductions generated as a result of actions in GHG emissions sectors not regulated under its domestic programs and not used by its sources in meeting compliance under those programs.

4. Exported Reductions. These would be reported expressly in terms of the year of their vintage, as well as being identified by their country of origin. In the case of the vintage year, this information is necessary for the purpose of calculating the emissions-value "premium" that could be earned for reductions that were "saved" and held unused over time. Since reductions, or CEUs, exported by nations whose annual reports revealed that they were exceeding their budgets would be discounted, in terms of their emissions value, before they could be applied to the importer's domestic compliance program, the identity of the country exporting the CEUs would have to be maintained.

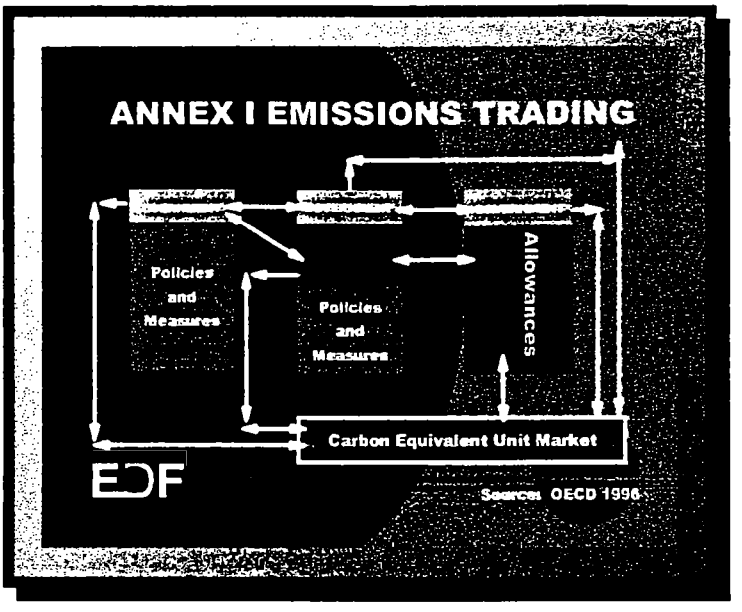
5. Imported Reductions, also reported expressly in terms of vintage year and country of origin for the same reasons.

6. Emissions Savings and End-of-Period Net. These would be the annual net of the other five entries. Of course, if in any year a nations emissions exceeded its annualized budget as adjusted to reflect domestic offsets, exports and imports, then such savings would be expressed as a negative value. In addition, to reveal each nation's performance relative to its GHG emissions budget obligation, and thus expressed as either a net savings to be carried forward for future use or a net debit to be deducted immediately from the ensuing period's budget, reports at the end of each budget period would state a net sum of the nation's savings, either positive or negative.

This reporting approach would provide a unified mechanism for compliance and trading. It would be through each year's report that the mechanics of compliance would be automatically triggered while at the same time international emissions trading would be effectuated.

Trading

Through this approach, which is, in effect, one of double-entry record-keeping, the international emission trading system can accommodate GHG emissions trading between and among private firms in different nations while ensuring both the integration of private and sovereign trading and the full GHG emissions budget accountability of all nations. In addition, it does not presuppose any particular set of policy approaches that participating nations may use on a domestic level, nor does it rely on developing extensive new institutional authorities internationally.



In fact, under this system, virtually any firm operating under virtually any domestic policy regime can transact the international sale of purportedly surplus GHG emissions reductions. Meanwhile, the integrity of the system of accountability remains assured. This approach achieves this by requiring nations to report annually *all* emissions exports, whether initiated by the sovereign itself or any private firms operating within sovereign borders. Even private firm sales transactions, therefore, of necessity will have to be effectuated through both their being reported to the government of the selling firm and a corresponding *deduction being taken from that sovereign's budget.*

To ensure that this occurs with every such transaction, the sovereigns whose firms are purchasing such reductions – presumably for the purpose of using the reductions to offset their own emissions and thus comply with domestic obligations – would agree not to recognize or accept such reductions for such compliance purposes in the absence of a demonstration that the exporting sovereign had acknowledged the transfer and made the deduction from its own budget. Of course, in accepting such purchases, the importing sovereigns would be able to report either a net increase in their own budgets or a net decrease in their emissions. This approach thus makes all international GHG emissions trading take the form of inter-sovereign trading of increments of the sovereigns' GHG emissions budgets. As a result, this approach guarantees that, *by definition or as a creation of the accounting mechanism* itself, *all* trades are for *surplus* reductions. In effect, certifying that a traded reduction is surplus, often a prohibitively cumbersome process in other trading approaches, is a seamlessly built-in feature of the accounting mechanism.

Compliance

The reporting mechanism is also a crucial trigger for the protocol's two key compliance mechanisms. Since the tenth annual report in each budget period will include a summing of each nation's "savings", both positive and negative, those reports that indicate a net deficit -- that is, emissions in excess of a nation's net budget as adjusted to reflect trades -- will trigger an automatic deduction from the affected nations' budget for the ensuing period.

Similarly, at any time during the course of a budget period a nation's annual report may reveal that its cumulative emissions exceed 110% of its total decadal budget. In that case, the discount requirement would be automatically triggered for application by every other sovereign whose firms held reductions, or CEUs, exported by that nation. Again, the discount, would be applied to those CEUs that were presented by the firms that had acquired them for use in offsetting their own emissions and thus meeting their domestic emissions obligations or were otherwise used by the sovereigns themselves to augment their budgets or offset their emissions. However, the discount would take effect only beginning in the first year after a nation's "budget deficit" was revealed and would affect only those CEUs or reductions that were submitted subsequently. Nevertheless, the ability of the annual reports to reveal, essentially immediately, the creation of nations' "deficits" before the end of the budget period would allow the protocol to require that the discount be applied automatically by all participating sovereigns.

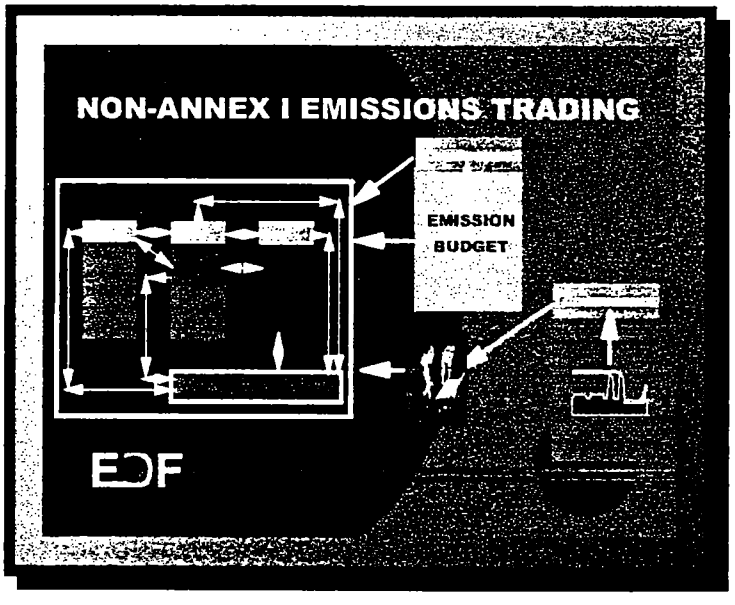
JOINT IMPLEMENTATION AND PARTICIPATION

In its January submission to the international negotiating process, among the items emphasized by the U.S. were the details of a strategy for ensuring the ultimate participation by developing countries in an GHG emissions protocol. The key elements in the U.S. proposal included a proposed requirement that these nations adopt "no regrets" policies to curb GHG emissions and that they prepare annual reports on their emissions and on measures adopted to control such emissions. In addition, the U.S. called for the establishment of a date certain for negotiations which would result in developing countries' accepting GHG emissions obligations and that included mechanisms for the eventual strengthening of those obligations.

The U.S. proposal's focus on these countries and their emissions is especially compelling from both an environmental and economic competitiveness perspective. GHG emissions from the developing world are rapidly reaching or exceeding par with those generated by the industrialized and Eastern bloc nations. Their emissions trajectory corresponds to their economies' increasing importance and activity in the

global marketplace. In fact, unless a GHG protocol creates a robust structure for encompassing these nations and their GHG emissions it will lack environmental – and economic – credibility, a conclusion recognized, much to its credit, by the U.S. proposal.

These ideas will need to be developed further in order to provide a more comprehensive answer to the question of how the developing nations will come to agree to their inclusion in a GHG emissions budget regime. Certainly, as climate science advances the threats posed by climate change will be of concern to those societies whose relative economic disadvantage may render them more vulnerable. At the same time, the traditional tools of diplomacy, which may include outright pressure from the industrial powers will play a role as well. Nevertheless, the same factors that limit the ability of the international community to *compel* routine compliance with a GHG emissions budget regime pose analogous challenges to securing the full-fledged participation of developing countries in such a regime.



Here, too, then, the economic dynamics a global GHG emissions trading market must be enlisted in meeting these challenges. Ostensibly, the most effective way of using the emissions trading market to create incentives for developing countries to participate in an international GHG regime is to condition their ability to engage in transactions in the emissions trading market on their agreement to subject themselves to a GHG emissions budget. Under this approach, "joint implementation", understood as a method by which developing countries without GHG emissions budgets can sell GHG emissions reductions, would not be available as a compliance option for firms and sovereigns subject to a GHG emissions budget.

Erecting such a barrier to developing nations' participation in trading may prove to be too crude and risky a strategy, however, while also denying opportunities for achieving environmental and economic gains. In contrast, permitting international GHG emissions trading for and with nations prior to their accepting GHG emissions budget -- that is, joint implementation -- may offer a smoother path by which developing countries can "graduate" to full participation in the emissions budget regime. Such an approach, in actuality, may enable the incentives represented by the opportunity to participate in emissions trading to function more effectively. In addition, it may create a stream of economic revenue tied to environmental investments during the current period when many developing economies are stepping up investment in long-term energy and transportation infrastructure. Furthemore, we believe that the incentives for participation can be inreased by offering non-annex I Parties that take a budget a growth allowance. With a budget explicitly accomodating growth, Parties opting in would enjoy the full benefits of international greenhouse gas trading without the transactions costs that may dominate joint implementation.[4]

Typically, the kinds of international transactions that would result in the transfer of GHG emissions reduction credits would have the mutual economic benefits to buyer and seller characteristic of trading: sellers would gain a new, additional sources of revenue and buyers would be able to achieve compliance at lower cost. Moreover, these transactions would bring a host of benefits crucial to the credibility, durability and environmental performance of a GHG protocol. First, the very opportunity afforded firms and sovereigns in the industrialized world to meet their GHG emissions budgets at reduced cost and with greater flexibility would enhance the acceptance and credibility of an international GHG regime.

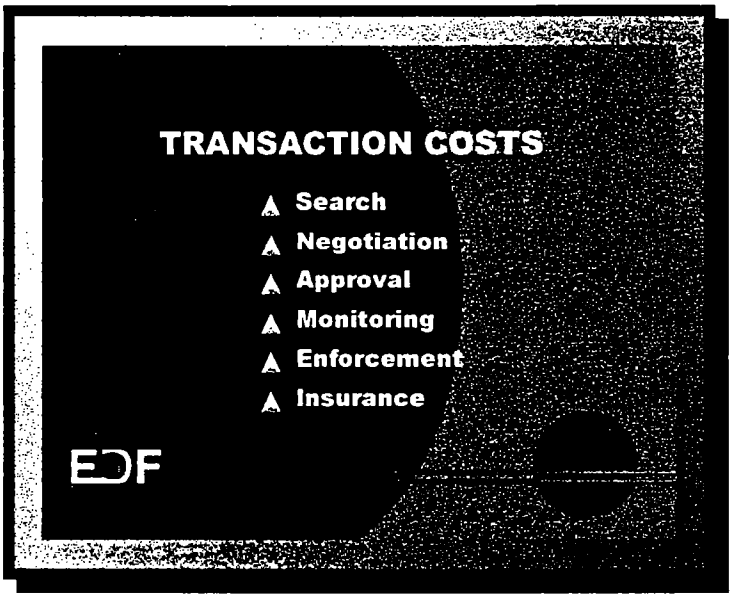
At the same time, those developing economies experiencing the greatest growth in the current economic time horizon are making substantial infrastructure investments whose environmental consequences, including GHG emissions, could have long-lasting effects for good or ill. Investments of the sort that yielded transactable GHG reductions for the host economy or the foreign investor simultaneously would help direct the host countries' economic growth along paths that were less, rather than more, GHG emissions-intensive. In addition to the environmental benefits that would result directly from this outcome, achieving growth in this way would make it that much easier for these countries to accept, eventually, a GHG emissions budget. As a result, the implicit gradualism in this strategy could speed and facilitate these countries' graduation to more rigorous international GHG obligations. In contrast, an approach which barred these countries from participating in international GHG emissions trading or joint

---

[4] *For a more detailed discussion of this point see Dudek, Daniel J. and Jonathan Wiener, "Joint Implementation and Transaction Costs", paper prepared for the Environment Directorate, Organization for Economic Cooperation and Development, Paris, 1996, 69 pp.*

implementation *until after* they had accepted a GHG emissions budget could actually result in developing countries' finding it more difficult to accept such budgets.

By the same token, allowing developing countries to reap the benefits of engaging in GHG emissions trading even before they agreed to GHG emissions budgets could enhance the effectiveness of the incentive created by the promise of participation in trading following the imposition of a GHG emissions budget. Direct experience in the international GHG emissions trading market and direct enjoyment of the benefits of participation in the market could help persuade developing countries to move into the budget regime and to do so more quickly.

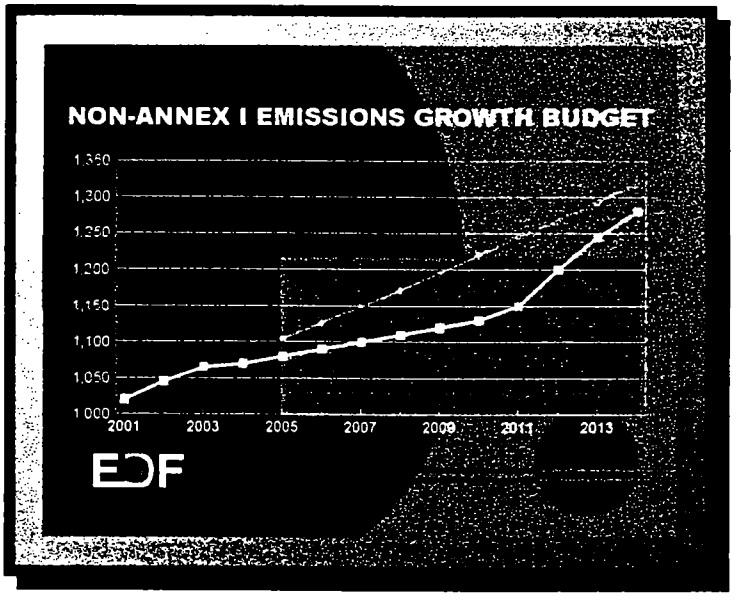


At first blush, this would seem to be a paradoxical result. Presumably, developing countries would be only too happy to reap the rewards of emissions trading without bearing the burden of a GHG emissions budget. In fact, participation in the emissions trading market under these circumstances inevitably will be significantly less advantageous and less lucrative for the exporting country than it would be for those countries that engage in trading while subject to a GHG emissions budget. It is this differential, which inevitably will be substantial, that will create the incentive for developing countries to adopt GHG emissions budget; yet, it is initially allowing countries to participate in emissions trading in the first place that will make the incentive more vivid and compelling.

This differential will arise from the contrast in transactions costs associated with trading where both affected sovereigns are subject to budgets and those associated with trades where the exporting nation is not subject to a budget. In the former case, as discussed at length above, the universal accounting and reporting system, backed by the discount and debt-carryover mechanisms, for countries subject to GHG

emissions budgets will render *all* transacted reductions surplus. As a result, firms and sovereigns engaging in such trades will have to incur few if any costs related to demonstrating that the reduction in question is surplus.

In the case of reductions exported by countries without GHG emissions budgets, however, the trading participants will be forced to incur significant costs in establishing that the reductions in question are truly surplus and can be used to offset emissions subject to GHG emissions budget requirements. This will be the case no matter how liberal the protocol may be or how dominant the constituencies seeking to encourage or facilitate joint implementation may be. In addition to meeting tests that may seek to establish not only "additionality" but "but for" causality as well, joint implementation projects may be required to demonstrate also that their emissions reductions are not merely the result of shifting emissions generation to other firms or activities. Proponents of joint implementation transactions will also incur the costs associated with seeking the approval of as many as three authorities -- that of the host country, that of the country against whose compliance requirements the reductions are being offered and possibly that of an international body that may be created for the purpose by the protocol itself.

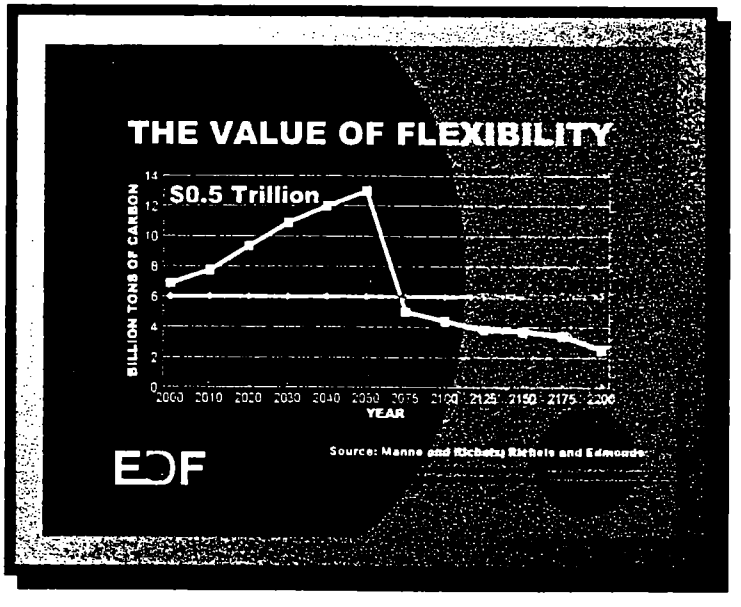


Meanwhile, thanks to the certification that reductions are surplus that is built into the very mechanics of reporting, parties to GHG trading in the emissions budget context will face none of these burdens and costs. As a result, they are likely to seek reductions from countries subject to GHG emissions budgets as a first preference and offer prices commensurate with the reliability and minimization of transactions costs characteristic of that context. In competing against that preference, sovereigns and firms without budgets will suffer smaller demand and lower prices for their reductions.

