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United States Department of State

*Bureau of Oceans and International
Environmental and Scientific Affairs*

Washington, D.C. 20520

May 23, 1994

MEMORANDUM

To: Interagency Working Group
From: Daniel A. Reifsnyder, Department of State *SAR*
Subject: Review copies of NAP chapters 5 and 6

Attached are copies of DOE's draft of Chapter 5, Mitigation Actions, of the National Action Plan, and USGCRP's draft of Chapter 6, Research and Observations, Education and Awareness. Please note that the Chapter 5 draft includes only DOE's input; EPA and other agencies also have contributions to make to it, which we hope to have in hand shortly. Also, the international portion of Chapter 6 will be folded into Chapter 7, International Activities.

EPA has already distributed interim draft copies of Chapter 3, Greenhouse Gas Inventory and its Technical Appendix to some key personnel at DOE, USDA and State. Should any of you wish to review the interim draft, please call Dennis Tirpak or Bill Hohenstein (260-7019) at EPA, or Barbara Cates at State (647-2245) to obtain a copy. EPA plans to circulate its final draft on June 10.

Only one copy of each chapter has been sent to each agency. We have used the agency contacts from the Interagency Working Group, Climate Change Subgroup. Please distribute copies to the appropriate individuals in your agencies, and return to us a single set of collated agency comments. Please return comments to Barbara Cates (fax 647-0191, phone 647-2245) by May 31. I realize that this is a short deadline; please note that this will put us approximately two weeks behind schedule, and that there will be additional chapters that have yet to be distributed.

The U.S. Global Change Research Program (USGCRP)

The U.S. Global Change Research Program (USGCRP) provides the research and information needs underpinning efforts within the U.S. to address the issue of climate change. The USGCRP was formalized through the Global Change Research Act, which was adopted by the U.S. Congress in 1990, establishing a research program "aimed at understanding and responding to global change, including the cumulative effects of human activities and natural processes on the environment, [and] to promote discussions toward international protocols in global change research . . ." To meet these needs, the Clinton Administration is recommending a focused Global Change Research Program budget of \$ 1.8 billion for FY 1995. These funds will support a wide range of policy-relevant research programs by the U.S., providing a major contribution to world-wide global change research efforts.

The USGCRP provides scientific insight into the causes and effects of changes in the Earth system, especially those related to human activities, and the evaluation of options for responding to these changes. The Program supports investments in Earth-system science and in research to develop and evaluate the options for maintaining the sustainability of human communities and protecting the environment. As the depth of the understanding of these systems and their feedbacks grows, the research results provide increasingly valuable input to support national and international policy formulation, as well as to evaluate the impacts and effectiveness of these decisions. Thus, long term commitment to a research program in global change provides the foundation for understanding and evaluating the changing world, and at the same time encouraging wise decisions for the future of the nation and the international community.

Major foci of the USGCRP are: to observe and record what is happening to the Earth's environment, to understand why changes are occurring, and to improve predictions of what will happen; to understand the consequences of change; and to develop capabilities for assessing change. Since its inception, the USGCRP has focused most intensely on:

- supporting land-, ocean- and space-based systems for observing global change;
- developing worldwide data management and archiving systems and enhancing data accessibility;
- supporting research on Earth system processes to improve the understanding of the most important physical, biological, and chemical processes that influence the global system; and
- supporting the development of integrative Earth-system models for predicting the magnitude and extent of global change.

In response to new insights on the complexities of global change, especially climate change, the program is expanding its efforts that are directed towards:

- analyzing the consequences of global change on the environment and on society; and
- developing tools for assessing national and international policies and options for responding to global change.

Current Scientific Understanding of Climate Change

To establish the scientific basis for national and international policy formulation and decisions relating to human-induced emissions of radiatively active substances, it is necessary to monitor and understand the changes occurring to radiatively active gases and aerosols in the Earth's atmosphere and to quantify the effects of those changes on the radiative forcing of climate. In the absence of offsetting factors, climate models predict that increases in greenhouse gas concentrations will raise the temperature of the Earth with potentially severe consequences. Reconstructions of past changes in climate over the Earth's history and theoretical understanding of how atmospheric, oceanic, and biological processes combine to determine the climate suggest that the increase in global average temperature may reach 1.5-4.5 °C over the next century, and that precipitation zones will shift, generally poleward. Recent evidence, however, has shown that increases in atmospheric aerosols,

which can scatter solar energy and which can alter cloud cover, can offset greenhouse warming. Because of the inhomogeneous distribution of aerosols and because of uncertainties in their influence on clouds, their impact on climate models remains difficult to quantify.

In addition to carbon dioxide, several radiatively active trace gases are being studied in the atmosphere. These include CH₄, N₂O, the CFCs and their substitutes, and ozone in the lower stratosphere and troposphere, all of whose atmospheric concentrations are changing as a result of human emissions. Several recent findings have led to policy-relevant conclusions about these trace gases.

CO₂ The atmospheric concentration of carbon dioxide has increased by about 30% since the 1700's. This increase is responsible for more than half of the enhancement of the trapping of infrared radiation due to human activities. Over the past two years the rate of increase in the CO₂ concentration slowed substantially. It is believed that enhanced sinks for carbon are responsible for the recent slowdown, but the exact cause remains unexplained. Recent evidence suggest that in the short term, at least, the land sink may be larger than previously thought. Anomalies in surface temperature and precipitation may have allowed terrestrial ecosystems to accumulate more carbon in the period 1991 to 1993 than normally would have been the case. The cause of the anomaly is unclear, but the timing is coincident with the eruption of Mt. Pinatubo. One hypothesis is that lower temperature at the Earth's surface temporarily reduced rates of respiration and thereby enhanced net carbon uptake.

CFCs. Because CFCs destroy lower stratospheric ozone, which is also a greenhouse gas, the net effect of CFCs as greenhouse gases is less than previously believed. Observations show the rate of increase of CFCs in the atmosphere to be slowing, consistent with international emissions controls, although stratospheric ozone depletion continues to occur.

Methane. The atmospheric lifetime of methane has been determined to be 25% longer than previously thought, which contributes to raising its global warming potential (GWP). New research has shown that while wetlands are a significant reservoir for carbon, methane emissions from wetlands may increase with increasing CO₂ concentration in the atmosphere. Over the last few years, the rate of increase of atmospheric methane has slowed. In 1992, the rate of

increase was sharply reduced, but current measurements indicate that it is returning to earlier values. Continued research is planned to understand whether the reduced rate is due to reduced human emissions or to an enhancement of sinks.

Ozone. Tropospheric ozone is an important greenhouse gas, and its influence is greatest in the upper troposphere. Calculations suggest that increases in upper tropospheric ozone can substantially increase radiative forcing. Field measurements demonstrate that more tropospheric ozone over the temperate North Atlantic Ocean is derived from transported North American precursors (nonmethane hydrocarbons and reactive nitrogen compounds).

Very Long-Lived Greenhouse Gases. The lifetimes of fully-fluorinated ("perfluorinated") hydrocarbons (PFCs), such as CF_4 , C_2F_6 , C_6F_{14} , have been shown, from laboratory and modeling studies, to exceed millennia. Understanding their chemistry and lifetimes ~~are~~ is critical because some have been proposed as CFC substitutes, while others are emitted as trace products of industrial processing, including aluminum production.

Aerosols. Emissions into the atmosphere of aerosols, and gases that chemically react to form aerosols, can have direct effects both on the global radiation balance and on global atmospheric chemistry. These direct effects can then result in follow-on effects on the climate and surface radiative fluxes (e.g., of UV-B radiation). During 1993, measurements from satellites and the surface showed that the volcanic aerosols injected into the stratosphere by the June 1991 eruption of Mt. Pinatubo in the Philippines are finally being removed from the atmosphere, leading to a return of the global average temperature to levels typical of the 1980s, and to a small recovery from the sharply increased rate of ozone depletion in the lower stratospheric, caused, studies suggest, by volcanic aerosols.

Studies on the physical and chemical characteristics of tropospheric aerosols are underway to determine whether changes in aerosol (and aerosol precursor) emissions may be, at least temporarily, hiding the warming effect of greenhouse gases. Research on the radiative effects of sulfate particles formed in the lower troposphere, mainly as a result of emissions from coal and oil combustion and from industrial processes, is important to understanding whether they may be counterbalancing the enhanced greenhouse effect of carbon dioxide. For aerosols emitted by biomass burning, the sign of the

climatic effect is less certain, and is dependent on the amount of black carbon in the aerosol. The absence of measurements confirming the predicted increase in land surface temperatures in the U.S. appears to be most related to recent increases in the frequency of cloud cover. Recent studies suggest that the hemispheric asymmetry in this century's warming may be due, at least in part, to the preferential presence of aerosols in the Northern Hemisphere.

Research on Understanding and Predicting Climate Change

The fact that the measured rise in global temperatures is somewhat less and different in timing than the rise predicted by computer models of the climate system emphasizes the importance of understanding all human influences, as well as the natural variations that may be either compensating for or exaggerating the warming that is evident.

USGCRP research on radiatively active trace species focuses on (1) the growth rates of the common greenhouse gases and why they are changing; (2) the global warming potentials (GWPs) [these are used to compare the relative radiative effects of equal emissions of different gases] of the greenhouse gases of current primary concern to the policy community, in particular, the GWPs of proposed substitutes for the ozone depleting substances; (3) the climate role of "emerging" greenhouse gases, in particular, the PFCs; (4) the abundance, trends, variability, chemistry, and role of tropospheric ozone in the climate system, including the impacts of the ozone precursors (e.g., CO, hydrocarbons, and reactive nitrogen species); (5) the impact of lower stratospheric ozone depletion on the climate system; and (6) the effect of human-induced aerosols in countering the warming trend of the greenhouse gases.

Research on the Impacts of Climate Change

A number of studies indicate that global change may result in more significant impacts on particular regions of the world and on certain global economic sectors. Warming of the oceans, coupled with land surface warming in high latitudes, may cause melted icecaps and glaciers which would result in sea level rise. The amount of sea level

rise could be tens of centimeters over the next century (several times the rate in the recent past), increasing the threats to coastal areas from storms and hurricanes. Prospective shifts in precipitation patterns could cause dramatic changes in world agricultural regions and in the availability of water resources, disrupting long-established patterns of land use. Even though the growth rate of plants can increase in the presence of additional CO₂, forests and grasslands could be degraded by use and altered precipitation patterns. These changes have the potential to cause shifts in flora and fauna greater than those that have occurred in response to natural climatic fluctuations. It is vital to understand what the vulnerabilities and capabilities of these systems to adjust are, and how their resilience to change can be enhanced.

Research supported by the USGCRP is designed to enhance the fundamental understanding of physiological and ecological responses of plants and animals to global changes of climate, atmospheric gas concentrations, and increased UV-B radiation. The international program Global Ocean Ecosystems Dynamics (GLOBEC) will examine the relationship between oceanic physical and biological processes that govern how the recruitment of marine fishes and zooplankton are linked to climatic change. Sensitivity analyses are being conducted to determine the effects of UV radiation on the oceanic carbon cycle in relation to global warming. In addition, methodologies are being developed and validated for estimating the effects of global climate change on lake environmental conditions and fishery resources on a regional basis. The reproductive dynamics of fishery resources, such as sardine, anchovy and mackerel stocks off the coasts of California, Chile, Spain and West Africa, are being studied.

Efforts have been initiated to evaluate the potential effects of climate change at the regional level. Recent impacts modeling efforts have successfully simulated winter precipitation at the local scale for a high-elevation, high-water-yielding mountain watershed in western Colorado by coupling regional/local scale atmospheric models to watershed models. These models also simulated the increase in temperature surrounding several federally managed reservoirs in western US watersheds that might result from doubling of atmospheric CO₂. Coupling global/regional/local scale models for watersheds with three-year current climate records, the average temperature increase predicted in areas surrounding several reservoirs in the model

watersheds was 3.8 °C in the doubled CO₂ environment. Water temperatures are also predicted to increase.

Significant advances in understanding the global and regional effects of climate change on agriculture have been made. These efforts have shown that, for a moderate scenario of climate change projected to accompany a doubling of greenhouse gases, global agricultural production potential is not seriously threatened. These results are sensitive to the positive direct effect of carbon dioxide fertilization on plant growth. Agricultural production losses are likely to be more severe in developing countries. The USGCRP plans to continue research in this area.

Research is also being conducted to determine how atmospheric deposition affects tree growth. The interaction of these pollutants with global change parameters, (i.e., elevated CO₂) and with biotic stresses (i.e., insect feeding) is also being investigated. These studies demonstrate that pollutants such as ozone and elevated CO₂ influence insect behavior, and hence forest health. Existing data on wildfires and prescribed, sedimentation of lakes, fire history, and climate have been used to refine ecosystem response models that improve the ability to anticipate ecosystem fluctuations due to climate change. These data are being used in dynamic vegetation modeling.

Global change, particularly changes in land use, can have substantial impacts which may result in a reduced ability to preserve species diversity. Landsat data for Brazil, for example, has shown a large increase in the fragmentation of the habitat, a process that reduces the number of plant and animal species (biodiversity). The area shown to be severely fragmented, and hence with diminished biodiversity, was thus more than twice the area actually deforested.

Research on Responses to Climate Change

Because projected acceleration in the rate of change is also vitally important, it is also essential to explore national and international options that may be available for reducing the extent and momentum of human influences. The problems associated with global environmental change have highlighted the need to understand the fundamental relationships between policy goals and the social processes which contribute to achieving those goals.

Responses to environmental changes occur at many levels in society. Response planning requires a predictive understanding of the various ways that individuals, institutions, and societies will react to environmental change and the policies or programs that are intended to mitigate or adapt to the consequences of global change. An empirical basis for this predictive understanding builds from research on historical adaptation to environmental change and environmental catastrophes; such studies provide some insights on the effectiveness of voluntary and coordinated responses.

Another aspect of exploring response options depends on improving our capability to understand and predict the human behavior, and understanding the ability and willingness of societies to change, both socially and technologically. This requires more concentrated research on the economic and social effectiveness of potential policy options that currently exist or are being developed to encourage sustainable patterns. Current research in the social and economic sciences is focusing on issues such as:

International population trends and the human condition

- What are the interactions between population growth/migration and environmental change?
- What demographic and social factors are particularly relevant for assessing the vulnerability of societies to environmental change?
- How do the health impacts of environmental change affect consumers and households?

Patterns of trade and global economic activity

- How do world economic growth and international trade patterns affect the use and value of environmental resources such as wetlands, coastal zones, and forest?
- What effects might large-scale debt-for-nature swaps have on global environmental resources?
- How will the development and diffusion of technology affect impacts from global changes?
- What effects might changes such as political and economic liberalization have on the use of environmental goods?

Adaptation and mitigation, including environmental resource use and management

- Under what conditions has adaptive behavior to environmental stresses been undertaken in the past?
- What are the costs and benefits of various policy approaches to influence the use of key resources such as land, energy, water, and coastal zones?
- How do institutional and legal rules affect the use of common property resources?
- What international mechanisms and processes can be used to build the international coalition needed to stabilize concentrations of greenhouse gases?

Research on Developing Tools for Assessing Policies and Options

An important new area of emphasis in the USGCRP is the development of decision tools and analytic approaches that will assist both short- and long-term needs of decisionmakers. In recognition of the fact that many responses to global change must be made at more local levels, many of these tools are more local in character. These new tools will enable decisionmakers to address competing objectives and to analyze potential trade-offs among available options. Particularly high demand has been expressed for new decision tools that can be used in coastal-zone management. Issues like fisheries, flooding, erosion, water quality and allocation, and sea-level rise in coastal settings require adaptive strategies, which must be considered in the context of complex human-environmental interactions over varying time scales despite high degrees of uncertainty.

Recent successes in the refinement of decision-support tools have been made possible through advances in knowledge of critical natural processes. As more complete understanding is gained of the frequency and scale of physical phenomena, decision tools have been refined to reduce uncertainties about the socioeconomic consequences of environmental changes. One example of these improvements is the improved predictive accuracy of El Niño/Southern Oscillation (ENSO) phenomena. Using more accurate forecasts, resource managers have been able to alter management strategies with respect to water use and agricultural practices.