With experience, these nations will come to identify an economic advantage that the emissions trading market can confer on those that accept budgets.

To facilitate developing countries' response to this incentive, the protocol should specify a fixed formula to be universally applied to developing countries when they elect to adopt a GHG emissions budget. While the formula can include an advantage for those nations that act more quickly, applying a pre-established set of specifications, and thus eliminating case-by-case negotiations, will ensure the integrity of the system of budgets imposed on developing countries. As a result, this approach can be tailored to address the pressing demand of developing countries: that the perceived need for rapid economic growth, comparable to that enjoyed by industrialized nations earlier in their economic history be accommodated. Specifically, for the initial budget period or periods developing countries can be subject to "growth budgets" calculated, for example, as a function of current emissions with a small-percentage margin for increase over a certain time horizon. At the end of the horizon, which can be set at a length that would be greater for those nations that begin their budget commitments earlier, they would be subject to the same reduction path applicable to all nations.

CONCLUSION



This paper has attempted to articulate the framework for an international greenhouse gas trading regime and to elucidate the importance of the elements of that framework for its effective functioning. As the international community rapidly moves toward the adoption of a protocol to limit greenhouse gas emissions, building an international understanding of the practicality and desirability of emissions trading is

essential if agreement is to be reached in Kyoto. Only a system of international emissions trading can effectively span the diversity of national interests, legal systems, norms, implementation strategies, and preferences represented among the community of nations. The very essence of emissions trading is choice -- the ability to choose when, where, and how much.

At the same time, only emissions trading has the capacity to modulate both total cost as well as the distribution of costs among nations. Economic analyses of greenhouse gas control are remarkably uniform in ascribing huge cost savings to emissions trading. The key to delivering these cost savings is the creation of a framework for trading which reduces transactions costs, provides environmental and financial credibility, and rewards innovation. This paper has identified the minimum elements necessary.

Environmental Information Center

1400 16th Street, NW
Suite 330, Box 5
Washington, DC 20036-2266
Phone 202.797.6500

Fax 202.797.6501
Email eicinfo@acpa.com or
[first initial]+[lastname]@acpa.com
Web http://www.igc.apc.org/eic

cc: JAT
JS
JR

Friday, February 21, 1997

Alicia Munnell
Member
Council of Economic Advisers
OEOB Room 314
17th St. and Pennsylvania Ave, NW
Washington, DC 20502

Dear Ms. Munnell:

As you probably know, in January, five preeminent economists -- Kenneth Arrow, Dale Jorgenson, Paul Krugman, William Nordhaus and Robert Solow -- signed the enclosed "Economists' Statement on Climate Change," and circulated it to their colleagues. The Statement has now been endorsed by eight Nobel Prize-winning economists and over 2,300 economists around the country. Never before, even in the case of the Smoot-Hawley Tariff Act, have so many economists endorsed a consensus declaration.

This remarkable consensus has garnered significant attention in the press. For example, Peter Passel of the *New York Times* commented that "the nation's movers and shakers would do well to pay attention" to the statement. The *Washington Post* discussed the Statement in a Sunday editorial that concluded that a "near-term date" should be set for reducing greenhouse gas emissions and that the consequences of inaction on climate change "are likely to be dire." We have enclosed copies of these and other press reports on the Statement.

We expect that the same special interests who continue to dispute the science of climate change will also continue to claim that climate change cannot be mitigated without adversely impacting Americans' standard of living. We believe, however, that the consensus expressed in the Economists' Statement makes such claims untenable, and we hope that the Administration's consideration of mitigation strategies is based on sound economics, just as its consideration of climate science has been based on sound science.

We would welcome the opportunity to discuss any aspect of climate change mitigation with you in greater detail. Please call either of us at (202) 797-6500.

Sincerely,

George Abar

Doug Kendall

Enclosures

Economists' Statement on Climate Change

Endorsed by Over 2000 Economists
including six Nobel Laureates

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

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

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

Sponsored By

Redefining Progress

One Kearny Street • 4th Floor
San Francisco, CA 94108
Phone: (415) 781-1191
Fax: (415) 781-1198
EMail: info@RProgress.org

January 3rd, 1997

Dear Colleague,

As you may know, representatives of the world's nations will convene in Kyoto in December, 1997 to negotiate an international agreement addressing the threat of global climate change due to greenhouse gas emissions. This presents a significant opportunity for the United States to exercise a leadership role in ensuring our long-term well-being. Conversely, a failure on the part of the U.S. government to put forward a well-reasoned position would be a major environmental, economic, and diplomatic setback.

As the climate debate unfolds, it is imperative that public policy be guided by sound economics rather than misleading claims put forward by special interest groups. For this reason, we invite you to join us in endorsing the attached non-partisan consensus statement on the economics of climate change.

Once this statement has been signed by a large number of economists, it will be widely disseminated to leaders in the public and private sectors, and to the general media. This effort is being coordinated by Redefining Progress, a non-partisan, non-profit public policy organization.

Attached please find an endorsement form for your consideration. This letter and endorsement form are being sent to the membership of the American Economic Association. Please feel free to circulate it to your colleagues in case they are not on the AEA mailing list.

We thank you for your prompt attention to this critical issue.

Sincerely,

Kenneth J. Arrow

Dale W. Jorgenson

Paul R. Krugman

William D. Nordhaus

Robert M. Solow

The Washington Pos

Staying Cool

WE NOW KNOW that the old saying attributed to Mark Twain—"We all grumble about the weather but nothing is *done* about it"—is not quite true. By virtue of the coal we burn and the gasoline we use and in a thousand other ways, we all have a great effect on the weather. The earth has grown warmer by about one degree, on average, during the last century, and scientists believe the process is accelerating. If nothing is done to slow global warming, the consequences in the next century are likely to be dire. Much turns on decisions the government must take this year.

After years of debate, few now dispute that the burning of fossil fuels releases gases into the atmosphere which then trap more of the sun's warmth than the planet would otherwise retain. The effects of this are more complex than the term "global warming" suggests. Some parts of the earth are likely to become colder, others drier; monsoon and hurricane paths may shift; storms may become more extreme; sea levels will rise. Many small islands and low-lying coastal areas, such as Maryland's Eastern Shore, are at risk. Relatively small temperature changes could have a dramatic impact on agriculture and even the spread of disease.

At the 1992 Earth Summit in Rio de Janeiro, the United States—which produces something like one-quarter of the world's greenhouse-gas emissions—vowed to reduce them to 1990 levels by the year 2000. It seemed a modest goal, but it won't be met. So last year the administration accepted, in principle, the notion of binding targets. Now nations are negotiating those targets—amounts and dates—hoping to reach agreement at yet another conference in Kyoto in December.

Opponents of meaningful action, led by parts of the energy and utilities industries, have shifted their strategy from attacking the scientists to warning of dire economic consequences. But last week more than 2,000 economists signed a statement challenging the industry claims. The broad array of economists, led by Nobel-Prize winners Kenneth J. Arrow and Robert M. Solow, said that measures to reduce greenhouse-gas emissions need not harm the economy—and "may in fact improve U.S. productivity in the longer run." That's because there are many innovative and energy-efficient technologies just awaiting the right financial incentives to enter the market. In many such fields, U.S. industry leads the way.

The key, then, is for the United States to set a goal that's not pushed off to some distant date like 2020 or beyond. A near-term date would send the signal industry needs to begin seriously investing in more efficient technologies, and the commercialization of such technologies would offer an alternative path for development to giants like China and India. Their economies are sure to grow in coming decades; and if they follow the U.S. path to prosperity, we will all be doing more than just grumbling about the weather.

The New York Times

THURSDAY, FEBRUARY 13, 1997

Economic Scene | Peter Passell

Yawn. A global-warming alert.

But this one has solutions.

STERNLY worded petitions and ringing screeds of principle are as much a part of campus life as grade inflation — which is why Washington rarely takes them seriously. But the nation's movers and shakers would do well to pay attention to a statement on global warming by some 2,000 mostly academic economists.

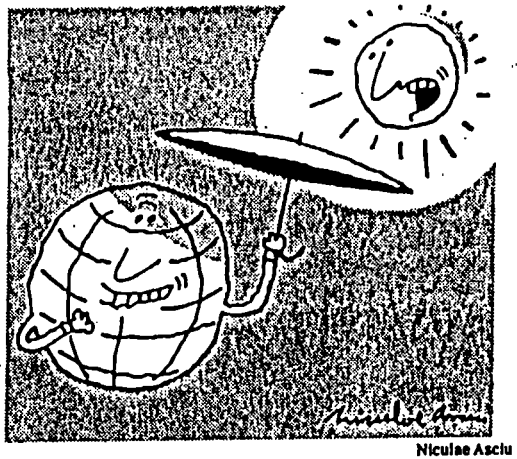
For one thing, the signatures collected by Redefining Progress, a group of policy-minded social scientists based in San Francisco, range from the newish left (Duncan Foley of Barnard College) to the skeptical center (James Heckman of the University of Chicago) to the libertarian right (Gordon Tullock of the University of Arizona). "Market-based approaches to coping with climate change generate as much consensus among economists as free trade," explains Paul Krugman of M.I.T., one of the organizers of the statement.

More important, the statement focuses on what is now regarded by insiders as a make-it-or-break-it issue in slowing atmospheric warming: designing an international system that permits rich economies to contribute cash in lieu of emissions reductions. "Allowing some to pay others to reduce greenhouse emissions could reduce the total cost by 80 to 90 percent," estimates William Nordhaus, an economist at Yale and another organizer of the statement.

• • •

Like any committee looking for consensus, the drafters of the climate statement cast their net widely. "We believe that global climate change carries with it significant environmental, economic, social and geopolitical risks, and that preventive steps are justified," the unshocking introduction reads.

Those who read on, however, will discover there is meat on these bones: "Sound economic analysis," the authors argue, "shows that there are policy options that would slow climate change without harming American living standards."



Nicolae Asciu

And what might these policy options be? Here, the drafters stake out a position that seems almost obvious to economists, but has barely entered the consciousness of environmental policy makers. "A cooperative approach among nations is required — such as an international emissions trading agreement," the statement asserts.

To understand where the economists really want the diplomats to go, consider where we are now. Current rates of deforestation and combustion of carbon-based fuels — coal, oil, gas — are adding carbon dioxide into the atmosphere faster than the oceans can absorb it. The higher carbon dioxide concentrations trap solar energy. Rising temperatures will likely change weather patterns radically and raise the level of the oceans.

Governments of all the major economies are vaguely committed to containing greenhouse gas emissions before once-a-century hurricanes become an annual event in the Caribbean, Kansas turns into a dust bowl and the Bay of Bengal doubles in size at the expense of Bangladesh. But the emphasis is on the vague: the process of setting emissions targets or creating political institutions to enforce the targets is in the talk stage.

That's where the economists' statement fits "We wanted to be there early," said Steph DeCanio of the University of California at Sa Barbara, "before governments and politici were locked into positions." Specifically, the sta ment is intended to give the Clinton Administ tion some help in pressing the idea of creating international market in emissions permits at next global meeting on climate change, set Kyoto, Japan, in December.

The idea is simple. If and when world leade start to deal with the practical issues, they are to set national targets for containing emissic that will be very expensive to meet in the ri industrial economies, and probably won't be he ored in the large emerging economies like Chi Russia, India and Indonesia.

Creating an emissions trading system that lows already rich economies to pay the emergi economies to use less energy and less carb intensive fuels as they develop offers a doul dividend. It reduces the cost for developed cou tries, in turn reducing the chances their legis tures will balk. And it creates a pool of capital be used as an incentive to push emerging eco mies toward environmentally benign growth.

Translation: Getting, say, China or India switch from coal to natural gas, or to encoura energy conservation by charging world mark prices at home would be a lot easier if they we paid billions of dollars each year to do it.

• • •

Not every economist who favors emissions tr ing signed the statement. "I'm worried it will used at Kyoto to commit America to usele expensive unilateral actions in reducing em sions," says Robert Hahn, an economist at American Enterprise Institute.

But Mr. Nordhaus has very different worri "Economists haven't been important players environmental policy over the last 30 years," said. "This time we could make a difference."

FINANCIAL TIMES

4

FRIDAY FEBRUARY 14 1997

Economists back call for new carbon taxes

Mark Suzman in Washington

ore than 2,000 US economists, cluding six Nobel laureates, sterday endorsed an unprecented statement calling for new xes on carbon use and an interational emissions trading agreeent to help control global arming.

The economists argue that using ch market-based policies to limit e growth in greenhouse gas issions could ultimately prove neficial for the economy.

"For the United States in particar, sound economic analysis ows there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve US productivity in the long run," the statement says.

Although there are still some sceptics, the overwhelming consensus among economists is a blow for energy companies and other lobby groups which have managed to derail previous attempts to introduce such a carbon tax on the grounds that it would be prohibitively expensive.

It will also put pressure on the Clinton administration to come up with concrete proposals on combating global warming ahead of the international conference on the issue in Kyoto, Japan, next December.

The administration recently indicated its support for emissions trading but has backed away from the idea of a carbon tax.

The statement was drafted by five prominent economists, Mr Kenneth Arrow and Mr Robert Solow, both Nobel prizewinners, Mr Dale Jorgenson of Harvard University, Mr Paul Krugman of the Massachusetts Institute of Technology and Mr William Nordhaus of Yale University.

It was circulated to economists across the country by Redefining Progress, a non-partisan, non-profit public policy organisation based in San Francisco.

The statement cites scientific evidence from the United Nations-sponsored Intergovernmental Panel on Climate Change in 1995 to argue that "preventive steps are justified" to combat the "significant environmental, economic, social and geopolitical risks" associated with global warming.

Specifically, it calls for the US and other countries to co-operate on reforms such as carbon taxes and the auction of internationally tradeable emission permits. "The revenues generated from such poli cies can effectively be used t reduce the deficit or to lower exist ing taxes," it says.

Mr Stephen DeCanio, senior ecc nomic fellow with Redefinin Progress, said the statement i aimed at persuading the US t take an international lead in com bating global warming.

"Some groups have asserted tha we cannot address the global cl mate change problem withou incurring serious economic harm, he said. "These 2,000 economist have said essentially the opposit – that the greatest risks lie wit inaction."

THE WALL STREET JOURNAL

THURSDAY, FEBRUARY 13, 1997 B

Group of Economists Seeks Treaty on Global Warming

By a WALL STREET JOURNAL *Staff Reporter*

WASHINGTON – A group of 2,100 economists signed a statement calling for international controls to prevent global warming, asserting that such controls would not harm Americans' standard of living and "may in fact improve" the nation's economic productivity.

The statement—to be announced here today – takes issue with a letter by more than 100 chief executives of U.S. companies sent to President Clinton in December that warned that a global treaty "could have serious economic and competitive consequences."

The proposed treaty would control emissions of carbon dioxide and other "greenhouse gases" that many scientists believe are slowly warming the planet by trapping sunlight. In their letter, the CEOs also warned the president to avoid making "premature commitments" because of "scientific uncertainties" that require further study.

But Kenneth J. Arrow, a Nobel Prize-winning economist at Stanford University who helped shape the agreement among the economists, said they believe there now is enough scientific research to establish that man-made causes of global warming will have a "significant" detrimental effect on climate.

The Washington Pos

FRI BRUARY 14, 1997 A3

Economists Urge Reduced U.S. Emissions

Reuter

More than 2,000 economists said in a statement yesterday that the United States would be able to reduce its industrial emissions to slow global climate change without damaging its economy.

Prepared by five leading economists, the statement said well-designed policies relying on market mechanisms "may in fact improve U.S. productivity in the longer run."

Spokesmen for industries that depend largely on fossil fuels such as oil and coal have argued that the threat of climate change from heat-trapping industrial emissions is overblown, and countries should wait for more scientific proof of global warming before implementing policies to slash emissions.

But the economists, who released the statement at a news conference, said climate change "carries with it significant environmental, economic, social and geopolitical risk," and that "preventive steps are justified."

They endorsed a system of "market mechanisms, such as carbon taxes or trading of marketable emissions permits among countries."

Revenues from carbon taxes or emissions credits could be used to reduce budget deficits or lower taxes to benefit the economy, said the statement drafted by Nobel laureates Kenneth Arrow and Robert Solow, as well as Dale Jorgenson of Harvard University, Paul Krugman of the Massachusetts Institute of Technology, and William Nordhaus of Yale University.

ECONOMISTS' STATEMENT ON CLIMATE CHANGE

Among the over 2,300 economists who have endorsed the Economists' Statement on Climate Change are the following, they include scholars at top universities and economists from top corporations.