The development of tools for conducting integrated assessments are also an important part of USGCRP research. Integrated assessment is

a process or mechanism which supports the policy process by bringing research results from natural, social, and policy sciences into a framework that helps decisionmakers formulate and evaluate actions to respond to potential environmental change. A major objective of integrated assessment is to develop information about the interactions of complex, linked systems and problems, and make this information available in the decision-making process. Integrated assessments also help set priorities for the natural as well as the social and policy science research areas by providing information about the relative value to decision makers of specific research investments. Integrated assessments advance the state of research by providing a framework for synthesizing findings and data from the physical, chemical, biological, economic, social, and health sciences.

The USGCRP plans to markedly increase its support of integrated assessment activities. Some of the increase will support the development of methods and tools. One set of tools, integrated assessment models (IAMs), are an emerging type of model that link human forcing functions (e.g., greenhouse gas emissions), the effects of those forcings on the physical Earth-system, the resulting impacts on humans and ecosystems, and the economic and environmental consequences of potential responses. The models allow different global climate change policy options to be evaluated according to various parameters, such as their effect on Gross Domestic Product and unemployment. A number of the climate change IAMs have evolved from cost models developed primarily in the 1970s and 1980s that predict emissions and calculate the cost of meeting various emission or concentration goals.

Related Research on Impacts, Adaptation and Mitigation

Many programs relevant to impacts, adaptation and mitigation of global change are underway as part of efforts outside of the USGCRP contributing substantial information to these global change issues. Programs on impacts examine effects of global change on the environment and society, including water quality and supply, agricultural systems, and the health and diversity of natural systems. Research in mitigation focuses on the reduction of greenhouse gases and ozone depleting chemicals in the atmosphere by reducing emissions and increasing sinks for these gases. Research in adaptation focuses on developing technologies and modifying

practices to cope with climate change and increased UV radiation. Adaptation and mitigation efforts also address costs and feasibility of alternative technologies and their transfer, and provide economic analyses of possible response strategies.

The President's Climate Change Action Plan, a \$280 million program in FY 1995, to reduce greenhouse gas concentrations in the atmosphere consists of almost 50 actions involving all sectors -- industry, transportation, homes, office buildings, forestry and agriculture. Several USGCRP agencies are reviewing progress under the Action Plan on a biennial basis to report on current trends and adapt existing programs to evolving circumstances. Improved land and agricultural management will be encouraged through technical and economic assistance to private non-industrial landowners. New residential appliance standards and a renewable technology consortium are being developed to encourage improved efficiency and commercialization of renewable technologies. Another program is encouraging the use of more energy-efficient lighting equipment.

U.S. funding for greenhouse gas mitigation research to develop energy efficient technologies for reducing emissions from all sectors has increased about 40%. Examples include energy supply and fuel usage in the utility, industrial, commercial and residential sectors; process and operation studies in energy-intensive industries such as primary metals, chemical and petroleum, cement and pulp and paper; fuels and efficiency for the transportation sector, as well as transportation modes and influences of urban planning; energy consumption, biomass burning practices, and fertilizer usage in the agriculture and forestry; afforestation/reforestation efforts and maintenance of soil carbon pools; coal mining practices; and CFC alternatives and new refrigeration, air conditioning and fire retarding technologies. This additional research, outside of the USGCRP, contributes to the overall goals and objectives of the USGCRP.

Impacts and adaptation research includes understanding the effects of global change on water supply and quality; review of water utilization and related technologies; understanding the effects of global change on food, fiber and timber supply, and ways to reduce vulnerability in these areas; understanding vulnerability and adaptability of species habitats and maintaining the health and diversity of natural systems; understanding the interactions and

effects of global change on humans; and researching human adaptability to change.

International Activities of the USGCRP

The U.S. is a major participant in international efforts to understand and assess the state of knowledge about global change issues. Hundreds of scientists from more than fifty countries have participated in the recent Intergovernmental Panel on Climate Change (IPCC) science assessments and the World Meteorological Organization (WMO)/United Nations Environment Programme (UNEP) assessments of ozone, which have included scientific, environmental impacts, and technology/economics assessments. Intergovernmental assessments are intended to serve as primary inputs to the many international conventions and protocols which the U.S. supports, such as the Framework Convention on Climate Change (FCCC), Montreal Protocol on Ozone, and the Convention on Biological Diversity.

The IPCC was established by the WMO and UNEP in 1988. It derives part of its mandate from the UN General Assembly. The purpose of the IPCC is to assess the information in the professional literature related to various components of the climate change issue. The IPCC does not sponsor research, although in some fields, it does encourage lead authors to synthesize results and apply insights from the literature in novel ways. U.S. scientists, both within the government and in the academic research community, have been instrumental in assisting in these efforts.

IPCC scientific assessments over the past years have not only provided information requested by governments but have also served to identify components of the climate change issue which deserve priority attention from the research community. To date, the IPCC has produced the 1990 Assessment Report and a 1992 Supplement. Progress on a 1994 IPCC Supplement addressing several very specific issues is underway. Together, these reports establish a common basis of scientific opinion. This basis has been used by governments to negotiate the Framework Convention on Climate Change that was signed at the U.N. Conference on Environment and Development (UNCED). A Second Supplementary Report to the IPCC Scientific Assessment, dealing with radiative forcing of the climate system, ~~currently in preparation,~~ is scheduled for release in June, 1994, and will serve as the scientific input to the

First Meeting of the Parties to the U.S. Convention on Climate Change, currently anticipated to be held in 1995.

IPCC is also due to complete in 1995 a second comprehensive assessment. Member agencies of the USGCRP will be closely coordinating efforts to assure needed support for participation of U.S. scientists in the three IPCC working groups. IPCC Working Group I is co-chaired by the United Kingdom and Brazil, and is charged with assessing the state of science with respect to the functioning of the climate system and possible changes to it resulting from human activities. IPCC Working Group II, co-chaired by the United States and Zimbabwe, is assessing potential impacts, adaptation, and mitigation measures. IPCC Working Group III, co-chaired by Canada and South Korea, is focusing on assessments of cross-cutting issues, including the economic implications of climate change and of available emissions scenarios.

Participation of U.S. scientists as lead and contributing authors is particularly strong due to the many activities supported by the USGCRP. In addition, for Working Group II, the USGCRP has established an IPCC Secretariat under the leadership of Dr. Robert Watson, Associate Director for Environment at the Office of Science and Technology. The Secretariat is providing support to U.S. authors of the 1994 and 1995 IPCC assessments, and which is tasked with coordination of the U.S. country reviews of the documents.

U.S. scientists, with strong support from the USGCRP, have also played an important role in developing a series of international assessments of stratospheric ozone depletion. In accordance with the provisions of the Montreal Protocol on Substances that Deplete the Ozone Layer, which entered into force in January, 1989, the United Nations Environmental Programme (UNEP), in coordination with the World Meteorological Organization (WMO), has sponsored a series of reports assessing the current state of knowledge of (1) scientific, (2) environmental, and (3) economic and technological matters relevant to implementation of the Protocol. The assessments are prepared at least every fourth year at the request of the Parties.

The UNEP/WMO assessments serve as the internationally recognized technical input underlying decisions taken by the Parties to amend the Protocol. The 1989 assessments were used as the basis for the London Amendments adopted at the Second Meeting of the Parties in 1990, and the 1991 assessments were used as the basis for the

Copenhagen Amendments adopted in 1992 at the Fourth Meeting of the Parties. A supplementary assessment on the atmospheric science, technology and economics of methyl bromide was prepared of the Parties in June, 1992 and served as the basis for decisions made that year by the Parties to limit methyl bromide use. Current plans call for creation of a 1994 set of assessments for consideration at the Seventh Meeting of the Parties in 1995.

The USGCRP is a major contributor to international global change research programs. Many nations, both developed and developing, contribute to this international cooperative research, primarily through three major international programs: (i) the World Climate Research Programme (WCRP); (ii) the International Geosphere-Biosphere Programme (IGBP); and, (iii) the Human Dimensions (of Global Environmental Change) Programme.

International programs are coordinated at a series of levels, including scientist-to-scientist, agency-to-agency, and government-to-government through a broad range of multilateral and bilateral organizations and arrangements. These arrangements generally involve United Nations agencies concerned with global change research, including the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC of UNESCO), and the United Nations Environment Program (UNEP). The International Council of Scientific Unions (ICSU) provides strong leadership for scientific planning for many of these key international programs, especially the WCRP and the IGBP. The U.S. shares in funding ICSU's coordination of these activities, and U.S. scientists and agencies participate on and interact regularly with ICSU, its Secretariat, and various related committees. U.S. scientists have also chaired many of the international scientific steering groups for the major international global change research programs, and have actively promoted regional programs as well.

Leading international economic organizations are also now considering how global change might impact economic development and identifying global change research-related issues that might usefully be addressed in the future. These include the Organization for Economic Cooperation and Development (OECD), which recently convened an experts' meeting on global change that resulted in a series of recommendations to its members for future action on the need for scientific inputs from the social science community to the policy process, and the Asia-Pacific Economic Cooperation

organization (APEC), which is reviewing the impacts and effects of global change in the Asia/Pacific region.

The U.S. is currently placing special emphasis on the development of networks and institutes to promote the development of regional capabilities to conduct global change research. The agreement establishing the Inter-American Institute for Global Change Research (IAI) entered into force early in 1994, following ratification of the Agreement in 1993 by the requisite number of signatories. The IAI Conference of the Parties is expected to meet for the first time in the spring of 1994. The United States will be working closely with the other countries party to the Agreement, as well as other signatories who have not yet ratified the Agreement, to assure that the Conference adopts a broad regional scientific program which also contributes to global objectives. The U.S. will continue to offer financial support to assist in organizing the scientific workshops which are needed to provide a basis for the IAI's scientific program.

The U.S. will increase its interaction with the European Commission (EC) with regard to implementation of the European Network for Research in Global Change (ENRICH). ENRICH is intended to improve coordination of global change research in three areas: Western Europe; Central and Eastern Europe; and Africa. The EC is expected to soon establish a central ENRICH Office in Brussels with liaison offices in each of the above three regions. The U.S. expects to work closely with the EC and the countries of Central and Eastern Europe and of Africa to develop regional global change research agendas for these regions.

Japan hosted a second workshop, in January of 1994, convened to plan an Asia-Pacific Network for Global Change Research (APN) in which U.S. scientists representing the CENR's Subcommittee on Global Change Research (SGCR) will participate. This workshop was intended to advance planning for the APN to serve as a framework within which sub-regional networks focused on areas such as southeast and temperate East Asia can coordinate their research efforts. It is expected that the APN will focus on issues of region-wide scope, such as those specific to tropical and coastal areas in the Pacific.

The U.S. will continue to work actively to support the development of a network of climate prediction centers. These centers are intended to advance our ability to predict ENSO-related climate variability on

seasonal to interannual time scales, and to produce and systematically disseminate regionally-tailored climate forecasts for use in a wide range of economic and social planning activities. Objectives in 1994 include: convening the second in a series of nine-month training exercises for international climatologists at the Lamont-Doherty Earth Observatory; workshops to examine the potential applications of climate predictions for North America and Africa; pilot application exercises in Peru, the Pacific Islands, Brazil, Australia, Southeast Asia, and Southern South America; and a high-level intergovernmental meeting to launch the multinational coordination of this initiative.

Another example of international commitment to build indigenous capacities for global change research in the developing areas of the world is the SysTEM for Analysis, Research and Training (START), a joint effort of the HDP, IGBP, and WCRP to develop regional research networks for global change. The START regional research networks promote focused research and training on regional issues of global importance, integrate and synthesize the research results and provide input to decision makers at national and regional levels. The USGCRP provides support for the operation of the International START Secretariat, based in Washington, D.C. , as well as for programmatic implementation of the START framework. This support also enables both U.S. and developing country scientists to participate in international scientific workshops and symposia on global change research issues.

The United States has initiated a \$25 million program to help countries develop scientific capabilities to address climate change. Under this initiative the U.S. is providing technical and financial support to developing countries and countries with economies in transition. The studies are designed to assist countries in developing inventories of greenhouse gases, assessing their vulnerabilities to climate change, and evaluating strategies for reducing net emissions of greenhouse gases and adapting to potential impacts of climate change.

U.S. Data Policy

The U.S. has developed a policy of full and open access for all to U.S. global change data. Language similar to the U.S. policy statements on the management of data for global change research, has been incorporated into various formal and informal international

agreements, including the Framework Convention on Climate Change, Agenda-21, Agreement establishing the IAI, the IGBP, IOC Data Management Policy for Global Ocean Programmes, CEOS Data Policy Resolution, and the US-Russian Joint Statement on the Development of Cooperation in Environmental Observations from Space and in Space Science. The CENR Sub-Committee on Global Change Research and the U.K. Inter-Agency Committee on Global Environmental Change are developing a draft joint arrangement for exchange of global change data.....

USGCRP Education and Communication Programs

The general public is the ultimate decision maker for national response strategies and policies. Thus, it is critical that the USGCRP provide sufficient information to improve the public's understanding of the global change science including consequences and implications of policy options. To respond, the USGCRP has programs for general education, communication, and dissemination of data and information.

The challenge of the education and communications activities of the USGCRP is to develop methods and tools to achieve the following objectives:

- Involve public and institutional decision makers in program planning and examination of policies and choices;
- Expand public awareness of global change: the prominent issues, their scientific complexity, and needed research, that includes predicting consequences and evaluating policy options for responding; and
- Train future scientists and educators. Promote understanding among educators and decision makers of the multidisciplinary nature of global change issues and solutions.

The effective conduct of the USGCRP is dependent on effective dialog among the various constituencies of the program. The USGCRP has undertaken specific initiatives to meet this objective. The private sector, including academia, industry consortia, and environmental groups currently conducts significant research in the areas of

environmental and natural resources, some of it already in conjunction with Federal agency programs. The USGCRP encourages private sector and government agency interactions to minimize duplication, to focus on key problems and issues, and to bring working-level researchers together.

USGCRP Education Programs

USGCRP agencies have long standing programs for the development of education materials for primary and secondary school levels. USGCRP agencies have developed monographs, resource guides, curricula, and other supporting teaching materials on global change, which are distributed to science teachers nationally. The USGCRP recognizes the need to strengthen the human resource base in science and technology and to provide the United States with highly trained and educated individuals. Thus, at the inception of the USGCRP, the agencies augmented this foundation to respond to the cross-disciplinary aspects of global change.

The major emphasis of these educational programs has been to award competitive graduate-level and postdoctoral fellowships for developing the interdisciplinary problem-solving skills that are necessary for addressing global change science, technology, and policy issues. Both postdoctoral and graduate-level fellows are encouraged to interact with the scientific staff of the various Federal research organizations. The postdoctoral fellows conduct research at agency laboratories, which may be outside their supporting organization, and as a part of university research projects. The graduate fellows are being trained and educated at 31 different universities and are required to spend at least six weeks at Federal laboratories to acquaint themselves with ongoing multidisciplinary research programs in global change.

To complement the agency programs, the USGCRP has launched an interagency initiative, *Project Earthlink*. The mission of this initiative is to launch a long-term education effort on global environmental change by increasing the understanding of global change issues, based on IPCC and similar scientific assessments, describing the effects of human actions on the global environment, and fostering access and use of scientific data sets and information technologies for informed decision making and policy formation. Six audiences will be targeted: community leaders, informal educators, teachers, students, journalists and the general public. Planned activities

include a National Town Hall Video conference on global change issues, workshops for educators and for journalists, community demonstration projects on sustainable practices, student science fair projects on global change data collection, and use of information superhighways to access scientific data sets.

Materials appropriate for different audiences will be developed, including an educator resource guide, a journalist resource guide, a data set directory, a manual on the use of information technologies, and classroom activities for students. Topics include natural variability, greenhouse effect, sea level rise, ozone depletion, ecosystem response, health effects, and decision making under scientific uncertainties.

Project Earthlink is being carried out in coordination with other White House initiatives, including the President's Council on Sustainable Development, Global Learning and Observations to Benefit the Environment (GLOBE), the Committee on Education and Human Resources, Americans Communicating Electronically, and Digital Resources for Education and Training. For example, the development of instructional materials planned for students in Project Earthlink will be coordinated with the design of GLOBE to provide teacher training and supporting materials to complement the GLOBE experiments. A highlight of these activities will occur in conjunction with the 25th Anniversary of Earth Day in April 1995.

Data and Information Dissemination

The USGCRP data and information dissemination activities are designed to serve the full range of national and international users of data and information. Thus, the design must recognize that users will request not only research data but also derived products such as analyses or edited data collections in association with descriptive text or graphical material. Many of these value-added products will be the product of choice for the non-research community.