Michael C. Barth	ICF Kaiser
William J. Baumol	New York University
Steven Neil Braun	Council of Economic Advisers
W.A. Brock	University of Wisconsin, Madison
Martin Bronfenbrenner	Duke University
John P. Brown	KPMG Econmic Consulting Services
R. Thomas Burge	Proctor & Gamble Pharmaceuticals
Dallas Burtraw	Resources for the Future
Trudy Ann Cameron	University of Los Angelos California
Jian Cao	AT&T
Carl F. Christ	Johns Hopkins University
Gerard Debreu	University of California at Berkeley
Stephen J. DeCanio	University of California at Santa Barbara
Robert Dorfman	Harvard University
anklin M. Fisher	Massachusetts Institute of Technology
eter J. Francis	CNA Corporation
ctor R. Fuchs	Stanford University
Claudia Goldin	Harvard University
Edward Gramlich	University of Michigan
Jerry R. Green	Harvard University
Frances Hammond	General Motors Corporation
John C. Harsanyi	University of California at Berkeley
Oliver Hart	Harvard University
James J. Heckman	University of Chicago
Albert O. Hirschman	Institute for Advanced Study
Jack Hirshleifer	University of Los Angelos California
Robert Hunt	World Bank
Leonid Hurwicz	University of Minnesota
Christopher Jencks	Harvard University
Gale D. Johnson	University of Chicago
Carl Kaysen	Massachusetts Institute of Technology
Robert Kirchner	PEPCO
Lawrence R. Klein	University of Pennsylvania
Kmenta	University of Michigan
Laurence J. Kotlikoff	Boston University
Anne O. Kreuger	Stanford University
Mordecai Kurz	Stanford University
Steven G. Lanning	Bell Labs-Lucent Technologies
Lester Lave	Carnegie Mellon University
David Lui	Southern California Edison
Paul W. MacAvoy	Yale School of Management
Gerald M. Meiser	Stanford University
John R. Meyer	Harvard University
Christopher J. Monroe	AT&T
Richard R. Nelson.	Columbia University
Richard B. Norgaard	University of California at Berkeley
Charles Plott	California Institute of Technology
Richard E. Quandt	The Andrew W. Mellon Foundation
Roy Radner	New York University
Gordon Rausser	University of California at Berkeley
Kenneth Rogoff	Princeton University
David Romer	University of California at Berkeley
Michael Rothschild	Princeton University
Daniel Rubinfeld	University of California at Berkeley
Vernon W. Ruttan	University of Minnesota
Jeffrey Sachs	Harvard University
Thomas Sargent	University of Chicago
F.M. Scherer	Harvard University
T. Paul Schultz	Yale University
M.M. Shahjahan	PEPCO
Steven Shavell	Harvard University
A. Michael Spence	Stanford University
Robert Stavins	Harvard University, Kennedy School
Bruce Stram	Enron Corporation
James Tobin	Yale University
Gordon Tullock	University of Arizona
Hal R. Varian	University of California at Berkeley
W. Kip Viscusi	Harvard Law School
Oliver E. Williamson	University of California at Berkeley

NOBEL LAUREATE SIGNATORIES

Kenneth J. Arrow 1972
Stanford University

Gerard Debreu 1983
University of California at Berkeley

John C. Harsanyi 1994
University of California at Berkeley

Lawrence R. Klein 1980
University of Pennsylvania

Wassily Leontief 1973
New York University

Franco Modigliani 1985
Massachusetts Institute of Technology (Emeritus)

Robert M. Solow 1985
Massachusetts Institute of Technology

James Tobin 1981
Yale University

GLOBAL CLIMATE COALITION

GROWTH IN A GLOBAL ENVIRONMENT

cc: AW
JAF
JS
TR

19 February 1997

Dear Member of the Interagency Taskforce on Climate Change Policy:

Attached for your information is a letter from the Global Climate Coalition to Assistant Secretary Eileen Claussen outlining several concerns expressed by Coalition members with the January 17 "U.S. Draft Protocol Proposal."

Also attached are questions that the GCC believes need further clarification so that sound climate policies can be developed.

I hope you find this information useful.

Sincerely,

William F. O'Keefe
Chairman

1331 Pennsylvania Avenue, NW • Suite 1500 - North Tower • Washington, DC 20004-1703
Telephone: (202) 637-3162 • Fax: (202) 638-1032 • Fax: (202) 638-1043

GLOBAL CLIMATE COALITION

February 14, 1997

The Honorable Eileen Claussen
Assistant Secretary of State for Oceans
and International Environmental
and Scientific Affairs
Room 7831
U.S. Department of State
2201 C Street, NW
Washington, D.C. 20520

Dear Ms. Claussen:

On behalf of the Global Climate Coalition, I want to thank you and other State Department officials for the time you set aside January 17 to brief interested parties about provisions in the "U.S. Draft Protocol Proposal" to the Framework Convention on Climate Change. In the interest of continuing that dialogue, I want to express several general impressions and to pose a number of questions prompted by this latest U.S. proposal and its predecessor last December.

First, we note the impressive effort evident in the proposal's elaborate policy architecture, given the short time allowed by the Secretariat to submit such documents. However, it is difficult to analyze the draft protocol and its implications until we are fully informed about the Administration's proposed target, timetables and policy tools--such as emissions trading--that have been proposed to implement a Kyoto agreement. The lack of detail denies the American public, labor and industry groups such as ours the ability to fully assess the merits of the U.S. draft protocol proposal, especially its implications for our nation's economic well-being. In our view, any protocol of this nature, were it ratified, may well result in policies, regulations and other measures many times more costly than they need be. Certainly, the growing body of economic analyses argues strongly against early actions that would be many times more costly but would produce no greater benefits than policies that were based on optimal timing.

As you know, our members strongly share the view that developing nations need to be part of any new Kyoto agreement. We have attached questions on

1331 Pennsylvania Avenue, NW • Suite 1500 - North Tower • Washington, DC 20004-1703
Telephone: (202) 637-3162 • Fax: (202) 638-1032 • Fax: (202) 638-1043

this matter, as well as others. It is vitally important to establish in advance of the Kyoto meeting appropriate criteria for including developing countries and the resolve not to support any agreement that does not involve a specific schedule for active developing country participation. There is a political and equity argument why developing countries must be included in any new commitments. Would Americans accept a U.N. agreement that requires substantial personal, economic and lifestyle sacrifices, yet allows environmental gains, however distant or few, to first be marginalized and then completely overrun by the absence of active participation by developing nations, which will be the major emission sources in the next century? We think not, and urge the Administration to stand firm on developing country participation in any new agreement. At home, we urge you to make public as soon as possible the economic analyses on which your draft protocol proposal is based.

The GCC is encouraged by the stipulation that all greenhouse gases be included in any new agreement and by the attention given to the "free rider" problem. However, the GCC believes a number of points in this document require additional comment so that policymakers and the public may more precisely understand what U.S. representatives are preparing to negotiate in Kyoto. For example, how are the results of the Administration's economic analyses linked to the policy choices outlined in this draft protocol proposal? What, if any, institutional organizations need to be created or strengthened to implement the proposed tradable permits initiative? If international oversight is not contemplated, how would the integrity of such a system be protected, and by whom? Given the myriad of proposals now before the Parties, is the Administration concerned that important issues will not be resolved at the December meeting in Kyoto? If key issues are left unresolved, would the "Kyoto Agreement" be contingent on the satisfactory resolution of those issues by a time certain?

In short, we are encouraged by the Administration's January 17 effort to clarify its position regarding post-2000 greenhouse gas emissions, but we also are concerned by the important questions the draft protocol raises and does not answer. Rather than dwell on those concerns here, we enclose a list of some of the questions that we hope you can respond to before or after the Bonn meeting late this month.

The Global Climate Coalition appreciates this opportunity to comment on the U.S. draft protocol proposal. Be assured we will continue to participate

constructively in this national and international debate seeking to identify realistic, flexible climate policies whose benefits are commensurate with costs.

Sincerely,

William F. O'Keefe
Chairman

Attachment

cc: Federal Interagency Group on Climate Change Policy

February 14, 1997

GLOBAL CLIMATE COALITION ENCLOSURE

RE: SOME ISSUES CONCERNING U.S. NON-PAPER OF DECEMBER 1996 AND U.S. DRAFT PROTOCOL FRAMEWORK OF JANUARY 17, 1997

In asking these questions, we, of course, recognize that, in some cases, (such as Articles 2.7 and 4.6) you have not had an opportunity to spell out all of the details in the draft protocol and, of course, the specific target and timetable are absent. However, in other Articles, the lack of details raises issues and serious concerns. Our primary interest is in understanding what you intend or what you were thinking in crafting any particular Article, Annex, or provision in order for industry, labor and others to better understand the impact of the draft U.S. proposal and how it would be implemented from a practical sense should it or elements of it combined with proposals by other Parties be adopted in Kyoto.

Article 1 - Definitions

A. The draft defines "Party" to mean a "Party to the Protocol". Annex A includes the Annex I Parties to the Convention that sign and ratify or accept the Protocol and Annex B includes such non-Annex I Parties to the Convention that want to be included in Annex B. Article 5.5 and 5.6 seem to suggest that other Convention Parties may become Parties to the Protocol. Is that intended? If the U.S. draft protocol or significant elements thereof are agreed to in Kyoto, could non-Annex I Parties to the Convention sign and ratify or accept the Protocol, have equal voting rights, and also not agree to be included in either Annex A or B?

Article 5 - Advancement of the Implementation of Article 4.1 of the Convention

B. As drafted, Article 5 of the draft Protocol only applies to those Convention Parties who become Parties to the Protocol. Since Article 5 seems to impose new requirements or obligations, which you presumably believe are consistent with section 2.(b) of the Berlin Mandate Decision, on Protocol Parties in regards to Article 4.1 of the Convention, what is the incentive for non-Annex I Parties to the Convention (i.e. developing countries) to become Parties to the U.S. draft protocol and be subject to such requirements?

C. Article 5.5 applies to non-Annex A and B Parties, while Article 5.7 applies to all Parties to the draft Protocol. Both include the words "no regrets measures" which are not defined. What are such measures? Is it true that "no regrets measures" are not necessarily "no risk measures"? Does Article 4.1 of the Convention provide for or require "no regrets measures" for any Party? If not, what is the application of Article 5.7(b) to Parties not subject to Article 5.5 of the draft Protocol?

Article 16 - Evolution

D. There is concern that greenhouse gas emissions are growing rapidly in developing countries and that the Berlin Mandate precludes any new commitments applicable to such countries in any AGBM protocol or other legal instrument with the result that any such

instrument will not be fully global, will create economic and competitive disadvantages and will not be environmentally sound. We think a provision like Article 16 is needed for the developing countries, although we realize that it is only an agreement to agree. It does not, for example, include even a hint as to whether the agreement might, as minimum, be patterned after Article 5 of the Montreal Protocol. However, we are concerned that Article 16 (which, as drafted, now applies only to Protocol Parties) will not apply to developing country Parties to the Convention unless they become Protocol Parties and become Annex B Parties. Is it your intention that Article 16 should apply to developing country Parties to the Convention? What if they are not included in Annex B of the Protocol? Would that intention be better achieved by converting Article 16 to an amendment to the Convention?

E. Do you contemplate that the process of implementation of Article 16 would be spelled out in a decision at COP3 by the Convention Parties or by the Parties to the Protocol at their first meeting after entry into force? Are you concerned that some Parties to the Convention might delay signing and ratifying the draft Protocol until they see the results of the process under Article 16, particularly if the delaying Parties are developing countries with significant growth in greenhouse gases?

F. Annex B states that it includes Convention Parties "not listed in Annex A" that "indicate" they want to be "included" in Annex B. One country that immediately comes to mind because of its recent accession to the OECD would, based on Administration testimony in the House Commerce Committee last September, seem to be Korea which is a U.S. trading partner. However, we understand that an OECD document entitled "Korea's Accession Revised Draft Report to the Council" and dated last August states in paragraph 24 of an Annex entitled "Korean Undertakings" that: "For purposes of future negotiations and agreements, Korea would not choose to be classified as a developing country, except in the areas of agriculture and the UN Framework Convention on Climate Change." If the U.S. draft protocol was agreed to in Kyoto, is Korea committed as an OECD member to becoming a Party subject to Articles 5 and 16, but not Annex A or B, or does it mean that, as a developing country Korea could choose not to become a Protocol Party?

G. As you know, non-Annex I Parties are participating in negotiations for new commitments for Annex I Parties, while they enjoy an exemption from new commitments. However, Article 16 provides no similar exemption for Annex I Parties. Why should Article 16 which calls for new and progressive "quantitative greenhouse gas emissions obligations" based on some future "agreed criteria" be applicable to Annex A Parties to the Protocol, including the U.S., since the U.S. draft of the Kyoto protocol otherwise applies to them and imposes new obligations on them beyond those in Article 4.1 and 2 of the Convention? What new obligations for Annex A Parties do you contemplate in the Article 16 process? Does, for example, this mean that under Article 4.1(b) Annex I Parties, like the U.S., by signing the Protocol are agreeing to reductions beyond the requirements of Article 2 of the draft protocol?

Article 2 - Emissions Budgets

H. We observe that Section III of the December Non-Paper called for "focusing" negotiations on a "binding, medium-term emissions target" and expressed interest in working toward a "longer-term concentration goal". However, Article 2.3 appears to call for a second target or "budget period" before there is an agreement by non-Annex A and B Parties to the Protocol that are developing countries to negotiate "quantitative greenhouse gas emissions obligations" under Article 16 and to adopt such obligations by [2005]. Does this second target send the wrong signals to the developing countries who agree to become Parties to the draft protocol and are subject to Article 16? Why is it in the best economic and competitive interests of the United States to offer a second target and timetable before negotiations with all Parties to the Convention in the AGBM begin and before the U.S. analysis and assessment and its assumptions are provided to Congress, industry, labor, environmentalists, and others? What is the need?

I. The Non-Paper states that the U.S. "strongly urges consideration of banking" and that multi-year averaging would give Parties "important flexibility". However, Article 2.5 seems to weaken that support for banking by providing that emissions of tonnes "may" (not "shall") be carried over and added to the "next budget period". That leaves uncertainty for industry and suggests that a Party like the U.S., might retire such tonnes rather than bank them which could have future economic and competitive consequences. Why did you take this discretionary approach? Why not follow the mandatory approach of Article 2.6? The Article does not specifically mention multi-year averaging. Why? Is it implied?

Article 6 - International Emissions Trading

J. As the chief proponent of an emissions trading program, the U.S. in its December Non-Paper said it was "critical" that provisions for "international" emissions trading "be included in the Kyoto agreement." When Title IV of the Clean Air Act (CAA) was signed into law, it spelled out in great detail the allowance program for existing and new electric utility units, including the timetable, the target, the cap, the trading system, the nature of the allowances, the rights of allowance holders, the tracking system, and the limitations. Upon enactment, the utility industry knew the program details and could plan their future. That program, which applied equally to all covered units of the electric utility industry, is for one industry with an identified and limited number of sources and it is a national trading program. Presumably, an international trading program will cover many industries, sectors, and gases on an international scale. However, our review of Article 6 of the draft protocol provides none of the details of an international trading program. It merely authorizes trading between Annex A and B Parties that establish a "mechanism" for certifying and verifying trades. It does not require that a trading program be established by all such Parties or that such a "mechanism" be put "in place" or that it be operated uniformly. All the important details are missing.

Do you intend to include these "critical" provisions in the protocol to be adopted in Kyoto or do you plan to defer development of such provisions to a post Kyoto legal instrument, to a decision of the Parties to the Protocol after it enters into force, to bilateral negotiations between Parties, or some other means?

K. Article 6 provides that a Party "may authorize" any domestic entity to participate in actions "leading to transfer" of tonnes. What "actions" do you have in mind for this entity? In the case of the CAA, the trades are between utilities with reporting to the Environmental Protection Agency. Is that same approach likely to be accepted on an international scale if the domestic entity is a non-governmental organization in one country and a government agency in another?

L. As noted, Article 6 authorizes trading between Parties. However, unlike the CAA no mention is made of trading by private sector entities that will likely need such trading to operate. Also, unlike the CAA it does not allocate, or provide for an allocation of, the initial tonnes for various industries and sources to operate or indicate whether such industries and sources will be faced with penalties for continuing to operate without such allocation if such a program is initiated.

It only allows private sector entities, after receiving authorization from a Party, to "participate in actions leading to transfer and receipt..." of carbon equivalent emissions. Therefore, it appears that private sector entities can only suggest to Parties that certain emissions trading transactions take place. This imposes significant constraints on private sector international emissions trading, establishes a bureaucracy involving two separate governments or their designees between the private sector and the completion of trades, lowers any possible expectation that private sector entities would receive any benefit from trades, and makes the private sector subservient to the political and policy whims of governments in order to carry out what industry does best, i.e., produce goods and services and employ workers.

The wording of Article 7 on Joint Implementation carries the same structure and constraints. Under Article 7.1, any Party can generate tonnes of carbon equivalent emissions. Under Article 7.5, only Annex A or B Parties may acquire those tonnes of carbon equivalent emissions. And under Article 7.6, private sector entities, even after receiving authorization from a Party, are limited to "participat[ing] in actions leading to generation, transfer and receipt under this Article of tonnes of carbon equivalent emissions." Again, the private sector entities cannot, themselves, engage in emissions trading.

The proposed construction of Articles 6 and 7 and lack of details would appear to virtually eliminate the functioning of an international market in tradable permits. Instead, trading, as noted, can occur only between governments. The type of trading activity that would occur between governments, as a practical matter, would likely bear little resemblance to the trading activity that would be expected to occur in a private sector international tradable permits market if the program works as its proponents contend. Is the Administration intending an international governmental trading system? Who will

make the trades, pay for the tonnes, and receive the tonnes and money? If not, when will we learn the details for evaluation by industry, labor, and others?

Article 3 - Measurement and Reporting

M. Article 3.5 suggests that the transfers of tonnes of carbon equivalent emissions under Articles 6 and 7 would be reported to the Convention Secretariat annually. Do you intend that the Secretariat would perform the role in trading that EPA does under Title IV of the CAA and if so is annual reporting adequate? If not, what entity should perform that role and what is the purpose and need for a Party to also report to the Secretariat? What are the advantages and disadvantages to the U.S. of an international entity performing the EPA-type role in trading?

Article 7 - Joint Implementation (JI)

N. Article 7.2(b) uses the term "additional" which is not defined or explained. The definition of "additional" and the methodology for calculating greenhouse gas reductions from JI projects must be determined in order to estimate the magnitude of the cost savings due to JI. How will the Administration obtain this information in order to factor the cost savings of JI into its economic analysis?

February 14, 1997

GLOBAL CLIMATE COALITION ENCLOSURE

RE: SOME ISSUES CONCERNING U.S. NON-PAPER OF DECEMBER 1996 AND U.S. DRAFT PROTOCOL FRAMEWORK OF JANUARY 17, 1997

In asking these questions, we, of course, recognize that, in some cases, (such as Articles 2.7 and 4.6) you have not had an opportunity to spell out all of the details in the draft protocol and, of course, the specific target and timetable are absent. However, in other Articles, the lack of details raises issues and serious concerns. Our primary interest is in understanding what you intend or what you were thinking in crafting any particular Article, Annex, or provision in order for industry, labor and others to better understand the impact of the draft U.S. proposal and how it would be implemented from a practical sense should it or elements of it combined with proposals by other Parties be adopted in Kyoto.

Article 1 - Definitions

A. The draft defines "Party" to mean a "Party to the Protocol". Annex A includes the Annex I Parties to the Convention that sign and ratify or accept the Protocol and Annex B includes such non-Annex I Parties to the Convention that want to be included in Annex B. Article 5.5 and 5.6 seem to suggest that other Convention Parties may become Parties to the Protocol. Is that intended? If the U.S. draft protocol or significant elements thereof are agreed to in Kyoto, could non-Annex I Parties to the Convention sign and ratify or accept the Protocol, have equal voting rights, and also not agree to be included in either Annex A or B?

Article 5 - Advancement of the Implementation of Article 4.1 of the Convention

B. As drafted, Article 5 of the draft Protocol only applies to those Convention Parties who become Parties to the Protocol. Since Article 5 seems to impose new requirements or obligations, which you presumably believe are consistent with section 2.(b) of the Berlin Mandate Decision, on Protocol Parties in regards to Article 4.1 of the Convention, what is the incentive for non-Annex I Parties to the Convention (i.e. developing countries) to become Parties to the U.S. draft protocol and be subject to such requirements?

C. Article 5.5 applies to non-Annex A and B Parties, while Article 5.7 applies to all Parties to the draft Protocol. Both include the words "no regrets measures" which are not defined. What are such measures? Is it true that "no regrets measures" are not necessarily "no risk measures"? Does Article 4.1 of the Convention provide for or require "no regrets measures" for any Party? If not, what is the application of Article 5.7(b) to Parties not subject to Article 5.5 of the draft Protocol?

Article 16 - Evolution

D. There is concern that greenhouse gas emissions are growing rapidly in developing countries and that the Berlin Mandate precludes any new commitments applicable to such countries in any AGBM protocol or other legal instrument with the result that any such

instrument will not be fully global, will create economic and competitive disadvantages and will not be environmentally sound. We think a provision like Article 16 is needed for the developing countries, although we realize that it is only an agreement to agree. It does not, for example, include even a hint as to whether the agreement might, as minimum, be patterned after Article 5 of the Montreal Protocol. However, we are concerned that Article 16 (which, as drafted, now applies only to Protocol Parties) will not apply to developing country Parties to the Convention unless they become Protocol Parties and become Annex B Parties. Is it your intention that Article 16 should apply to developing country Parties to the Convention? What if they are not included in Annex B of the Protocol? Would that intention be better achieved by converting Article 16 to an amendment to the Convention?

E. Do you contemplate that the process of implementation of Article 16 would be spelled out in a decision at COP3 by the Convention Parties or by the Parties to the Protocol at their first meeting after entry into force? Are you concerned that some Parties to the Convention might delay signing and ratifying the draft Protocol until they see the results of the process under Article 16, particularly if the delaying Parties are developing countries with significant growth in greenhouse gases?

F. Annex B states that it includes Convention Parties "not listed in Annex A" that "indicate" they want to be "included" in Annex B. One country that immediately comes to mind because of its recent accession to the OECD would, based on Administration testimony in the House Commerce Committee last September, seem to be Korea which is a U.S. trading partner. However, we understand that an OECD document entitled "Korea's Accession Revised Draft Report to the Council" and dated last August states in paragraph 24 of an Annex entitled "Korean Undertakings" that: "For purposes of future negotiations and agreements, Korea would not choose to be classified as a developing country, except in the areas of agriculture and the UN Framework Convention on Climate Change." If the U.S. draft protocol was agreed to in Kyoto, is Korea committed as an OECD member to becoming a Party subject to Articles 5 and 16, but not Annex A or B, or does it mean that, as a developing country Korea could choose not to become a Protocol Party?

G. As you know, non-Annex I Parties are participating in negotiations for new commitments for Annex I Parties, while they enjoy an exemption from new commitments. However, Article 16 provides no similar exemption for Annex I Parties. Why should Article 16 which calls for new and progressive "quantitative greenhouse gas emissions obligations" based on some future "agreed criteria" be applicable to Annex A Parties to the Protocol, including the U.S., since the U.S. draft of the Kyoto protocol otherwise applies to them and imposes new obligations on them beyond those in Article 4.1 and 2 of the Convention? What new obligations for Annex A Parties do you contemplate in the Article 16 process? Does, for example, this mean that under Article 4.1(b) Annex I Parties, like the U.S., by signing the Protocol are agreeing to reductions beyond the requirements of Article 2 of the draft protocol?

Article 2 - Emissions Budgets

H. We observe that Section III of the December Non-Paper called for "focusing" negotiations on a "binding, medium-term emissions target" and expressed interest in working toward a "longer-term concentration goal". However, Article 2.3 appears to call for a second target or "budget period" before there is an agreement by non-Annex A and B Parties to the Protocol that are developing countries to negotiate "quantitative greenhouse gas emissions obligations" under Article 16 and to adopt such obligations by [2005]. Does this second target send the wrong signals to the developing countries who agree to become Parties to the draft protocol and are subject to Article 16? Why is it in the best economic and competitive interests of the United States to offer a second target and timetable before negotiations with all Parties to the Convention in the AGBM begin and before the U.S. analysis and assessment and its assumptions are provided to Congress, industry, labor, environmentalists, and others? What is the need?

I. The Non-Paper states that the U.S. "strongly urges consideration of banking" and that multi-year averaging would give Parties "important flexibility". However, Article 2.5 seems to weaken that support for banking by providing that emissions of tonnes "may" (not "shall") be carried over and added to the "next budget period". That leaves uncertainty for industry and suggests that a Party like the U.S., might retire such tonnes rather than bank them which could have future economic and competitive consequences. Why did you take this discretionary approach? Why not follow the mandatory approach of Article 2.6? The Article does not specifically mention multi-year averaging. Why? Is it implied?

Article 6 - International Emissions Trading

J. As the chief proponent of an emissions trading program, the U.S. in its December Non-Paper said it was "critical" that provisions for "international" emissions trading "be included in the Kyoto agreement." When Title IV of the Clean Air Act (CAA) was signed into law, it spelled out in great detail the allowance program for existing and new electric utility units, including the timetable, the target, the cap, the trading system, the nature of the allowances, the rights of allowance holders, the tracking system, and the limitations. Upon enactment, the utility industry knew the program details and could plan their future. That program, which applied equally to all covered units of the electric utility industry, is for one industry with an identified and limited number of sources and it is a national trading program. Presumably, an international trading program will cover many industries, sectors, and gases on an international scale. However, our review of Article 6 of the draft protocol provides none of the details of an international trading program. It merely authorizes trading between Annex A and B Parties that establish a "mechanism" for certifying and verifying trades. It does not require that a trading program be established by all such Parties or that such a "mechanism" be put "in place" or that it be operated uniformly. All the important details are missing.

Do you intend to include these "critical" provisions in the protocol to be adopted in Kyoto or do you plan to defer development of such provisions to a post Kyoto_legal instrument, to a decision of the Parties to the Protocol after it enters into force, to bilateral negotiations between Parties, or some other means?

K. Article 6 provides that a Party "may authorize" any domestic entity to participate in actions "leading to transfer" of tonnes. What "actions" do you have in mind for this entity? In the case of the CAA, the trades are between utilities with reporting to the Environmental Protection Agency. Is that same approach likely to be accepted on an international scale if the domestic entity is a non-governmental organization in one country and a government agency in another?

L. As noted, Article 6 authorizes trading between Parties. However, unlike the CAA no mention is made of trading by private sector entities that will likely need such trading to operate. Also, unlike the CAA it does not allocate, or provide for an allocation of, the initial tonnes for various industries and sources to operate or indicate whether such industries and sources will be faced with penalties for continuing to operate without such allocation if such a program is initiated.

It only allows private sector entities, after receiving authorization from a Party, to "participate in actions leading to transfer and receipt..." of carbon equivalent emissions. Therefore, it appears that private sector entities can only suggest to Parties that certain emissions trading transactions take place. This imposes significant constraints on private sector international emissions trading, establishes a bureaucracy involving two separate governments or their designees between the private sector and the completion of trades, lowers any possible expectation that private sector entities would receive any benefit from trades, and makes the private sector subservient to the political and policy whims of governments in order to carry out what industry does best, i.e., produce goods and services and employ workers.

The wording of Article 7 on Joint Implementation carries the same structure and constraints. Under Article 7.1, any Party can generate tonnes of carbon equivalent emissions. Under Article 7.5, only Annex A or B Parties may acquire those tonnes of carbon equivalent emissions. And under Article 7.6, private sector entities, even after receiving authorization from a Party, are limited to "participat[ing] in actions leading to generation, transfer and receipt under this Article of tonnes of carbon equivalent emissions." Again, the private sector entities cannot, themselves, engage in emissions trading.

The proposed construction of Articles 6 and 7 and lack of details would appear to virtually eliminate the functioning of an international market in tradable permits. Instead, trading, as noted, can occur only between governments. The type of trading activity that would occur between governments, as a practical matter, would likely bear little resemblance to the trading activity that would be expected to occur in a private sector international tradable permits market if the program works as its proponents contend. Is the Administration intending an international governmental trading system? Who will

make the trades, pay for the tonnes, and receive the tonnes and money? If not, when will we learn the details for evaluation by industry, labor, and others?

Article 3 - Measurement and Reporting

M. Article 3.5 suggests that the transfers of tonnes of carbon equivalent emissions under Articles 6 and 7 would be reported to the Convention Secretariat annually. Do you intend that the Secretariat would perform the role in trading that EPA does under Title IV of the CAA and if so is annual reporting adequate? If not, what entity should perform that role and what is the purpose and need for a Party to also report to the Secretariat? What are the advantages and disadvantages to the U.S. of an international entity performing the EPA-type role in trading?

Article 7 - Joint Implementation (JI)

N. Article 7.2(b) uses the term "additional" which is not defined or explained. The definition of "additional" and the methodology for calculating greenhouse gas reductions from JI projects must be determined in order to estimate the magnitude of the cost savings due to JI. How will the Administration obtain this information in order to factor the cost savings of JI into its economic analysis?

OFFICE OF TIMOTHY E. WIRTH
UNDER SECRETARY
FOR GLOBAL AFFAIRS

DEPARTMENT OF STATE
2201 C Street, N.W.
Room 7250
Washington, D.C. 20520
Phone: 202-647-6240 Fax: 202-647-0753

TO: Distribution: See Attached List

FROM: Debbie Jones

DATE: 3/4/97

FAX:

Number of Pages (including cover): 12

COMMENTS: Under Secretary Wirth is hosting a Climate Change Luncheon on Thursday, March 13 from 12:00-1:30 pm in the Henry Clay Room on the 8th floor of the State Department. Please contact me on (202) 647-6205 of your principal's attendance. FYI: Guest of Honor is Prof. Paul Krugman of MIT.

United States Department of State

Under Secretary of State
for Global Affairs

Washington, D.C. 20520–7250

March 4, 1997

MEMORANDUM

TO: Climate Deputies Group

FROM: G - Timothy E. Wirth TEW/hm 9M

SUBJECT: Scheduled Luncheon Speakers

Following is a list of speakers for our Climate Change luncheon group:

Thursday, March 13: Prof. Paul Krugman, MIT

Prof. Krugman was one of the five signatories of the economics letter (attached). He will discuss economic impacts and benefits.

Thursday, March 27: Prof. Paul Epstein, Harvard Medical School

From his perspective on Medicine and Public Health, Prof. Epstein has done extensive work on the health impacts of Climate Change. He is one of the world's leading public health authorities, paying special attention to infectious diseases.

Tuesday, April 1: E. Linn Draper, President & CEO, American Electric Power

American Electric Power is one of the largest invester-owned utilities in the USA, with major investment in coal fired power plants. Mr. Draper is deeply engaged in the issues of utility deregulation and strategies for climate change.

Wednesday, April 16: Robert Shapiro, President, Monsanto

Robert Shapiro has led Monsanto through a major transformation, and the company is now world leader in bio-engineering related agribusiness. The impact of Climate Change for agriculture makes this transition even more compelling.

Wednesday, April 30: Kenneth Lay, President, Enron

Ken Lay has transformed Enron into a broad energy company and views Climate Change as a great opportunity for business and for the USA.

Thursday, May 8: New Director of the National Renewable Energy Laboratory

The new Director (who will be officially designated on March 1) will discuss renewables, their expected role in dealing with climate change, cost and technology projections to 2050. NREL is the government-sponsored laboratory dedicated to renewables.

Friday, May 30: Paul O'Neill, Chairman & CEO, ALCOA

A member of the Business Council on Sustainable Development and President of the largest aluminum company in America, Mr. O'Neill has been a leader in the transition of a major industry and in positioning that industry in the world economy.

We have a number of other invitations outstanding and I would welcome any ideas you may have for speakers. Lunch will be held on the 8th floor of the State Department, a buffet style. The cost is approximately $15.00. We will send out a reminder three weeks before each lunch, and ask for an RSVP. In prior discussions, we agreed on a no substitution policy unless a truly compelling case could be made.

If you have questions, please call Randy Wood or Debbie Jones on (202) 647-6205.

g/admin:clispeak

PAUL KRUGMAN: BIOGRAPHICAL SKETCH

Paul Krugman is Professor of Economics at MIT. He received his B.A. from Yale University in 1974, and his Ph.D. from MIT in 1977. From 1977 to 1979 he taught at Yale; then moved to MIT, where he remained on the faculty from 1979 to 1994, he then moved to Stanford from 1994 until 1996. In 1982-3, on leave from MIT, he served as chief international economist of the Council of Economic Advisers.

Krugman is the author or editor of 16 books and more than 100 papers in professional journals and edited volumes. His professional reputation rests largely on work in international trade and finance; he is one of the founders of the "new trade theory," a major rethinking of the theory of international trade. In recognition of that work, in 1991 the American Economic Association awarded him its John Bates Clark medal, a prize given every two years to "that economist under forty who is adjudged to have made a significant contribution to economic knowledge". Krugman's current academic research is focussed on the application of ideas from complexity theory and the concept of self-organizing systems to economics, especially to the spatial organization of production.

At the same time, Krugman has written extensively for a broader public audience. Some of his recent articles on economic issues, originally published in *Foreign Affairs*, *Harvard Business Review*, *Scientific American*, and other journals, are reprinted in his latest book, *Pop Internationalism*.

January 3rd, 1997

Dear Colleague,

As you may know, representatives of the world's nations will convene in Kyoto in December, 1997 to negotiate an international agreement addressing the threat of global climate change due to greenhouse gas emissions. This presents a significant opportunity for the United States to exercise a leadership role in ensuring our long-term well-being. Conversely, a failure on the part of the U.S. government to put forward a well-reasoned position would be a major environmental, economic, and diplomatic setback.

As the climate debate unfolds, it is imperative that public policy be guided by sound economics rather than misleading claims put forward by special interest groups. For this reason, we invite you to join us in endorsing the attached non-partisan consensus statement on the economics of climate change.

Once this statement has been signed by a large number of economists, it will be widely disseminated to leaders in the public and private sectors, and to the general media. This effort is being coordinated by Redefining Progress, a non-partisan, non-profit public policy organization.

Attached please find an endorsement form for your consideration. This letter and endorsement form are being sent to the membership of the American Economic Association. Please feel free to circulate it to your colleagues in case they are not on the AEA mailing list.

We thank you for your prompt attention to this critical issue.

Sincerely,

Kenneth J. Arrow

Dale W. Jorgenson

Paul R. Krugman

William D. Nordhaus

Robert M. Solow

Endorsed by over 2,000 Economists, including six Nobel Laureates.

ECONOMISTS' STATEMENT ON CLIMATE CHANGE

We the undersigned agree that:

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

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

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

ENDORSEMENT FORM

NAME _____ SIGNATURE _____

TITLE/AFFILIATION _____ DATE _____

DO YOU HOLD A PHD IN ECONOMICS ☐ YES ☐ NO IF NO, DEGREE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE _____ FAX _____ E-MAIL _____

WOULD YOU LIKE TO RECEIVE MORE INFORMATION ON REDEFINING PROGRESS ☐ YES ☐ NO

➡ PLEASE COMPLETE AND SEND TO REDEFINING PROGRESS

BY FAX:
FAX: (415) 781-1198
PHONE: (415) 781-1191

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

NOBEL LAUREATE SIGNATORIES

Kenneth J. Arrow
Stanford University

Gerard Debreu
University of California at Berkeley

John C. Harsanyi
University of California at Berkeley

Lawrence R. Klein
University of Pennsylvania

Wassily Leontief
New York University

Franco Modigliani
Massachusetts Institute of Technology (Emeritus)

Robert M. Solow
Massachusetts Institute of Technology

James Tobin
Yale University

Environmental Information Center

1400 16th Street, NW
Suite 330, Box 5
Washington, DC 20036 2266
Phone 202.797.6500

Fax 202.797.6501
Email eicinfo@acpa.com or
[first initial] + [lastname]@acpa.com
Web http://www.igc.apc.org/eic

MEDIA ADVISORY
Thursday, February 27, 1997

Contact: George Abar
Telephone: (202)797-6500

Debunking Doomsday

With GCC's Economic Models, It's Garbage In, Garbage Out

Washington, DC -- Only this month, eight Nobel Prize-winners and 2,300 other economists endorsed a statement that reads, "sound economic analysis shows that there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run."