Individual agency programs, whose focus is supporting the data and information needs of USGCRP researchers, are also supporting outreach activities to the broad global change user community. These include published and on-line directories, announcements in newsletters and other publications, and training workshops for teachers and educators.

An integral component of the GCDIS is the Global Change Research Information Office (GCRIO) which began operation in 1993. The GCRIO is currently tasked to: (1) determine GCRIO-specific and related global change information holdings and dissemination methods used by various agencies and develop modalities for conveying that information to end-users; (2) facilitate information access by developing a capability to point-to, or store, retrieve, and directly disseminate global change research information; (3) provide customer service to both technically sophisticated as well as low-technology end-users as stipulated in the legislation; and (4) evaluate the functioning and effectiveness of the disseminating global change information to the end-user community.

The GCRIO has identified worldwide sources of data and information to satisfy requests about Global Change topics. The Internet provides the primary access to these tools, and most are available at no charge to the user. The GCRIO will provide easy to use on-line data and information services. For example, the GCRIO has implemented a GOPHER menu system on the Internet which identifies available resources and allows the user to connect to some on-line systems.

The USGCRP is a long-term, diverse, complex, and evolving undertaking. Clearly, the success in the USGCRP depends upon the cooperative and energetic leadership among the participating agencies to provide a better understanding of the issues involved. The education and communications activities are central to meeting these goals, and to building an informed public capable of participating in the necessary public dialogue toward building a sustainable future.

MITIGATION ACTIONS

The major greenhouse gases are carbon dioxide (CO₂), methane, nitrous oxides, and hydroflourocarbons (HFCs), including perflourocarbons (PFCs). Net emissions of these gases in the U.S. are projected to grow by about 7 percent between 1990 and 2000 without the **1994 National Action Plan**. Emissions of greenhouse gases are project to grow from 1462 million metric tons of carbon equivalent (MMTCE)¹ in 1990 to 1568 MMTCE in 2000 and 1777 in 2010².

Carbon dioxide from fossil energy production and use is the largest contributor to greenhouse gas emissions. In 1990, gross U.S. CO₂ emissions were 1,367 MMTCE. In 1990, forests and other plants removed 130 MMTCE from the atmosphere, leaving net U.S. carbon emissions at 1,237 MMTCE in 1990. Emissions of methane, primarily from landfills, coal mining, natural gas production, and agricultural activities, were 166 MMTCE in 1990, or less than 12% of U.S. net greenhouse gases. Nitrous oxide (N₂O) emissions (39 MMTCE) and HFCs (20 MMTCE) contributed another 2.7% and 1.4% respectively of greenhouse gases in 1990.³

Net carbon emissions alone are projected to grow to 1,337 by the year 2000 -- over 8 percent above 1990 levels -- without the policies in outlined in the Action Plan.⁴ Methane and nitrous oxide emissions are expected to decline slightly, but HFCs are expected to increase to 45 MMTCE. These projections already account for some policies recently enacted and programs implemented by the Administration that reduce CO₂, methane, and nitrous oxide emissions. Without these programs, U.S. greenhouse gas emissions would rise to 1,674 MMTCE by 2000, according to Administration estimates. Thus, while significant progress has been made, more is needed to meet the year 2000 goal. In order to return U.S. greenhouse gas emission to 1990 levels by the year 2000, the **1994 National Action Plan** must reduce the projected emission level by about 106 million metric tons below the year 2000 forecasted level. See Table __ for _____

¹ All gases are converted to MMTCE by conversion factors based on radiative forcing, called "global warming potential." The emission estimates for 1990 and the radiative forcing factors are taken from Emissions of Greenhouse Gases in the United States, 1985-1990 (EIA, 1993) and Anthropogenic Methane Emissions in the United States, Estimates for 1990 (EPA, 1993). The nitrous oxide emissions from agriculture were provided by USDA. Projections are based on analysis conducted by DOE, EPA, and USDA for the Climate Change Action Plan. Baseline estimates of emissions may change as internationally recognized methodologies evolve.

² Further references to 2010 can be found in the Climate Change Action Plan: Technical Supplement, which follows this chapter.

³ The HFC figure includes a small amount of other halogenated compounds, discussed later.

⁴ Although projections of greenhouse gases are given as point estimates, considerable uncertainty surrounds any projection that depends on future economic activities. A broad range of outcomes are plausible. See the Appendix I for a discussion of uncertainty.

Emission Reductions

The Action Plan is expected to return net U.S. greenhouse gas emissions to 1990 levels by the year 2000. The combined impact of all actions reduces emissions from projected levels by almost 109 MMTCE in 2000. Net carbon emissions are likely to be slightly higher -- about 2 percent above their 1990 levels. The rate of increase in HFC emissions is cut in half. Offsetting these increases in emissions are even larger reductions in methane and nitrous oxide emissions.

The U.S. plan to reduce greenhouse gas emissions, which is primarily the Climate Change Action Plan (CCAP), released by President Clinton in October 1993, is built on a variety of previous actions. Since 1990, the U.S. has passed a number of laws and undertaken a number of administrative actions at the federal, state, and local levels which have served to reduce greenhouse gas emissions. These actions have had the beneficial effect of reducing greenhouse gas emissions in addition to alleviating the problems for which they were created. These actions include: the Energy Policy Act of 1992 (EPACT), the Clean Air Act Amendments of 1990, the Budget Reconciliation Act of 1990, and the Intermodal Surface Transportation Act of 1991.

The EPACT has served to reduce greenhouse gas emissions in different ways. There are several titles of EPACT that are extremely important to the overall strategy of reducing greenhouse gas emissions. They include:

Title I-- the energy efficiency title of the EPACT establishes energy-efficiency standards, promotes research and deployment of energy efficient technologies, promotes dissemination of energy savings information, and provides incentives for state and local authorities to promote energy efficiency.

Titles III, IV, V, and VI-- the alternative fuels and vehicle titles of the EPACT provide monetary incentives, establish federal requirements, and provide for research, design and development of fuels and vehicles that can reduce carbon emissions.

Title XII, XIX, XXI, and XXII-- the renewable energy title, the revenue provisions, the energy and environment title, the energy and economic growth title; promote increased research, development, production, and use of renewable energy sources.

Title XVI-- the global climate change title of EPACT provides for the collection, analysis and reporting of information pertaining to global climate change.

Title XXVIII-- this title streamlines licensing for nuclear plants, which enables nuclear power to displace carbon emitting sources.

In addition to EPACT, the 1990 Clean Air Act Amendments (CAAA) achieve substantial reductions in greenhouse gases and their chemical precursors. The CAAA reduces U.S. emissions of volatile organic compounds, carbon monoxide, and nitrogen oxides, which will curb tropospheric ozone levels, in addition to reducing emissions of the more familiar pollutants such as sulfur dioxide. Moreover, the CAAA will result in direct carbon dioxide reductions due to more efficient electricity generation. The CAAA also promotes enhanced energy conservation and fuel switching to natural gas.

The Intermodal Surface Transportation Efficiency Act of 1991 provides for improved operation of the transportation system and gives state and local governments increased flexibility in spending federal funds for a variety of projects. The act requires the development of a prototype of a completely automated highway and vehicle system, which would aid in reducing greenhouse gas emissions.

Approach

The **1994 National Action Plan** targets multiple emission reduction opportunities in all major areas: energy demand in the residential, commercial, industrial and transportation sectors, energy supply, methane and other gases, and forestry. A broad portfolio of policy actions is more likely to succeed than a narrow one. Some programs called for here will work better than expected, while others may fall short of their estimated impact, but a portfolio approach reduces the risk that any specific program that does not live up to expectations will cause a substantial shortfall of emission reductions.

CARBON DIOXIDE

ENERGY DEMAND ACTIONS

In 1990, the United States consumed nearly 85 quadrillion Btus of primary energy⁵, which produced 1,338 million metric tons (MMTs) of carbon.⁶ Fossil energy consumption is responsible for almost 85 percent of gross U.S. greenhouse gas emissions. The largest end-use energy consumer in 1990 was the industrial sector, which used 32.1 quadrillion Btus (39 percent) of the primary energy supplied. Residential and commercial energy consumption comprised slightly more than one-third of primary energy supplied to end users, with the residential sector consuming about 28 percent more than the commercial sector. Transportation comprised 27 percent of primary energy.