Yet today, the Global Climate Coalition (GCC) plans to proclaim, once again, that efforts to mitigate climate change will bring doom and gloom to the U.S. economy and to the economy of developing nations. The GCC, a lobby funded by the coal and oil industries, will point to the economic analysis of industry consultants Charles Rivers Associates for proof of this self-serving conclusion.

The economic projections promoted by the GCC are seriously flawed, according to Dr. Florentin Krause, a lead author of the economic modeling review recently undertaken by the authoritative UN Intergovernmental Panel on Climate Change (IPCC), and the Director of the International Project for Sustainable Energy Paths (IPSEP).

In a soon to be released report, Dr. Krause concludes that studies relied upon by the GCC (including prior studies by Charles Rivers Associates):

- report costs for climate change mitigation that fall outside the range of credible estimates because they fail to use analytically sound, state-of-the-art modeling procedures;

- grossly overstate costs because they fail to consider five major policy options for increasing economic welfare while reducing emissions (so-called double dividends or no regrets options).

Dr. Krause also documents the "spin" used by the GCC to paint an alarmist picture from supposed economic impacts that are slight enough to be well within the margin of error of long-range economic forecasts. The GCC rarely mentions that its predicted worst-year cost for climate change mitigation (typically between 2-4 percent of GDP) occur in the context of a ***doubling*** of projected GDP over approximately the same time frame. Thus, climate change mitigation would not, as the GCC has claimed, "force Americans into second class lifestyles."

Press wishing to discuss these and other findings in the upcoming IPSEP report can contact Dr. Krause at (510) 525-7530.

ECONOMISTS' STATEMENT ON CLIMATE CHANGE

Among the over 2,300 economists who have endorsed the Economists' Statement o Climate Change are the following, they include scholars at top universities and economists from top corporations.

Michael C. Barth	ICF Kaiser
William J. Baumol	New York University
Steven Neil Braun	Council of Economic Advisers
W.A. Brock	University of Wisconsin, Madison
Martin Bronfenbrenner	Duke University
John P. Brown	KPMG Econmic Consulting Services
R. Thomas Burge	Proctor & Gamble Pharmaceuticals
Dallas Burtraw	Resources for the Future
Trudy Ann Cameron	University of Los Angelos California
Jian Cao	AT&T
Carl F. Christ	Johns Hopkins University
Gerard Debreu	University of California at Berkeley
Stephen J. DeCanio	University of California at Santa Barbara
Robert Dorfman	Harvard University
Franklin M. Fisher	Massachusetts Institute of Technology
Peter J. Francis	CNA Corporation
Victor R. Fuchs	Stanford University
Claudia Goldin	Harvard University
Edward Gramlich	University of Michigan
Jerry R. Green	Harvard University
Frances Hammond	General Motors Corporation
John C. Harsanyi	University of California at Berkeley
Oliver Hart	Harvard University
James J. Heckman	University of Chicago
Albert O. Hirschman	Institute for Advanced Study
Jack Hirshleifer	University of Los Angelos California
Robert Hunt	World Bank
Leonid Hurwicz	University of Minnesota
Christopher Jencks	Harvard University
Gale D. Johnson	University of Chicago
Carl Kaysen	Massachusetts Institute of Technology
Robert Kirchner	PEPCO
Lawrence R. Klein	University of Pennsylvania
J. Kmenta	University of Michigan
Laurence J. Kotlikoff	Boston University
Anne O. Kreuger	Stanford University
Mordecai Kurz	Stanford University
Steven G. Lanning	Bell Labs-Lucent Technologies
Lester Lave	Carnegie Mellon University
David Lui	Southern California Edison
Paul W. MacAvoy	Yale School of Management
Gerald M. Meiser	Stanford University
John R. Meyer	Harvard University
Christopher J. Monroe	AT&T
Richard R. Nelson.	Columbia University
Richard B. Norgaard	University of California at Berkeley
Charles Plott	California Institute of Technology
Richard E. Quandt	The Andrew W. Mellon Foundation
Roy Radner	New York University
Gordon Rausser	University of California at Berkeley
Kenneth Rogoff	Princeton University
David Romer	University of California at Berkeley
Michael Rothschild	Princeton University
Daniel Rubinfeld	University of California at Berkeley
Vernon W. Ruttan	University of Minnesota
Jeffrey Sachs	Harvard University
Thomas Sargent	University of Chicago
F.M. Scherer	Harvard University
T. Paul Schultz	Yale University
M.M. Shahjahan	PEPCO
Steven Shavell	Harvard University
A. Michael Spence	Stanford University
Robert Stavins	Harvard University, Kennedy School
Bruce Stram	Enron Corporation
James Tobin	Yale University
Gordon Tullock	University of Arizona
Hal R. Varian	University of California at Berkeley
W. Kip Viscusi	Harvard Law School
Oliver E. Williamson	University of California at Berkeley

INTERAGENCY GROUP ON CLIMATE CHANGE

Jim Baker	Commerce/NOAA	(O) 482-3436 (F) 408-9674 POC: Pat
Rosina Bierbaum	White House	(O) 456-6202 (F) 456-6025 72 POC: Sandy
Eileen Claussen	State	(O) 647-1554 (F) 647-0217 POC: Lillie
Charles Curtis	Energy	(O) 586-5500 (F) 586-7573 POC: Kim
Everett Ehrlich	Commerce	(O) 482-3727 (F) 482-0432 POC: Vickie
Jeffrey Frankel	CEA	(O) 395-5046 (F) 395-6947 POC: Francine
John Garamendi	Interior	(O) 208-6291 (F) 208-1873 POC: Gwen
Jack Gibbons	White House	(O) 456-7116 (F) 456-6021 POC: Susie
T. J. Glauthier	OMB	(O) 395-4561 (F) 395-4639 POC: Alecia
Joshua Gotbaum	Treasury	(O) 622-2200 (F) 622-2633 POC: Rosemary

Fred Hansen	EPA	(O) 260-4724 (F) 401-3764 POC: Linda H.
Elgie Holstein	NEC	(O) 456-2800 (F) 456-2223 POC: Gay
Jeff Lang	USTR	(O) 395-5114 (F) 395-4549 POC: Dena
Katie McGinty	CEQ	(O) 456-5147 (F) 456-2710 POC: Robert
Jerry Melillo	White House	(O) 456-6202 (F) 456-6025 POC: Sandy
Alicia Munnell	CEA	(O) 395-5036 (F) 395-6958 POC: Lisa
Richard Rominger	USDA	(O) 720-6158 (F) 720-5437 POC: Joanne
David Sandalow	CEQ	(O) 456-6224 (F) 456-2710 POC: Wendy
Lois Schiffer	Justice	(O) 514-2701 (F) 514-0557 POC: Norma
James Steinberg	White House	(O) 456-9480 (F) 456-9490 POC: Kathy

Lawrence Summers	Treasury	(O) 622-1080 (F) 622-0081 POC: Judy
Dan Tarullo	NEC	(O) 456-5353 (F) 456-1605 POC: Kristin
Timothy E. Wirth	State	(O) 647-6240 (F) 647-0753 POC: Debbie
John (Randy) Wood	State	(O) 647-9796 (F) 647-0753 POC: Debbie

G/Admin:IAClimte

cc: Ann
STAF
JS
JR

THE WHITE HOUSE

WASHINGTON

March 3, 1997

MEMORANDUM FOR DISTRIBUTION

FROM: ELGIE HOLSTEIN
DAVID SANDALOW

SUBJECT: Climate Change

There will be a meeting Tuesday, March 11 from 9:30-11:00am in OEOB Room 472.

One of the items on our agenda will be clearance of a background paper on domestic emissions trading programs. Please review the attached draft, prepared by EPA, and provide any comments to David Gardiner (260-4332) no later than COB Thursday, March 6. EPA will distribute a revised draft prior to our meeting.

Complete agenda for our meeting to follow.

Everyone of the attached list has been cleared into the building. For questions concerning clearance, please contact Wendy Phillco (456-6224).

DISTRIBUTION:

Organization	Name
State	Eileen Claussen
	Rafe Pomerance
Commerce	Everett Erhlich
	Jeffrey Hunker
OSTP	Rosina Bierbaum
CEA	Alicia Munnell
	Jeff Frankel
	Mark Mazur
Treasury	Joshua Gotbaum
Justice	Lois Schiffer
Interior	Brooks Yeager
	Brooke Shearer
NOAA	Terry Garcia
OMB	T.J. Glauthier
USTR	Jennifer Haverkamp
Agric	Charlie Rawls
DOE	Mark Chupka
	Joe Romm
EPA	Mary Nichols
	David Doniger
	David Gardiner
DOT	Frank Kruesi
OVP	Pete Jordan
CEQ	Steve Seidel
USAID	David Hales
DOL	Ed Montogmery
TaskForce	Dirk Forrister

Overview of Domestic Greenhouse Gas Emissions Trading Programs

Introduction

This paper describes how a domestic emissions trading program could be used to comply with an emissions target designed to meet an international agreement on greenhouse gases. Emissions trading is a tool for meeting a total quantity limit on emissions. It involves allocating or auctioning emissions allowances, and allowing the trading of allowances in a market with sufficient mechanisms to ensure compliance with targeted levels. Since emission trading involves the creation of new, marketable assets that can have substantial value, addressing distributional issues will be an important component of program design. Allocation rules or auction revenues can be used to address these distributional issues.

Emission trading systems can offer both static and dynamic efficiency advantages over more traditional forms of regulation. The potential for static efficiency gains exists because emitters face different abatement costs. Emissions trading allows those with high abatement costs to purchase allowances from those whose costs are lower. Total costs would therefore be lower than through traditional regulations, which require all polluters to comply with a specific standard. However, it should be noted that such a program involves people and firms adjusting to higher energy prices.

Under traditional regulation, firms have little incentive to investigate ways of abating pollution by more than the minimum required to comply with regulatory requirements. Firms under-invest in pollution control R&D since they can capture neither the full market benefits from such spending (since others benefit from learning of their successes), nor the full value of any resulting environmental improvements. Trading offers dynamic efficiency gains because of the incentive to continuously improve pollution abatement technologies in order to create "surplus" allowances for sale. In addition, tradable permits can provide incentives for reduced total energy use.

These same efficiency benefits could be achieved through a system of emission taxes. However, a system based on emissions trading differs from a tax system in two important ways. First, under a tax system, the quantity of total emissions is the result of individual polluters' decisions in response to the incentive provided by the tax. In principle, if the entire cost structure is known, any quantity target attained by a tradable permit system could also be attained by an appropriately calculated tax. In so far as forecasting in practice is difficult, however, the resulting level of emissions can be greater or less than the level targeted when the tax rate is set. By setting overall quantity targets, emissions trading programs coupled with appropriate compliance procedures, offer greater certainty that national emission targets will be achieved. Second, emission tax systems always involve revenues accruing to the government (although they can be rebated). Under an allowance system, the government has greater flexibility in deciding

whether to collect revenues by auctioning permits or allocating them based on historical emissions or some combination of the two. This flexibility can affect the public acceptance of the mitigation program.

US Experience with Emissions Trading

The US has had more experience with emissions trading than any other country in the world. Specific programs include:

- *Sulfur Dioxide (SO2) Allowance Trading:* The Clean Air Act Amendments of 1990 imposed an overall 50% emission reduction requirement for SO2 emissions from electric utility boilers. The portion of the program concerning trading works by allocating emission allowances to electric utilities based on a formula reflecting historical emissions. In addition, a small portion of allowances are auctioned every year to facilitate price discovery and new entrants. Allowances are specifically excluded from being defined as property rights, may be traded to any party anywhere within the continental U.S., and may be "banked" for use in future years. Participants need to conduct regular monitoring of emissions and make an annual accounting of their emissions. Penalties are imposed if emissions exceed the number of allowances held by a source.

  There is now a functioning market in SO_2 allowances involving both bilateral exchanges between companies, and brokered exchanges through third parties. This market, along with other factors[1], has helped to dramatically reduce the cost of the abatement program. Initially, forecasters claimed that emissions allowances would sell in the range of $100 to $1000 per ton.[2] Current spot prices are in the range of $80 to $90. In addition, 1995 emissions were actually 40% below the legally required levels for that year.

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

[1] These include the fact that the bill that was actually adpted was not as onerous as many in industry had feared, the low price and widespread availability of low sulfur coal, the awarding of "bonus allowances," the postponement of capital investments, and lower than expected transportation costs.
[2] Hahn, Robert W., and Carol May, "The Behavior of the Allowance Market: Theory and Evidence," The Electricity Journal, March, 1994.

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

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

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

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

Emission Trading of Greenhouse Gases

These examples show that emission trading and banking have been used to meet established reduction requirements. Emissions trading, coupled with sufficient compliance mechanisms, may similarly be used to meet an established target for greenhouse gas emissions.

An emissions trading program, like any program designed to limit greenhouse gases, must contain certain elements. First, an agreed upon emissions budget must be established. A central authority must be given the domestic responsibility for verifying

compliance and must be provided sufficient information to do so. Finally, noncompliance with allowance limitations or reporting requirements must generate real consequences, such as penalties or subtraction of allowances.

A program would have to establish permit lifetimes, monitoring and enforcement provisions, as well as rules for permit banking, borrowing, and trading. Consideration should also be given to transaction costs, which should be kept as low as possible. However, particularly difficult issues involve determining what types of activities require a permit and how permits should be allocated.

What types of Activities Should Require a Permit

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

The decision for determining who should be required to hold a permit should consider the following:

- *Coverage:* While it may not be necessary to ensure that every ton of greenhouse gas is accounted for within an emission trading regime, the scope of coverage of the trading program should be sufficient to ensure compliance with targets set in accordance with an international agreement.
- *Administrative and compliance feasibility:* The number of sources involved in the trading program should be small enough to be administratively feasible and large enough to ensure market competition. In addition, monitoring and verification of permit compliance must be possible for those included in the program.
- *Potential to Diffuse Low Greenhouse Gas Technologies:* Alternative points of intervention should be evaluated for their ability to provide incentives for research, development, adoption and diffusion of low greenhouse gas technologies.
- *Market Impacts:* Any program that limits emissions will affect the bottom line of firms. The permit program will have economic impacts that vary depending on program design. For example, exempting certain sizes or categories of sources from permit requirements because of administrative or equity concerns (e.g., small boilers or home heating oil) has competitive implications within the energy market..

Carbon Sources

Carbon dioxide currently accounts for about 85% of U.S. greenhouse gas emissions. The term "emission trading" implies the creation of a market of emission allowances (or permits) among *emitters* of greenhouse gases through a limitation on those

emissions. In the case of carbon dioxide, however, direct emitters number in the hundreds of millions since they include sources such as automobiles and residential gas water heaters.

However, since virtually all of the carbon contained in fossil fuel extracted from the ground (with the possible exception of certain feedstocks) is eventually released to the atmosphere, a trading program need not focus uniquely on direct emitters, but can be implemented through other points in the energy market. These include fuel imports, fuel extraction, processing, refining, distribution, and secondary conversion (e.g., coal to electricity). In addition, these points could vary by sector. For example, an emission trading program could focus on the point of final combustion for coal, but on refining for oil, or distribution for natural gas. Given the wide variety of options available for including energy sources in a trading program, a few alternative programs are described below for illustration:

A Program Targeting Primary Fuel Producers

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

A Program of Emission Trading at the Sectoral Level

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

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

Other Greenhouse Gases and Sinks

The remaining 15% of greenhouse gas emissions (on a carbon-equivalent basis) are accounted for by other gases. Most important among these is methane, which by itself accounts for 11% of national emissions. Since gases differ in their lifetimes and in their potential to trap heat in the atmosphere, an "exchange rate" or trading ratio must be established to convert all gases into common units for inclusion in a trading program. Such ratios have been developed by climate researchers and could be applied here. These should be consistent with the rules established in the international protocol.

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

Forests in the United States currently remove an amount of carbon equal to 8% of national emissions from the atmosphere. However, translating the potential of sinks into monitorable, verifiable, and cost effective emission reductions is hampered by the lack of a comprehensive national accounting system for sinks. Thus, while it may be possible to observe and monitor the planting of trees and preservation of forests in a given area, it is difficult to know how such actions affect national emissions. Preservation of one stand of forests may simply lead to destruction of another in a different location. Overcoming the difficulties associated with monitoring and verification is therefore especially important for the inclusion of sinks to be included in a trading program.

Allocating Permits

In an emission trading system, some mechanism must be provided for allocating permits to sources. This could be done on the basis of baseline/historical emissions (where permits are given to those currently emitting) or through an auction (where revenues accrue to the government). These two mechanisms might also be combined: some portion of permits could be allocated on the basis of historical emissions while the rest are auctioned. In any case, the value of these assets could be large depending on the permit price, which is determined by the emissions target and the costs of substitutes. Given that an auction could produce substantial revenues, some decision would have to be made with respect to what to do with the proceeds

A reserve of allowances or a portion of auction revenues could be set aside to encourage more rapid development and diffusion of low greenhouse gas emitting technologies. For example, manufacturers of energy consuming equipment could compete for the set aside based on the degree to which they produce equipment more efficient than the average in use or than required by current mandatory efficiency standards. Such a program could yield reductions in energy demand and help buffer the consumer from the impact of higher energy costs.