⁵Primary energy consumption includes fuels used to generate electricity. Losses associated with the conversion of primary fuels to electricity are distributed to end-use sectors based on electricity sales.

⁶ A British Thermal Unit, or Btu, is the quantity of heat needed to raise the temperature of 1 pound of water by 1°F at or near 39.2°F. A quadrillion Btu (quad) is 10¹⁵ Btu.

Investing in energy efficiency is the single most cost-effective way to reduce CO₂ emissions. The **1994 NAP** combines an array of public/private partnerships to stimulate the deployment of existing energy-efficient technologies and accelerate the introduction of more advanced technologies. These programs will cut CO₂ emissions while enhancing productivity at home and U.S. competitiveness abroad.

Technical studies have consistently shown that profitable energy efficiency investments exist in residential, commercial, and industrial sectors, yet many of these opportunities go unrealized. This observation neither refutes the technical studies nor suggests that people or firms behave irrationally -- energy analysts have identified the information, regulatory, financial and institutional barriers that impede this investment. Many private sector efforts successfully address these barriers. For example, utility sponsored conservation programs and energy service companies are able to use these opportunities for profitable energy savings.

Programs that enhance and accelerate these trends can help reduce greenhouse gas emissions and increase U.S. competitiveness. The **1994 NAP** is a comprehensive strategy that applies innovative solutions to these investment barriers -- from financial reforms in residential mortgages to agreements between motor manufactures and users. This plan will align market forces with the environmental imperative to reduce greenhouse gas emissions.

In the past, many Federal programs have been a confusing patchwork of competing activities that were not coordinated effectively with utility or state and local efforts. By expanding existing successful programs, by combining them with new and complementary initiatives, and by linking programs with State, local, and private sector efforts, the **1994 NAP** will maximize the energy-saving impact of Federal programs and their associated greenhouse gas emissions reductions.

Commercial Energy Efficiency Strategy

In 1990, commercial buildings accounted for nearly 11 percent of total end-use energy consumption in the United States⁷. However, commercial buildings consumed over 30 percent of all electricity, primarily for lighting, heating, cooling, and air handling. Including the fossil fuel used to generate the electricity, the commercial sector accounts

⁷ All 1990 energy figures are derived from *Annual Energy Outlook 1993* (Energy Information Administration). "End-use" energy does not include the generation and distribution losses in electric generation, which on average account for almost 70 percent of the fuel input used in powerplants.

for over 15 percent of gross U.S. CO₂ emissions.⁸

Commercial buildings are complex, dynamic systems made up of numerous components and subsystems. The energy-related subsystems include: the building envelope; the lighting system; and the heating, air-conditioning, and ventilation systems. The energy requirements of a building depend not only on the performance of these individual systems, but also on how they are integrated and operated in the building. The 1994 NAP incorporates actions to lower energy use in commercial buildings that address specific building attributes, such as lighting, as well as those that take a whole-building approach.

Across America, companies are investing in energy efficiency in order to improve their energy performance, lower overhead, and increase their competitiveness. The Environmental Protection Agency (EPA) Green Lights program continues to help firms reduce lighting bills by forging agreements with corporate partners, utilities, lighting equipment suppliers and by offering state-of-the-art technical assistance. The Department of Energy (DOE) and EPA sponsor research programs in commercial energy technologies. Expanding these programs into new technologies and markets will further cut greenhouse gas emissions while improving competitiveness.

The following actions are part of the 1994 NAP:

- EPA and DOE will launch new coordinated initiatives, *Energy Star Buildings* and *Rebuild America*, for efficient heating, cooling, and air handling.
 - EPA and DOE will provide the product development, marketing and technical assistance necessary for comprehensive commercial building upgrades.
 - By bringing the most up-to-date technical knowledge to the people who need it, these programs will help companies reduce their overhead and become more efficient, and will stimulate the introduction of more advanced commercial technologies.
- EPA will enhance its *Green Lights* efforts to reach untapped portions of the commercial lighting market. Since its inception in 1991, the Green Lights program has entered into more than 1,000 partnership agreements covering over 4 billion square feet of facility space (representing over 5 percent of all U.S. commercial and industrial space) to analyze and, where profitable, to upgrade lighting equipment with more energy-efficient systems.

⁸ This emission figure assumes that the sector's electric utility CO₂ emissions are proportional to its share of electric demand.

- The expanded Green Lights will include new partnerships with electric utilities, a new marketing effort targeted to attract non-profit partners, and expanded technical support for program participants.
- DOE will create a *State Buildings Energy Incentive Fund* that includes state revolving funds for public buildings. The Administration will provide seed money of \$10 million per year over five years to States to fund, design and start-up of energy management programs for public buildings.
- DOE will initiate *cost-shared demonstrations* of emerging technologies in Federal, State or local government as well as private buildings. This action will help overcome the lack of confidence in new technologies, a major barrier to their acceptance.
 - Demonstrated technologies will include: fuel cell applications for on-site power generation; advanced windows including electrochromic technologies; advanced building monitoring/control systems; and active and passive solar technologies.

Residential Energy Efficiency Strategy

In 1990, America's homes consumed 15 percent of all U.S. end-use energy, and accounted for 34 percent of U.S. electricity demand. Including the fossil fuels used to generate electricity for homes, the residential sector contributed 19 percent of U.S. CO₂ emissions in 1990.

The **1994 NAP** targets key opportunities in the residential sector, such as delivery of heating and cooling services, home appliances, lighting, and the design of the building exterior itself, and includes a mix of partnerships with business and utilities, economic incentives, and new standards and building codes. There are environmental and economic advantages to bringing energy efficiency to the residential sector. An energy-efficient new home that meets today's best design criteria consumes 50 percent less energy than a poorly designed alternative, while offering a lower lifecycle cost. A typical home built 15 years ago can be upgraded to save 20 percent of energy use, at a profit to homeowners.

The following actions are part of the 1994 NAP:

- EPA and DOE will form new "*Golden Carrot*" partnerships with non-profits, utilities and environmental groups to accelerate the commercialization of advanced energy efficient appliances. The Golden Carrot creates a financial incentive for the development of more efficient appliances by combining financial resources from a variety of sources. For example, some utilities offer rebates to customers who purchase efficient appliances because the efficiency investment "on the consumer

side of the meter" (i.e., the rebate) can help the utility avoid having to build an expensive new powerplant. Under a Golden Carrot, several utilities pool their rebates to provide a clear market signal (a guaranteed pool of rebate money) for appliance manufacturers to commercialize advanced energy efficient appliances. The original Golden Carrot -- the Super Efficient Refrigerator Program -- pooled \$30 million in utility rebate money for the manufacturer who could commercialize a 50 percent more energy efficient, CFC-free refrigerator.

- DOE will issue new *residential appliance standards* for eleven product categories: central air conditioners, furnaces, refrigerators, room air conditioners, water heaters, direct heating equipment, mobile home furnaces, kitchen ranges and ovens, pool heaters, televisions and fluorescent lamp ballasts. Cost-effective energy standards ensure that consumers will only be able to purchase appliances that are both energy efficient and affordable. Raising the energy efficiency of appliance standards will result in a measurable decline in electricity use in the United States.
- DOE will work with the U.S. Department of Housing and Urban Development, Veterans Administration, and other Federal agencies to lead a new national effort to market *Home Energy Rating Systems (HERS) and Energy-Efficient Mortgages (EEMS)*. These programs allow home buyers to finance investments in energy improvements through their mortgage lender when the monthly energy savings are greater than increased monthly mortgage payments. Current federal and state programs are fragmented and not readily accessible to lenders or borrowers and their use is not widespread. Federal agencies will coordinate an effort involving financial institutions, utilities, and contractors to ensure that a uniform EEMS program reaches the intended market.
- DOE will assist States in *updating and enforcing residential building codes* by the end of 1994. Code enforcement, which lags in many regions, is an effective tool to increase the energy efficiency of homes.
- DOE, the Department of Agriculture, the Department of Defense and their industry partners will take *Cool Communities* beyond the pilot stage. This program promotes the use of strategic landscaping to shade residential and commercial buildings, and of light-colored building surfaces to reduce absorption of sunlight. In targeting 100 Federal facilities and 250 new cities (population of 30,000 and over), the program will work with homeowners, businesses, and their communities and partners to proliferate strategic landscaping and light-colored surfacing as energy-conserving technologies.