Allocation Based On Baseline/Historical Emissions

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

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

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

Permit allocation formulae could also take into account the market impacts of the mitigation program. For example, "set asides" could be made available to those industries or consumers who experience a grossly disproportional share of the costs of control. Alternatively, a set aside could be auctioned, with the revenues used to redress gross inequities in the distribution of control costs.

Auction

Alternatively, an auction could be used to allocate permits. In this case, permit holders would pay the market clearing price for every unit of greenhouse gas released. Auctions ensure that permits are available for trade, and would serve to inform potential traders about current price levels. All participants have equal access to permits, placing new entrants on the same footing as existing emitters. Given that an auction could produce substantial revenues, some decision would have to be made with respect to what to do with the proceeds. These include programs to redress inequities in the distribution of control costs (as discussed above), R&D for less carbon intensive energy sources and end uses, reductions in taxes, and/or deficit reduction.

Conclusion

Past experience with emission trading programs indicates that they can help significantly reduce the costs of meeting environmental objectives. This is due in part to the incentives they provide for developing and diffusing new environmental technologies. Thus, final compliance costs for the programs that have incorporated emissions trading have, in general, been dramatically lower than ex ante expectations. With careful attention to design, a system of emissions trading could be instituted for greenhouse gas emissions. Such a program would provide similar incentives to research, develop, and diffuse low greenhouse gas technologies and result in achieving targeted emission levels at the lowest possible cost.

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
WASHINGTON, D.C. 20503

February 24, 1997

MEMORANDUM FOR DISTRIBUTION

FROM: KATHLEEN A. McGINTY

SUBJECT: G-7/Climate Technologies

There will be a meeting Wednesday, February 26 at 5:00 pm in OEOB Room 422 to discuss a possible climate technology initiative for the Denver G-7 Summit. Background materials are attached.

I look forward to seeing you.

DISTRIBUTION

Jack Gibbons
Charlie Curtis
Richard Rominger
TJ Glauthier
Alicia Munnell
Jeff Frankel
Eileen Claussen
Rafe Pomerance
Sherri Goodman
David Gardiner
Mary Goode
Jeffrey Hunker
Rosina Bierbaum
Elgie Holstein
Bill Antholis

OSTP Discussion Draft

CLIMATE TECHNOLOGY PROPOSALS FOR
THE DENVER G-7 SUMMIT

This is a proposed event for President Clinton during the G-7 Summit in Denver to show leadership in committing to reduce greenhouse gas emissions through renewable energy technologies and energy efficiency. There are two distinct elements to this proposed event -

The first is the most critical for the summit and includes two items in which the President can work to achieve agreements with G-7 members on commitments to reduce greenhouse gas emissions through deployment of renewable energy technologies.

The second includes a portfolio of activities that we are doing to help reduce our own greenhouse gas emissions through energy efficiency and renewables.

An event could be held at the National Renewable Energy Laboratory in Golden Colorado.

Challenge G-7 partners to:

Þ **Join with us in supporting World Bank efforts to harness markets and entrepreneurship for solar energy technologies** in developing countries through the proposed "Solar Development Corporation"

Þ **Commit to purchasing non-hydroelectric renewable energy for their federal facilities** in a way that ensures that at least x% of the electricity purchased comes from these sources by 2000 and y% by 2010. The U.S. government could be prepared to implement this agreement with an executive order.

Activities that show our commitment to renewables and efficiency:

à Announce the formation of non-profit sister of the National Renewable Energy Laboratory (NREL) to make U.S. leadership, technology and expertise more readily accessible to consumers and companies globally.

à Celebrate the 20th Anniversary of the NREL

à Announce a more focused effort to make residential housing more efficiency and affordable through a Partnership for Advancing Technologies in Housing

à Announce Million Solar Roofs Initiative.

à Announce continued support for the Biomass Energy and Products Initiative.

à Hold an international workshop on technology and economics of sustainable development.

State Dept. Draft

UNCLASSIFIED

CLIMATE-FRIENDLY TECHNOLOGY INITIATIVE

U.S. Objectives

1. To reduce the risks of climate change by accelerating the deployment and further development of advanced technologies, particularly in the energy sector, that mitigate greenhouse gas emissions.

2. To seek P-8 support for domestic and international actions that can be taken to spur accelerated adoption of available technology and the development of advanced, climate-friendly technologies by the public and private sectors through:

   a. Targeted investment in research and development of climate-friendly technologies.
   b. Private sector investment in development and deployment of climate-friendly technology; and
   c. Adoption of international programs for development and deployment of climate-friendly technology.

Background

Climate change has emerged as one of the most challenging global environmental threats. Human activities -- largely through fossil fuel combustion -- are increasing the concentration of heat-trapping greenhouse gases (GHG) in the atmosphere. If these concentrations continue to grow, the best scientific evidence indicates that significant global climatic changes will occur, with serious consequences for the United States and the world. The development of advanced technology, particularly clean energy technology, is a necessity for addressing this problem and preventing adverse impacts of climate change.

Unfortunately, without the right incentives and cooperative efforts, investment and development in these technologies will not occur at a pace commensurate with the challenge. Creating these incentives requires public-private partnerships within and among nations, recognizing appropriate roles and the benefits of competition. While each country must tailor specific strategies to be implemented at the national level, significant progress could be made through agreement by the P-8 leaders to encourage the deployment of existing technologies and the further development of advanced, climate-friendly technologies.

We envision that the focus of these strategies will be within the P-8 countries where a wide range of both renewable and energy efficiency technologies (e.g. solar photovoltaics, fuel cells and biomass), which are commercially viable and market-ready, have not penetrated critical markets because of financing and other related problems. These problems include a lack of experience on the part of banks and other financial institutions in working with renewable and energy efficiency companies. Many banks are reluctant to supply the necessary capital to the generally small-sized firms because the transaction costs are high relative to the amount involved in the financial deals; there is generally a greater degree of risk with these types of companies as well. The companies in this sector also have little experience in preparing

UNCLASSIFIED

attractive business plans and in marketing their products in the U.S. and overseas. Another set of challenges arises from existing regulatory and pricing policies.

P-8 nations could adopt a two-pronged strategy to further technological diffusion and development. They can formulate measures to deal with risk as well as transaction and information barriers in the near term. In the longer-term, they can emphasize the utilization and diffusion of a new generation of climate friendly technologies. In this way, a wide range of government departments and agencies can contribute their expertise, and the private sector will receive encouragement to pursue newt opportunities.

There is a menu of potential options from which P-8 members can choose in order to move forward. At a minimum, we could agree to reinvigorate the existing Climate Technology Initiative (CTI). The CTI is a voluntary cooperative effort, announced by 24 countries (primarily OECD members) at the First Conference of the Parties to the Climate Convention in April 1995. Its purpose is to promote more rapid development and international diffusion of technologies that can reduce GHG emissions. After a period of organization and start up activities, the CTI has begun to develop and implement concrete cooperative programs over the past year. A Japanese official from MITI has recently taken over as Chair of the Initiative. Current activities in the seven focus areas (including Energy Technology Networking and Capacity Building, International Collaboration on Research, Development and Systematic Evaluation of Technology Options, and Climate Technology Prizes) are still limited in scale (with only one or two individuals from any country engaged, and with less than $100,000 committed to programs), primarily "pilot" activities, which could provide a basis for a scaled-up program in the future. The P-8 could also agree to encourage the Multilateral Development Banks, and especially the World Bank, to better implement, and, where possible, strengthen their efforts to promote energy efficiency and renewable energy projects which have greenhouse gas mitigation benefits.

Another option is to launch efforts in each of the P-8 countries to target publicly supported research and development on energy and other technologies that will help to reduce GHG emissions.' In preparation for the P-8 meeting, governments could examine recent trends in public expenditures for advanced technologies in key sectors (e.g., energy, transportation, buildings, utilities). Based on these results, the P-8 members could agree to focus on the development of very low emitting or no-GHG emitting energy technologies (e.g., photovoltaics, alternative fuel vehicles, efficient electric motors, advanced building designs, very efficient industrial processes). This menu of options closely tracks with key recommendations being developed for the Deputies process on climate change; the importance of R&D has already been acknowledged by the Assistant Secretaries' group in formulating an overall domestic strategy.

As a primary engine for innovation and commercial application of advanced technology, the private sector must play a leadership role in the development of the technologies that will be necessary to mitigate greenhouse gas emissions. P-8 governments can be key partners with the private sector in the development of climate-friendly technology. The P-8 could encourage the adoption of programs, such as technology prizes, and public-private partnerships (e.g. demonstration programs) to help encourage private sector research, development and diffusion.

United States Department of State

Bureau of Oceans and International Environmental and Scientific Affairs

Washington, D.C. 20520

AW
cc: JAF
JS
TR

February 21, 1997

TO: Distribution

FROM: OES - Eileen B. Claussen Eileen

SUBJECT: Climate Change Work Program

Attached is a revised version of the work program that was agreed at the meeting held on Wednesday, February 19. Please note revisions to some of the agencies designated to lead the drafting efforts. Also note the addition of two new items: (1) on the issue of entry into force (which we did not discuss, but which will need additional fleshing out; and (2) on the issue of grandfathering of early actions. I do not believe either of these will need to be completed prior to the April 1 deadline.

I anticipate that specific drafting assignments on all of the recommended papers will be made in the IWG/GEA Climate subgroup; please direct staff in your agencies to complete drafting on these papers as expeditiously as possible. Also, I note that we agreed to defer publication of the U.S. Climate Action report until after the April 15 deadline; this will allow for a one-month public comment period. However, we can only meet this new timetable if all agencies are diligent in completing their drafting and reviewing of assigned chapters. Please insure that this work is given a high priority.

CLIMATE CHANGE: FURTHER WORK

(Based on A/S discussion of 2/19/97)

1. * Budget (White House with support of IAT)
   - Initial budget level and period?
2. Emissions Trading (DOE and EPA)
   - How to operationalize trading in the protocol (e.g., whether there will need to be a new international oversight group under the Protocol; the units in which trades might occur; how to address "problem" countries which may not be in domestic compliance or have inadequate monitoring capability)?
3. Developing Country Initiative (AID with State, DOE, EPA and CSP/USIJI)
   - U.S. carrot to encourage developing countries (funding of US program, including continuing/expanding the USIJI and the Country Studies program/Support for National Action Plan (CSP/SNAP) efforts; incentives to bring developing countries into the fold)?
4. * Joint Implementation (EPA and DOE)
   - Additional provisions on calculation, measurement, monitoring, verification, review and reporting?
5. Reporting/Compliance (State with EPA, Justice, DOE and USTR)
   - * Consequences of non-compliance (possible provisions on sanctions against non-Parties, non complying Parties or minimally complying Parties)?
   - National reporting, review mechanism, multilateral consultative process and compliance procedures
6. Annex C gases/sectors (OSTP with EPA, DOE, USDA and NOAA)
   - * What GWPs will be used?
   - What gases/sectors will be included (requires an assessment of what can be monitored – may need to be considered on the basis of agreed criteria)
7. * Non-Annex C gases /sectors (Article 2, para. 7) (EPA, DOE, USDA)
   - What measures will be proposed to address these?
8. * Annex B commitments (State)
   - Candidate countries and potential commitment(s)?
9. Borrowing (State)
   - Possible additional constraints (e.g., limiting the amount allowed to be borrowed, limiting the countries which can borrow or phasing in/out the borrowing option)?

10. Entry into Force (State)

- What provisions should be made for the number of countries (or the percentage of global emissions they represent) required for the agreement to enter into force?

11. "Grandfathering" (DOE and EPA)

- Should the international agreement include provisions ensuring that early reduction efforts be credited against a future obligation? If so, how, and would such provisions be established differently in a domestic process?

* INDICATES WORK THAT MUST BE DONE BEFORE APRIL 1

Format for Work Products

All papers should follow the following structure: Issue, Background, Options (if appropriate), Recommendation(s), and Draft Text (for inclusion in U.S. Protocol Proposal). Papers should be no more than 5 pages in length, shorter when possible.

United States Department of State

Bureau of Oceans and International Environmental and Scientific Affairs

Washington, D.C. 20520

DATE: 2/24/97

NUMBER OF PAGES TO FOLLOW: 3

FAX TO: See Distribution List Attached

TELEPHONE: _____ FAX: _____

OFFICE: _____

****

FAX FROM: Eileen Claussen

TELEPHONE: 647-1554 FAX: 647-0217

OFFICE: _____

****

MESSAGE: Memo on Climate Change Work Program

CLIMATE CHANGE MEETING ASSISTANT SECRETARY EILEEN CLAUSSEN

Commerce	Everett Erhlich	482-0432
	Jeffrey Hunker	482-4636
OSTP	Rosina Bierbaum	456-6025
CEA	Alicia Munnell	395-6958
NEC	Elgie Holstein	456-2223
Treasury	Joshua Gotbaum	622-2633
Justice	Lois Schiffer	514-0557
Interior	Brooks Yeager	208-4561
NOAA	Terry Garcia	482-6318
OMB	T.J. Glauthier	395-4639
USTR	Jennifer Havercamp	395-4579
Agric	Charlie Rawls	720-5437
DOE	Dirk Forrister	586-9987
DOE	Mark Chupka	586-0861
EPA	Mary Nichols	260-5155
	David Gardiner	260-0275
DOT:	Frank Kruesi	366-7127
OVP	Pete Jordan	456-9500
CEQ	Steve Seidel	456-6546
NSC	David Sandalow	456-2710

Mon, 2/3/97, 4pm

cc: JHF
JS
MM

FAX TRANSMISSION

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF POLICY, PLANNING AND EVALUATION
401 M STREET SW
WASHINGTON, DC 20460
202-260-4332
FAX: 202-260-0275

To:	Assistant Secretaries' Climate Change Group (see attached list)	**Date:**	January 30, 1997
Fax #:	See attached list	**Pages:**	19, including this cover sheet.
From:	William N. White Special Assistant to David Gardiner		
Subject:	Climate Change Mitigation Overview Paper		

COMMENTS:
Please find attached the revised version of the overview paper discussed at the last Assistant Secretaries meeting, for your review prior to the Assistant Secretaries' meeting on Monday. If you do not receive the complete fax please call me at 260-1345.

DISTRIBUTION:

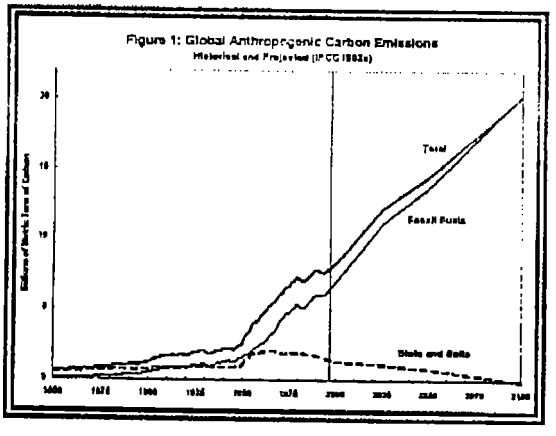
Organiz.	Name	Fax #
State	Eileen Claussen	647-0217
	Rafe Pomerance	
Commerce	Everett Erhlich	482-0432
	Jeffrey Hunker	482-4636
OSTP	Rosina Bierbaum	456-6025
CEA	Alicia Munnell	395-6958
	Jeff Frankel	
Treasury	Joshua Gotbaum	622-2633
Justice	Lois Schiffer	514-0557
Interior	Brooks Yeager	208-4561
NOAA	Terry Garcia	482-6318
OMB	T.J. Glauthier	395-4639
USTR	Jennifer Haverkamp	395-4579
Agric	Charlie Rawls	720-5437
DOE	Dirk Forrister	586-9987
	Mark Chupka	586-0861
EPA	Mary Nichols	260-5155
	David Doniger	
	David Gardiner	260-0275
DOT	Frank Kruesi	366-7127
OVP	Pete Jordan	456-9500
CEQ	Steve Seidel	456-6546
USAID	David Hales	703-875-4639
DOL	Andrew Samet	219-5980

Overview of Greenhouse Gas Mitigation Options

Introduction

Over the next century, important shifts in the global economy would be required to address climate change. While many mitigation options exist, some of these policies entail costs, increases in energy prices, or have important budgetary implications. This paper presents a context for the consideration of the climate issue, lays out the broad policy options available for limiting emissions, but does not analyze the costs and benefits of particular options.

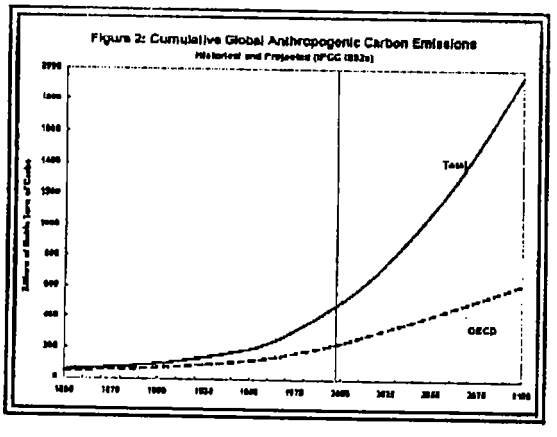
Growing emissions of greenhouse gases (GHGs) from industrial activity and land-use changes are rapidly raising the concentrations of these gases in the atmosphere, making some degree of climate change virtually certain. Although there are many sources of greenhouse gases, carbon dioxide (CO_2) from fossil fuel use is the source of greatest concern because of its rapid historical and projected growth.[1] Atmospheric carbon concentrations are already over 30% higher than their preindustrial levels and rising at about 4% per decade. The further potential for human activities to disrupt the natural balance is enormous because there are hundreds of years' worth of carbon (at current rates of use) currently available in proved fossil fuel reserves that could be exploited under current economic and technological conditions – and even larger "ultimately recoverable" reserves. In the absence of controls, emissions are projected to grow quickly as the developing countries experience rapid population growth and industrial development. These trends are expected to lead to ongoing atmospheric accumulation and climate change into the indefinite future, with a doubling of atmospheric carbon concentrations sometime during the second half of the next century and a resulting long-run increase in average global temperatures by an estimated 1.5° to



[1] In total, human activities have already resulted in roughly 250 billion tons of carbon (gigatons of carbon or GtC) emissions from fossil fuel combustion and perhaps 200 GtC from net deforestation since 1700. In terms of carbon equivalent, cumulative anthropogenic greenhouse gas emissions since the beginning of the Industrial Revolution have been roughly 570 billion metric tons of carbon equivalent (GtCe), of which about 450 GtC have been carbon. (Deforestation and other changes in land use have reduced the amount of carbon stored in biota and soils by perhaps 275 GtC, or around 10%, since the beginning of agriculture.) More than 75% of all fossil emissions in history have occurred since 1945, and 50% have occurred since 1970. About 40% of total carbon emissions have accumulated in the atmosphere, raising the stock of atmospheric carbon by nearly 30% from 280 ppm (parts per million) to over 360 ppm. Somewhat less than half of current emissions are accumulating in the atmosphere, while the rest is absorbed in natural sinks (the oceans and biosphere) through processes that are as yet only poorly understood. Although most of the increased carbon will ultimately be absorbed by the oceans, the increased atmospheric concentrations of carbon dioxide and other greenhouse gases will affect the climate for centuries to come.

4.5°C. Even stabilizing global emissions at 1990 levels *permanently* will lead to a near doubling of atmospheric carbon concentrations by the end of the next century.

Climate change is truly a global problem in the sense that emissions from anywhere will affect everyone everywhere. As a consequence, concerted international action will be needed to induce all countries to cooperate in reducing emissions. Nevertheless, cooperation will be hampered by the uneven distribution of past and future emissions. Simply put, the developed industrial nations have relatively high levels of per capita emissions and are largely responsible for past emissions, while the developing nations, whose per capita emissions are currently very low, will be responsible for the bulk of emissions in the future.[2] Since the developed countries have high levels of emissions now and have already used up a substantial portion of the overall "GHG budget," the developing countries will be reluctant to undertake any emissions reductions at all in the absence of significant emission controls on the part of the developed countries. (The issue becomes more complex when all GHG emissions and sequestration from land-use changes are taken into account, but the basic point holds.) Sharing the burden of control among countries will thus be a very serious and difficult issue.



At the same time, it is clear that actions taken by the developed countries alone are likely to have little effect on cumulative global emissions or on atmospheric concentrations. Based on the projections shown in Figures 1 and 2, stabilization of Annex I country[3] emissions at 1990 levels from 2000 through 2100 would reduce cumulative carbon emissions by around 8%, and would reduce atmospheric CO_2 concentrations in 2100 by less than 5%. In other words, Annex I emissions stabilization will still lead to well more than a doubling of atmospheric CO_2 concentrations by 2100. Even stabilizing total global emissions – which, given anticipated population growth, would require dramatic reductions in global per capita

[2] Historically, fossil carbon emissions have come mainly from the U.S. (27% of the postwar total), the rest of the OECD (22%), and the former Soviet Bloc (24%). The rest of the world, with nearly 80% of the population, is responsible for a mere 27% of cumulative emissions. On a per capita basis, U.S. emissions are over 5 tons per person per year; the industrial nations of Western Europe and Japan emit about 2 to 2.5 tons per person; and the nations of the former Soviet Bloc, whose per capita emissions used to be very high due to the inefficiencies of central planning, have fallen to about 2.5 tons per person. At the other end of the spectrum, the developing countries of the Americas, Africa and Asia have emissions on the order of 0.6 to 0.2 tons per person.

Despite their relatively low emission levels, developing countries' emissions are growing very rapidly. (Developing county emissions grew by a whopping 21% between 1990 and 1995, and global fossil fuel emissions have been roughly stable during this period only because of the 30% reduction in former Soviet Bloc emissions associated with the collapse of the centrally planned economies.) Given current projections of population growth and economic activity, developing countries' share of annual global fossil emissions should surpass that of the developed countries during the second quarter of the next century. However, their share of *cumulative* fossil emissions will remain below that of the developed countries for many years to come, as will their per capita emissions.

[3] The OECD nations plus the former Soviet Bloc.

emissions – will not lead to stabilized concentrations. *Stabilization of concentrations requires global emissions to fall well below current levels, and ultimately to decline to zero.*

Researchers have examined in some detail the emissions paths – and various distributions of emissions between developed and developing countries – required to meet atmospheric carbon concentration targets of 450 to 750 ppm, representing increases of 63% to 173%% over preindustrial concentrations.[4] All of these targets require significant reductions in global carbon emissions from the roughly 1500 MMTC projected over the period 1991 to 2100 in the absence of controls, as shown in Table 1. Furthermore, these budgets must be distributed both across countries and across time. And while there is room for increases in emissions in the near term, higher growth in emissions in the near term must be offset by increasingly dramatic reductions later on.

Table 1: Alternative Carbon Targets and Budgets

Target	Carbon Budget 1991-2100 (GtC)	Reduction from 1500 GtC
450 ppm	630 - 650	-57% to -58%
550 ppm	870 - 990	-34% to -42%
650 ppm	1030 - 1190	-21% to -31%
750 ppm	1200 - 1300	-13% to -20%

The United States is currently engaged in international negotiations concerning limits on greenhouse gas emissions with the goal of signing an agreement in Kyoto, Japan, in December, 1997. This legal instrument will prescribe the obligations of the United States and other countries with respect to greenhouse gas emissions. Among the items under negotiation are:

- the emissions budget for single or multiple years
- the additional temporal flexibility accorded to emission reduction obligations such as the banking and borrowing of reduction obligations
- the gases and sources to be included in an emissions budget and the rules for trading among them
- the extent of and rules for international trading of emission reduction obligations
- measurement, verification and compliance mechanisms to ensure countries meet their budgets
- other policies and measures

A domestic mitigation program would have to implement this agreement and be consistent with its provisions. Since many issues are currently unresolved, it is not possible at this time to precisely delineate the options for implementing a domestic greenhouse gas mitigation program. Nonetheless, it is possible to outline several general approaches for mitigating greenhouse gas emissions.

[4] The lower target would limit the projected average global temperature increase to roughly between 0.6° to 1.75°C; the higher target would limit the increase to between 1.4° to 3.5°C.

Mitigation Options

There are a number of policies and options which may be used to mitigate emissions of greenhouse gas emissions. Some options are more focused on the short term and aim to increase the rate at which existing energy efficient technologies are deployed in the marketplace. These options seek to overcome information and other market barriers to the use of these technologies. Other options seek to create new government infrastructure to internalize greenhouse gas emissions in the marketplace. Finally, no mitigation program can be fully successful without the development of new technologies that dramatically reduce greenhouse gas emissions in the long term.

Market Transformation Programs

There is evidence that a wide range of energy saving technological options already exists, but is not being implemented. Studies by the National Academy of Sciences, the Office of Technology Assessment, and the American Council for an Energy-Efficient Economy have demonstrated that the technological potential already exists to cut energy consumption by 20% or more at a net economic benefit. Market transformation programs seek to deploy this potential.

Some of these barriers to the deployment of existing technologies are the result market failures. Markets, by themselves, will not provide information at optimal levels. This is because those providing information cannot capture all the returns to their investment. However, for energy efficient technologies to be employed, potential buyers of products need to know of the technology, as well as its performance and economic benefits. Service providers must have the expertise to appropriately design for, install, and operate the technology. In many cases, these conditions are not met.

A second market failure relates to environmental externalities. Using energy efficient equipment results in less generation of pollution. However, these pollutant reductions are not valued in the marketplace even though they result in widespread social benefits. This, in turn, results in underinvestment in energy saving technologies.

A number of successful, market transformation programs are currently underway. The Climate Change Action Plan (CCAP) programs, as well as other DOE programs, are overcoming many of the existing market failures in all sectors of the economy. Despite budget cuts, these programs are making a substantial contribution to controlling growth in greenhouse gas emissions. Examples include the ENERGY STAR consumer labeling program which allows manufacturers to label qualifying, efficient products and provides reliable information on energy consumption to consumers. The Green Lights Program is targeting the provision of energy efficient lighting in the commercial sector, while DOE's motor challenge program seeks to improve the efficiency of electric motors in industry.

The CCAP programs were designed to maximize reductions by the year 2000, a relatively short period of time to achieve fundamental market transformation. With continued support beyond the year 2000, these programs should significantly restrain growth in U.S. greenhouse gases through 2010 and beyond. Previous interagency analysis indicates that around 1/3 of total emissions growth through 2010 will be avoided by the CCAP.

There are additional barriers that the Climate Change Action Plan programs and other efforts are not yet fully addressing. Many arise from split incentive problems, which occur when the manufacturer or purchaser of a technology does not receive the energy bill savings. Others are related to the ubiquitous problems of imperfect information. Following are some example areas where further efficiency improvements can be gained through government interventions to overcome market failures:

- Should a domestic emissions trading system be created, a reserve of allowances or a portion of auction revenues could be set aside to reward new R&D investment and production of efficient equipment.

- A financial institution (along the lines of Sallie Mae) could be established to invigorate a profitable secondary market for energy efficiency financing.

- An energy performance rating system for commercial buildings could be established to provide better information to prospective buyers and energy efficiency education and/or certification for designers and contractors.

- Sector-wide compacts could be established in which entire industries could pledge improvements in energy intensity and benefit from shared information on technologies.

Standards and Regulations

Limitations on greenhouse gas emissions could also take the form of standards and regulations. Such standards could include:

- *Minimum energy efficiency standards for energy consuming equipment:* Historically, these have targeted appliances and other residential and commercial equipment, as well as personal transportation (i.e., the Corporate Average Fuel Economy (CAFE) program).
- *Other measures:* These can take many forms and could include minimum purchase requirements for renewable sources of electricity, demand side management programs (which mandate electric utilities to undertake information and energy efficiency subsidy programs), federal spending rules for transportation infrastructure, and federal procurement policies.

Standards could also be imposed directly on sources of greenhouse gas emissions. For example, a powerplant could face a limit on the amount of carbon dioxide emitted per kilowatt of electricity generated. Another example is methane from some landfills, which is already controlled due to limits on emissions of volatile organic compounds. However, such a program would probably be inferior to an emissions allowance trading program (described below).

1. Energy efficiency Standards

Appliance Standards

Standards for energy consuming equipment can expand markets for such technologies, help to reduce information barriers and can lower consumer's decision costs. Standards can also provide incentives to private research and development by reducing uncertainty in the market. U.S. homeowners spend $110 billion each year to power home appliances. These uses account for about 70% of all the primary energy consumed in homes.

During its typical 10-15 year lifetime, an appliance's operating costs may exceed its initial purchase price several times over. Nevertheless, many consumers do not consider energy efficiency when making purchases. Manufacturers are often reluctant to invest in more efficient technology that may not be accepted in the highly competitive marketplace.

Recognizing the great potential for energy savings, many states began prescribing minimum energy efficiencies for appliances. Anticipating the burden of complying with differing state standards, manufacturers supported the development of federal standards that would preempt state standards. Federal standards provide a high degree of certainty for energy savings and achieve higher penetration rates for efficiency gains than voluntary, educational or incentive programs.

In 1975, the U.S. Congress established a program of test procedures, energy conservation standards, and labeling for certain major household appliances including refrigerators, freezers, air conditioners, water heaters, furnaces, dishwashers, clothes washers, clothes dryers and kitchen ranges and ovens. A 1987 amendment, the National Appliance Energy Conservation Act, set the first national efficiency standards for these appliances and established a schedule for regular updates by DOE to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified.

The Energy Policy Act (EPACT) of 1992 expanded coverage to certain commercial and industrial equipment, including commercial heating and air-conditioning equipment, water heaters, certain incandescent and fluorescent lamps, distribution

transformers, and electric motors. EPACT also established maximum water flow-rate requirements for certain plumbing products and provided for voluntary testing and consumer information programs for office equipment, luminaires, and windows.

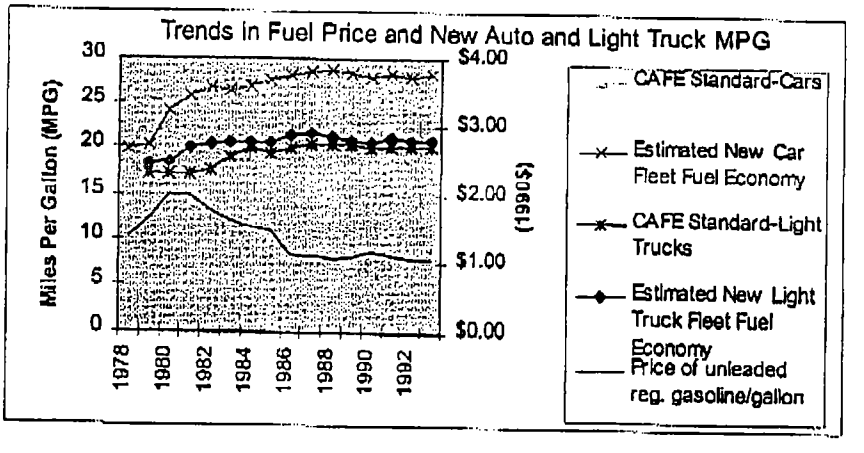
Under DOE's first rulemaking in November 1989, updated standards were set for refrigerators and freezers that went into effect January 1993. The Final Rule for energy conservation standards for clothes washers, clothes dryers, and dishwashers issued in May 1991 became effective May 14, 1994.

The initial standards included in EPCA, and those already amended by DOE, are expected to save about 23 quadrillion Btus (24.3 exajoules) of source energy from 1993 to 2015. Current appliance standards have already saved consumers $1.9 billion and will ultimately save $58 billion in energy costs over the lifetimes of units installed between 1990 and 2015.

In addition, more efficient products are more competitive internationally and have environmental benefits from reduced atmospheric emissions. The total emission reductions of federal appliance standards implemented to date are estimated to be 14.2 MMTCE in the year 2000. Further development of standards could result in additional reductions.

Personal Transportation

The Energy Policy and Conservation Act of 1975 established mandatory average fuel economy standards for new cars and light trucks starting with the 1978 model year.



The standard is calculated by each manufacturer's fleet (domestic or import) and model year. Each manufacturer's fleet average is equal to the sales-weighted fuel economy of all its new cars or light trucks of that vintage that are sold in the United States. Manufacturers that exceed the standard can carry forward credits for up to three years; manufacturers that fall short can carry backward projected future credits for up to three years. Failure to comply with CAFE requirements can result in a civil penalty. No major U.S manufacturer has ever paid a fine; only European manufacturers of luxury cars have opted to pay a fine rather than comply with the standards in a given year or take advantage of the credit system.

Opinions differ concerning the impact of CAFE on the fuel economy of the fleet of light duty vehicles on the road and its implications for future requirements. One view is that CAFE has constrained consumer choice, and has caused manufacturers to subsidize fuel efficient vehicles in order to stay in compliance. This view is supported by observations that CAFE standards have tracked new vehicle fuel economy fairly closely. During the period when CAFE standards were rising, from 1978-1985, fuel economy also rose, and during the period since 1985 both CAFE standards and on-road fuel economy have remained steady. As measured by EPA, CAFE and new vehicle fuel economy have not differed by more than a few MPG in any year since CAFE was introduced.

Others argue that rises in fuel economy in the late 70's and early 80's can be explained not by CAFE, but first and foremost by rising fuel prices and expectations about future fuel prices as a result of fuel crises in 1973-74 and 1979-80. Statistical analyses are employed to show that a combination of other factors also explain changes in fuel economy during the entire period in which CAFE has applied, including fuel prices, changes in consumer preferences for vehicle attributes other than fuel economy, and a proper accounting of the time required for manufacturers to change products in response

2. Other Measures

Standards could also be used to limit greenhouse gas emissions in other sectors of the economy. Most prominent among these are:

Electricity Restructuring: There is currently a trend among states to adopt retail competition for the electricity industry. This trend could be accelerated with federal legislation. Retail competition is expected to lower the price of electricity by as much as 20-25% in certain regions and change the fuel mix of generation. Preliminary EPA and DOE analysis indicates that utility greenhouse gas emissions could rise by as much as 2-6% as a result. To mitigate the environmental impacts of competition and maintain the environmental benefits of current state level renewable and demand side management programs, a number of options have been adopted at the state level (for states that have already adopted competition) or are under consideration for the rest of the nation. These include:

- A "portfolio standard" for renewable energy or greenhouse gas emissions: This involves requiring that all generators meet a specified level of renewable generation or greenhouse gas emission reduction either by undertaking such projects themselves or purchasing "credits" from others who have.

- A social benefit fund: Revenue is collected by placing a charge on transmission service. The funds are then used to subsidize energy efficiency projects or low income consumers. California has already adopted this approach.

- Information disclosure requirements: Generators could be required to disclose the emission profiles of their generation, facilitating the marketing of "green" electricity.

- Additional air pollutant requirements: Many states are hesitant to adopt retail competition because they perceive that differing regional environmental requirements both put their electric industry at a competitive disadvantage and will result in more pollution being transported into their states. Thus, additional environmental requirements to "level the playing field" – which could include greenhouse gas emission reductions – are currently being debated.