Industrial Energy Efficiency Strategy

The nation's industries consumed 39 percent of the nation's end-use energy in

1990, including 35 percent of electricity generated. Since two-thirds of the sector's electricity use is for motors, industrial motors use over 20 percent of all U.S. electricity generation. Including the emissions from electricity generation, the industrial sector accounted for 33 percent of U.S. CO₂ emissions in 1990. A small number of major manufacturing groups -- primary metals, petroleum refining, chemicals, pulp and paper - account for about two-thirds of industrial energy use and 19 percent of gross domestic product (GDP).

Since the 1970's, the Federal government has funded a large research and development program for energy efficiency and waste-reduction technologies in the industrial sector. The **1994 NAP** establishes working partnerships with American industry to help get those improvements off of the drawing board and on to the factory floor.

The following actions are part of the 1994 NAP:

- DOE has launched the *Motor Challenge* -- an industry-driven collaborative program to test, verify, and disseminate information on the cost saving potential of industrial motor systems -- and to get commitments from American industry to use them. Companies will achieve increased efficiency in their motor systems through the system integration of a variety of technology and application options including: energy efficient motors, adjustable speed drives, and efficient motor-driven equipment (e.g., pumps, fans, compressors).
- DOE will create "*Golden Carrot*" programs for industrial equipment. By helping to pool financial incentives and purchasing power, these programs can stimulate rapid commercialization of new energy efficient equipment. Targeted equipment include air compressors, fans and pumps, and other types of industrial process equipment.
- EPA, DOE and the Department of Agriculture will expand voluntary source reduction, pollution prevention, and product recycling programs targeted at industrial producers. Increased source reduction and recycling of paper and other municipal waste will save energy and money, reduce greenhouse gas emissions, reduce the need for natural resource extraction and help alleviate disposal problems.
- EPA and DOE have launched the *Climate-Wise* program, a performance-based recognition program based on the premise that government can spur innovation by jointly establishing goals and allowing individual firms to identify the most cost-effective means to achieve them. Through Climate-Wise, EPA and DOE will recognize and encourage a broad array of emission reduction measures, including industrial process changes, raw materials and fuel substitutions, and innovative transportation programs.

ENERGY SUPPLY ACTIONS

The fuels used to meet U.S. energy needs vary in their greenhouse gas emissions. Among fossil fuels, natural gas emits the least amount of CO₂ per unit of energy provided, while renewable energy sources such as solar, wind, geothermal, hydroelectric and biomass energy, release no net CO₂. Nuclear power, which currently provides over 20 percent of electricity generated, will continue to play a key role in limiting CO₂ emissions from electricity production because it has no greenhouse gas emissions. Newer technologies can also increase the efficiency of generating and distributing electricity. Increased efficiency lowers the amount of greenhouse gases emitted by reducing the amount of fuel needed to generate and deliver electricity to customers. The energy industry is entering an era of unprecedented change due to market and regulatory shifts. The Energy Policy Act of 1992 and actions taken by the Federal Energy Regulatory Commission (FERC) have increased competition in a variety of energy markets, increasing the efficiency of energy supply. New requirements under the Clean Air Act have prompted a shift to cleaner fuels. Federal research and development into new energy technologies continues to help the industry meet environmental and market challenges.

The **1994 NAP** includes a number of new actions to reduce the amount of CO₂ emitted from energy production and use. In the energy supply area, the Plan's intent is to increase the use of natural gas; encourage the commercial application of renewable energy resources; make more efficient use of our existing hydroelectric resources; and reduce the amount of energy lost in electricity transmission.

Natural Gas Strategy

Natural gas, an abundant domestic fuel, emits less CO₂ per unit of energy provided than either oil or coal. The Administration recognizes the environmental, economic, and national security benefits of encouraging the use of natural gas.

The following actions are part of the 1994 NAP:

- EPA will *encourage the use of natural gas as a pollution control strategy* under the Clean Air Act. This initiative will lower the cost of combatting the severe ozone pollution problem plaguing many of our cities in a way that also reduces greenhouse gas emissions. As part of that effort, EPA recently issued guidelines to urge state and local pollution control agencies to allow the use of natural gas in the summer in existing coal- and oil-fired power plants as a NO_x reduction strategy. EPA will examine additional regulatory options where shifts to cleaner fuels could provide environmental benefits and cost savings.
- DOE will accelerate the *commercialization of high-efficiency gas technologies* such as fuel cells through joint ventures with utilities, research organizations and

technology developers to fund demonstrations and market entry initiatives. Fuel cells are an ultra-high efficiency and environmentally benign method of producing electricity and by-product thermal energy. This technology provides a means of converting a fuel's chemical energy into electrical energy without a combustion process.

- DOE will work with the Federal Energy Regulatory Agency (FERC) to continue to facilitate the implementation of reforms that will increase the availability and use of natural gas. This action will further the work of the FERC to enhance the market-orientation of an industry that previously had been characterized by excessive regulation, which unnecessarily hampered the ability of the natural gas industry to serve its customers at cost-effective prices. The focus of this initiative will be on an investigation of current pipeline construction rules, promulgation of incentive ratemaking guidelines, and a review of the rules regarding the secondary market for pipeline transportation.

Renewable Energy Strategy

Renewable energy sources include solar energy, biomass energy (wood, wood waste, and energy crops), geothermal energy, wind energy, hydroelectric power, and related energy sources that emit relatively little or no net greenhouse gases. Through increased funding, utilization of incentives included in the Energy Policy Act of 1992 to promote the use of renewable energy, and the removal of institutional barriers, the Administration is already laying the groundwork for a future that can rely on these resources. The **1994 NAP** features new initiatives to accelerate the widespread commercial deployment of renewable energy sources.

The following actions are part of the 1994 NAP:

- DOE to form a *renewable energy technology consortium* with utilities that will increase the emphasis on commercialization programs for windpower, photovoltaics, biomass, and geothermal energy. DOE will facilitate collective purchases of nearly-commercial renewable energy technology by States, utilities, and other interested firms. Mass purchase strategies enable equipment manufacturers to increase their production capacity and reduce their unit costs -- which will in turn further broaden the market for the technologies.
- The Administration to propose legislation to enable non-Federal developers to invest in environmentally sound *upgrades at existing Federal hydroelectric projects*, and to sell the incremental power at market rates. Significant technological potential exists for increasing generation at hydroelectric facilities, but institutional barriers have stifled efforts to make these profitable efficiency upgrades. Non-Federal investments will increase generation from hydroelectric facilities, reducing the need for fossil fuel-fired generation. Lease payments will help reduce the

To: Jonathan Pershing
From: Linda Silverman

This should replace
1st bullet under "Electricity
Distribution Efficiency Strategy"
on p. 11
Thanks!

Electricity Distribution Efficiency Standards

- DOE will accelerate the development of testing requirements for distribution transformers to determine if standards would be technically feasible, economically justified, and result in significant energy savings. DOE is charged with developing testing requirement for distribution transformers under the Energy Policy Act of 1992. Losses from utility distribution transformers in service are about 1.5 percent of the amount of electricity generated¹. Based on the DOE determination, testing procedures, standards and labelling will be accelerated so that carbon savings will begin in 1998 or 1999.

¹ Losses from comparable size distribution transformers on the customer side of the meter are significantly higher.

Federal deficit.

Electric Distribution Efficiency Strategy

In 1991, about 7.4% of U.S. electric generation was lost while being distributed from power plants to end-users. When transmission and distribution losses are reduced, less electricity needs to be generated to meet end-use demands, which reduces CO₂ emissions. The Federal Energy Regulatory Commission is currently implementing changes in the Federal Power Act contained in the Energy Policy Act of 1992, which will help promote the efficient use of the transmission system. The **1994 NAP** focuses on increasing the adoption of more efficient transmission and distribution equipment.