The Intermodal Surface Transportation Efficiency Act (ISTEA): This Act establishes the rules for federal transportation funding to the states. In 1991, ISTEA authorized $140 billion in transportation projects over a six year period. The Act expires in 1997 and Congress is now considering options for its reauthorization. These could include provisions that would indirectly reduce greenhouse gas emissions. Examples include the following:

- *Congestion Mitigation and Air Quality Improvement Program:* Additional funds could be targeted to transportation projects that reduce air emissions and energy consumption on a long-term sustainable basis.

- *Brownfields Restoration:* Successful redevelopment of browfields can help revive inner city areas and reduce sprawl, thereby reducing vehicle miles traveled. By focusing job growth in inner city areas it encourages greater reliance on more energy efficient and environmentally sound transporation modes, including transit, walking, and bicycling. More funds could be made available for these projects.

- *Incentive Funds:* Climate actions through ISTEA can produce economic efficiency and reduce emissions, while increasing mobility choice and community livability. One option would be to create a $500 million Fuel Efficiency Incentive Fund that rewards the ten states that are able to reduce fuel consumption, on a per capita basis, the greatest over the next five years.

Emissions Trading

Emissions trading is a tool for meeting a total quantity limit on emissions. It involves allocating or auctioning emissions allowances to sources, and allowing the trading of allowances in a market with sufficient mechanisms to ensure compliance with targeted levels. Emission trading systems can offer both static and dynamic efficiency advantages over more traditional forms of regulation. The potential for static efficiency gains exists because emitters face different abatement costs. Emissions trading allows those with high abatement costs to purchase allowances from those whose costs are lower. Total costs would therefore be lower than through traditional regulations which

require all polluters to comply with a specific standard. However, it should be noted that such a program involves people and firms adjusting to higher energy prices.

Dynamic efficiency gains can arise because emissions trading provides an incentive to conduct research and development in pollution abatement technologies. Under traditional regulation, firms have little incentive to investigate ways of abating pollution by more than the minimum required to comply with regulatory requirements -- even though going beyond the standards would result in additional environmental benefits. This, coupled with the inability of firms to capture all the economic benefits from R&D spending, results in under-investment in abatement technology R&D. Under emissions trading, emitters continue to face an incentive to look for further cost-effective ways of achieving emissions reductions even when they are in compliance with allowance limits. This is because any "surplus" allowances created can be sold to others in the emissions allowance market or banked to meet future reduction obligations. Emissions trading can therefore lead to a more rapid rate of development of pollution control technologies than those traditional regulatory policies that do not offer incentives to go beyond compliance. In addition, tradable permits can provide incentives for reduced total energy use. Experience in the United States has shown that final compliance costs for the programs that have incorporated emissions trading have, in general, been dramatically lower than ex ante expectations.

An emissions trading program, like any program designed to limit greenhouse gases, must contain certain elements. First and foremost, an agreed upon emissions budget must be established. A central authority must be given the responsibility for verifying compliance and must be provided sufficient information to do so. Finally, there must be real consequences for noncompliance with allowance limitations or reporting requirements, such as penalties or subtraction of allowances.

A program would have to establish permit lifetimes, monitoring and enforcement provisions, as well as rules for permit banking, borrowing, and trading. Consideration should also be given to transaction costs, which should be kept as low as possible. However, particularly difficult issues involve who is required to hold a permit and how permits should be allocated.

The decision for determining who should be required to hold a permit should consider the following:

- *Coverage:* While it may not be necessary to ensure that every ton of greenhouse gas is accounted for within an emission trading regime, the scope of coverage of the trading program should be sufficient to ensure compliance with targets set in accordance with an international agreement.
- *Administrative and Compliance feasibility:* The number of sources involved in the trading program should be small enough to be administratively feasible and large enough to ensure market competition. In addition, monitoring and verification of permit compliance must be possible for those included in the program.

- *Potential to Diffuse Low Greenhouse Gas Technologies:* Alternative points of intervention should be evaluated for their ability to provide incentives for research, development, adoption and diffusion of low greenhouse gas technologies.
- *Market Impacts:* Any program that limits emissions will affect the bottom line of firms. The permit program will have economic impacts that vary depending on program design. For example, exempting certain sizes or categories of sources from permit requirements because of administrative or equity concerns (e.g., small boilers or home heating oil) has competitive implications within the energy market.
- *Wealth transfers:* Allocating permits redistributes wealth within the economy. The amount of redistribution can be large depending on the permit price (which is determined by the emissions target and the cost of fossil fuel substitutes). While one option would be to auction permits with revenues accruing to the government, another would be to award permits to sources based on historical rates of emissions. In the latter case, wealth would be transferred to whomever is allocated permits.

In the case of carbon dioxide, direct emitters number in the hundreds of millions since they include sources such as automobiles and residential gas water heaters. However, since virtually all of the carbon contained in fossil fuel extracted from the ground (with the possible exception of certain feedstocks) is eventually released to the atmosphere, a trading program need not focus uniquely on direct emitters, but can target other points in the energy market. These include fuel extraction, processing, refining, distribution, and secondary conversion (e.g., coal to electricity). In addition, these points could vary by fuel type. For example, an emission trading program could focus on the point of final combustion for coal, but on refining for oil, or distribution for natural gas.

In an emission trading system, some mechanism must be provided for allocating permits to sources. There are a number of options available for so doing. These include allocating permits on the basis of baseline/historical emissions (where permits are given to those currently emitting) or through an auction (where revenues accrue to the government). These two mechanisms could also be combined: some portion of permits could be allocated on the basis of historical emissions while the rest are auctioned. Given that an auction could produce substantial revenues, some decision would have to be made with respect to what to do with the proceeds.

Research and Development (R&D)

Given the long term nature of the climate change problem and the long lifetimes of energy related capital stock, R&D can be an important element of a greenhouse gas mitigation program. The aim of such a program would be to lower the costs of renewable and other lower carbon energy supply technologies and increase the efficiency of energy-consuming products and equipment. Since energy supply equipment can have lifetimes of 60 years or more, having economically viable, less carbon intensive technologies in the

market place as capital stock turns over can produce long term emission reductions. This underscores the immediacy of the need for R&D.

Without government support, markets will underinvest in R&D. This is because, despite rules ensuring intellectual property rights, investors in R&D cannot capture all of the economic returns of their investments. Others benefit from learning about winning technologies without having to compensate original investors. This problem is particularly acute in the energy sector, where research has a long-term time horizon and involves a high degree of experimentation, with some options facing a real potential for failure. In addition, R&D spending on energy efficiency technologies results in widespread environmental benefits that are not captured by markets. Most industrial pollution in the United States comes from the country's seven most energy-intensive industries: steel, aluminum, petroleum refining, chemicals, pulp and paper products, glass, and metal casting. These industries account for about 80 percent of the energy consumed in U.S. manufacturing and for more than 90 percent of hazardous waste and 60 percent of air emissions produced. Existing environmental regulations provide little incentive for these industries to reduce pollution below required levels even though doing so would result in additional environmental benefits. Energy R&D thus offers the potential of preventing pollution that is not valued in the marketplace, but is valued by society.

R&D is particularly important for addressing the issue of climate change. The Framework Convention on Climate Change sets as its objective the stabilization of the concentration of greenhouse gases in the atmosphere at safe levels. No matter what concentration level turns out to be "safe", this obligation requires that anthropogenic CO2 emissions must, over the very long term, decline dramatically, perhaps to zero. Otherwise, atmospheric concentrations would continue to increase as carbon that is now stored in the ground accumulates in the atmosphere.

While replacing the present energy technology is a daunting task, it will eventually happen in any event. The supply of conventional oil and gas resources is limited, and during the first quarter of the twenty-first century most energy models suggest that the ability of the energy system to expand supply at the same pace as global demand will become increasingly difficult. This is likely to lead to higher fossil fuel prices and inaugurate another energy system transition.

Were it not for climate change, coal would play the dominant role in this transition. Coal could be used as a feedstock for synthetic liquids and gases and become an increasingly important fuel for electric power generation around the world. Roughly 1200 GtC of coal – 200 year's worth at current rates of use – are currently available from proved reserves. Given estimates of "ultimately" recoverable fossil fuel resources ranging from 5,000 to 12,000 GTC, it is apparent that uncontrolled fossil fuel use could lead to potentially disastrous levels of atmospheric CO2 and climate change. These levels compare to only about 180 GtC from manmade sources that has accumulated in the atmosphere to date.

The importance of energy technology in shaping the cost of achieving any climate goal is indisputable. Edmunds has calculated that the world-wide discounted costs of stabilizing the atmosphere at 550 ppmv by the year 2100 using 1990 energy technologies would exceed $12 trillion or more than 1.5 percent of GDP – even with maximum temporal and geographical flexibility. In contrast, an advanced technology scenario lowers costs to approximately one trillion dollars or only 0.12% of GDP.[5] Thus R&D spending has the potential to dramatically reduce control costs.

In the United States, measured in almost any way, energy R&D investment levels have declined substantially over the last decade. For example, total (public and private) United States expenditures for energy R&D declined from $5.2 billion in 1985 to $3.4 billion in 1994, a real decline of 42% (expressed in constant 1987 US dollars; Dooley 1996). Furthermore as a percent of GDP, United States investments in energy R&D have declined from 0.074% of GPD in 1985 to 0.035% of GDP in 1994 (Dooley 1996). Public spending declined 10% from 1992 to 1995.

The pattern of energy R&D expenditures could be reoriented given the concern over climate change. The International Energy Agency (IEA) has reported that over the period 1977-1990, its governments spent approximately $120 billion on energy-related R&D. Of this, almost 50% was channeled into nuclear fission research, almost 12% into nuclear fusion research, close to 15% into fossil fuel related research and 9% into general research on electricity generation. Only 5.8% was spent on research on energy conservation and 9% on renewable energy. The latter two options have a considerable potential to mitigate the risk of global warming.

In the shorter term, promising technologies to reduce greenhouse gases include:

- Biofuels: If R&D were funded at current levels for five to ten years, ethanol from fast-growing dedicated crops, crop waste, and wastepaper could be produced for as little as sixty to seventy cents a gallon by 2005. The potential for biofuels is large in the United States because of the presence of excess cropland. Bioenergy could also be derived from municipal and agricultural wastes.

- Hybrid vehicles: These operate with both an internal-combustion engine and some kind of energy-storage device, such as a battery or a flywheel. Supporting technologies include lightweight, superstrong materials and advanced engines, among other things. Current research is being undertaken by the Partnership for a New

[5] For example the efficiency of the average fossil fuel powerplant is assumed to increase at more than 1.0%/yr between 1990 and 2050, from 0.33 to 0.66. End use energy intensity declines at between 0.5%/yr (OECD nations) and 2.5%/yr (Eastern Europe and the Former Soviet Union). The cost of non-fossil fuel electric power generating technologies, other than nuclear and hydroelectric, declines at an average annual rate of 4.5%/yr between 1990 and 2025, and at 1.25%/yr from 2025 to the year 2100. And the cost of biomass energy production declines at an annual rate of one percent per year between 1990 and 2100 from 1990 values ranging from $2.50/GJ to $4.40/GJ, depending on the location and scale of production

Generation of Vehicles, a collaboration among several federal agencies, national laboratories, and the auto industry and has as its goal the development of prototype vehicles.

- Advanced batteries for use in electric cars: These include nickel metal-hydride battery—which promise to double the range achievable with existing lead-acid batteries. In conjunction with advances in clean power generation, these batteries hold the prospect of replacing imported oil with domestically produced electricity.

- Fuel cells. These are compact modular devices that generate electricity and heat with high efficiency and virtually no pollution. They run on hydrogen converted from natural gas and other fuels. The Japanese government has been increasing its fuel-cell budget by an average of 20 percent a year for the past five years, and Japanese companies are less than five years behind U.S. companies in this technology.

- Electricity from biomass and wind: R&D has the potential to bring these technologies into the current range of wholesale costs for coal and other traditional sources of electricity: three to five cents per kilowatt-hour. Gasifying biomass and using advanced turbines could bring biomass power to 4.5 cents per kilowatt-hour within a decade. according to the DOE's National Renewable Energy Laboratory. Royal Dutch Shell projects that by 2010 commercial energy from biomass could provide five percent of the world's power; using Shell's projections, the value of that power generation could exceed $20 billion.

- Photovoltaics: Photovoltaic (PV) cells, which convert sunlight into electricity, now cost one tenth what they did in 1975. In developing nations distributed sources can obviate the need for huge power lines and other costly elements of an enormous electric-power grid (much as personal computers replace large mainframe computers). PV modules sold worldwide totaled less than four megawatts in 1980 and now exceed 80 megawatts a year.

In the longer term, potential future low greenhouse gas emitting technologies include:

- Advanced liquefied hydrogen fuel cells
- Hydrogen transformation from natural gas, biomass, or electrolysis
- Non-fossil fuel electric power generating technologies including solar photovoltaic, nuclear fusion, wind, and commercial biomass energy production.
- Sink enhancement technologies such as CO2 scrubbers and deep injection.

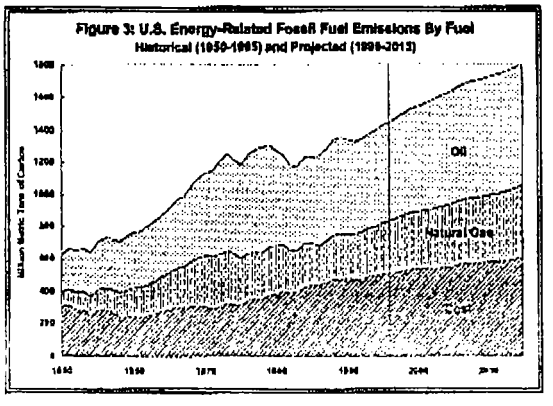
Some reorientation of, and stimulation for, *private* R&D could be expected if some of the other mitigation options described below were adopted. That is, if carbon emission or energy efficiency constraints are adopted, the market for technologies that mitigate carbon would be expanded, raising the pay-off to successful R&D in this area. This would not eliminate the need for government sponsored research, however, as the market failures described above would continue to exist.

Conclusion

A number of mitigation options exist for controlling greenhouse gas emissions. In considering which are most appropriate, it is useful to consider the time scale in which they operate. In the near term, priority could be placed on diffusing currently underutilized energy efficiency technologies. This could be best accomplished through programs to address current information and other market barriers. Both the programs of the current Climate Change Action Plan, current energy labeling programs, as well as DOE's appliance standards are targeted at this problem. In the medium term, new government infrastructure, either in the form of emissions trading or expanded regulatory programs could be put into place to limit greenhouse gas emissions. However, in the long run, it is only through the adoption of new, non-fossil technologies, that stabilization of atmospheric concentrations of greenhouse gases can be accomplished. Thus, it is important for any program to consider the incentives it provides for both private and government research and development.

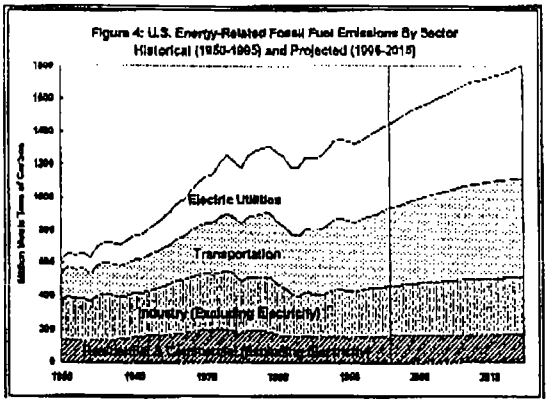
Attachment: U.S. Emission Trends

Total U.S. greenhouse gas emissions in 1995 were about 1,557 MMTCe (million metric tons of carbon equivalent), with gross emissions of 1,674 MMTCe offset by 117 MMTC of carbon sequestered by the nation's forests. *This total represents an increase of 100 MMTCe, or nearly 7%, in just five years.* Of the total, methane accounted for 176 MMTCe, mainly from landfills and agricultural activities, nitrous oxides about 40 MMTCe, and the various halocarbons 37 MMTCe. The remaining bulk of U.S. emissions were carbon emissions from fossil fuel combustion and non-fossil industrial activities.



Annual U.S. fossil-related carbon emissions have grown from around 620 MMTC (million metric tons of carbon) in 1950 to about 1430 MMTC in 1996, and are projected to rise to around 1800 MMTC over the next twenty years. Coal's share of the total has fallen from 50% in 1950 to 35% in 1996; while oil's share has risen from 36% to 42% and natural gas' share has risen from 14% to 23%. These shares are expected to remain fairly steady over the next quarter century.

The electric utility sector's share has grown from 12% in 1950 to 35% in 1996 (500 MMTC), as the American economy has steadily increased its use of electricity. Over 85% of electric utility sector carbon emissions come from burning coal. Similarly, the transportation sector's share of fossil-related carbon emissions has grown from 28% in 1950 to 33% in 1996 (470 MMTC), with oil accounting for practically all of the fuel use in the transportation sector. Thus, the transportation and utility sectors together currently account for 68% of U.S. fossil-related carbon emissions.



In contrast, carbon emissions from the residential and commercial sectors' direct energy use have fallen from 22% of the total in 1950 to 12% in 1996; while emissions from industrial direct energy use have fallen from 38% to 20%. However, if electricity-related carbon emissions are attributed to the sectors that consume the electricity (rather than to the utility sector which produces it), the residential and commercial sectors' share has risen from 28% in 1950 to 35% in 1996. In contrast, the industrial sector's share has fallen from 44% in 1950 to

32% in 1996, as industry's share of economic activity has declined and services' share has risen.

Attributing electricity-related emissions to end-use sectors, then, 35% of carbon emissions are related to households and commercial businesses; 33% are related to transportation, and 32% are related to industry. These shares are projected to remain fairly constant over the next twenty to twenty-five years, although transportation's share of carbon emissions will increase slightly, while electricity generation will account for a slightly increasing share of primary energy consumption.