The following actions are part of the 1994 NAP::

- DOE is determining if *distribution transformer standards* would be technologically feasible, be economically justified, and result in significant energy savings, in accordance with the Energy Policy Act of 1992. Distribution transformers reduce the distribution system voltage to a level that can be used by customers. There are approximately 40 million distribution transformers in service with approximately 28 million units located on the utility side of the meter. Losses from utility distribution transformers in service are about 1.5 percent of the amount of electricity generated. Losses from comparable size distribution transformers on the customer side of the meter are significantly higher. The determination process on standards is being accelerated to the extent possible. If standards are warranted, the process of establishing test procedures, standards, and labeling requirements will also be accelerated to the extent possible.
- EPA to implement an "*Energy Star*" *identification program* to encourage electric utilities to invest in high-efficiency transformers to increase the efficiency of their distribution systems by reducing distribution transformer losses (approximately 41 billion kWh are lost per year in the delivery of electricity from these transformers). Participating utilities would agree to purchase only qualifying equipment that has been designated with the Energy Star logo, and to accelerate the replacement of higher loss transformers where economically warranted.

Utility Industry Strategy

The energy demand and supply programs outlined above rely on an assumed private sector response to a collection of government initiatives. The analysis of their impact assumes that a favorable climate exists for the penetration of technology and that the programs will be supported by electric utilities. In order to ensure that these programs deliver the estimated impacts, and to enhance the prospects for early emission reductions, DOE has begun to forge commitments with electric utilities to limit greenhouse gas emissions. In addition, DOE and EPA will expand their efforts to encourage

supportive state regulatory actions.

The following actions are part of the 1994 NAP:

- On April 19, 1994, 766 utilities signed a Memorandum of Understanding with the Department of Energy outlining their commitment to the *Climate Challenge*. The *Climate Challenge* is a voluntary program, being developed jointly by the electric utility industry and DOE to reduce, limit, or avoid greenhouse gas emissions. This partnership links accountability with maximum flexibility to give participating utilities an opportunity to demonstrate cost-effective emission reduction efforts. These utilities represent about 80 percent of U.S. electricity generation and about 80 percent of CO₂ emissions from this sector.
 - The Climate Challenge is an innovative government/industry partnership. It builds upon Section 1605(b) of the Energy Policy Act of 1992, in which participants report historic emissions baselines and submit periodic reports of actions taken voluntarily to successfully reduce greenhouse gas emissions.
 - Participating utilities will have flexibility to implement a portfolio of emissions reduction measures -- including enhancing the efficiency of generation and transmission, switching to lower-carbon fuels, investing in renewable generation, enhancing the performance of existing hydroelectric and nuclear capacity, expanding demand-side management programs, undertaking forestry projects, promoting electrotechnologies, and international projects. To the extent that utilities invest in international projects to help meet their voluntary commitments, they could provide an important source of private sector participation in the U.S. Initiative on Joint Implementation (discussed on page _).
- DOE will *Expand Utility Integrated Resource Planning (IRP) Assistance* to provide a foundation for other Federal and State programs, and to encourage a supportive regulatory environment for utilities entering the Climate Challenge. The expanded IRP program will focus on: increasing Federal technical and financial support to State Regulatory Commissions to make utility investments in energy efficiency as profitable as supply side investments and for more effective demand and supply side planning; and increasing Federal support for removing regulatory barriers to increased use of renewables and natural gas. The intent behind this initiative is to provide more planning flexibility, lower costs for utilities over the long-term, and spur adoption of innovative technologies and approaches.
 - Integrated resource planning (IRP) stresses systematic consideration of all relevant options and uncertainties in the development of a utility's resource plan. Such options include both supply and demand resources, such as

renewable generating technologies; programs to help customers improve energy efficiency or use alternative fuels; utility investments to improve the efficiency of their generation, transmission and distribution equipment; purchase of electricity from non-power producers; and electricity imports from Canada.

TRANSPORTATION ACTIONS

The combustion of fossil fuels to move people and goods consumed 35 percent of the nation's energy in 1990 and produced over 32 percent of U.S. CO₂ emissions. The expected increase in demand for transportation services over the next decade will hamper efforts to abate urban air pollution and to reduce U.S. reliance on foreign oil. Transportation will be the fastest growing source of CO₂ emissions through the year 2000. The Action Plan contains a package of initiatives to curb growth in transportation sector emissions by slowing the growing demand for vehicle travel and enhancing the market for more efficient technology and cleaner fuels.

In addition, the Administration has initiated a one-year study of potential additional actions to reduce greenhouse gas emissions from personal vehicle travel, focusing on the post-2000 time frame. This study will involve an Advisory Committee comprised of stakeholders, that will seek consensus on policies to return personal vehicle emissions to their 1990 levels by 2005, 2015, and 2025.

The following actions are part of the 1994 NAP:

- The Administration is preparing legislation *providing workers the option of receiving the cash value of employer-paid parking* as an alternative to existing subsidized parking arrangements. This action calls for transforming an existing tax subsidy narrowly targeted at employer-paid parking into a powerful reward for commuters to ride transit, carpool, or find other ways to get to work. Employees given free parking at work will have the option of retaining the parking space, or accepting a cash allowance equal to the market cost of the leased parking space. The cash reward will be considered taxable income, and will generate income for the Federal Government. Those who opt for the parking space will be unaffected by the change.
- EPA, in consultation with the Department of Transportation (DOT), will draft guidance documents that identify the air quality benefits of *innovative transportation strategies to reduce vehicle miles travelled (VMT)*. The Transportation System Efficiency Strategy will broaden the arsenal of strategies available to cities and States seeking to meet the joint challenges of clean air and urban mobility. This initiative will reduce the costs of clean air compliance and improve the quality of life of transportation users through increased choice and

enhanced environmental quality. Some states have experimented with innovative programs, such as congestion pricing tolls and mass transit finance. New technologies, such as virtual offices (completely portable communications and computing equipment), smart cars and transit vehicles, and advanced traveller information systems will be encouraged.

- DOT will institute a *tire labeling program* to help consumers identify tires that have low rolling resistance. Consumers often purchase replacement tires that have 20% more rolling resistance than original equipment tires, reducing their fuel economy by up to 4%. With the labeling program, consumers will readily have the information they need to make better decisions on how to save gas, save money, and protect the environment, and tire manufacturers will have greater incentive to produce low-rolling resistance tires. This program is expected to result in the purchase of about 20 million additional fuel efficient tires (out of a total replacement market of about 120 million units) in the year 2000.
- DOT has initiated a *telecommuting* program aimed at reducing commuter travel through arrangements that allow employees to work at home or at neighborhood telework centers. DOT has begun to implement a federal pilot telecommuting program, in collaboration with the General Services Administration (GSA), DOE, and EPA that will both utilize the existing federal telework centers developed by GSA and also encourage work at home arrangements. On March 1, 1994, the Secretary of Transportation issued a formal departmental policy on telecommuting and directed DOT to begin to identify potential candidates for this program.

[The following section to follow post-2000 sections]

State and Local Outreach

State Energy Offices and Federal officials are defining a new working relationship as the implementation of National Action Plan actions are developed and carried forward. The intent is to provide support to States and localities to build expertise in climate change policy issues and to provide a central Federal point of contact for greenhouse gas mitigation efforts. States have been involved in the implementation planning process from the beginning, bringing their considerable expertise to these issues, particularly as related to energy efficiency and renewable technologies.

Both EPA and DOE are coordinating efforts to work with States and localities for implementation of these climate actions through a variety of mechanisms. DOE has been holding a series of Regional Roundtable discussions for stakeholders, including State and local government officials, to obtain input and feedback on the DOE initiatives. DOE has established a centralized point-of-contact staff for climate-related activities, and they have been working closely with State energy office staff to ensure internal and external

coordination.

Thirty-five States currently operate industrial and commercial efficiency programs. They have significant expertise working with builders, manufacturers, utilities, public utility commissions (who regulate utilities and natural gas distribution companies), and building owners. For example, many utility demand-side management programs have been initiated through the joint efforts of utilities and State energy offices. State programs have helped hundreds of industrial and commercial energy users to convert from fossil fuels to low-cost biomass and other renewable technologies; organized photovoltaic technologies to work in new applications; and coordinated with State Public Utility Commissions and utilities to implement integrated resources planning, opening up new opportunities for efficiency and renewable technologies.

In addition, EPA has a State and Local Climate Change Outreach Program to build capacity in climate change issues and to integrate climate actions with other activities undertaken under such statutes as the Clean Air Act Amendments of 1990, the Energy Policy Act of 1992, and the Intermodal Surface Transportation Efficiency Act of 1991. EPA provides technical and financial assistance to States and localities to conduct greenhouse gas inventories and develop State "action plans" to reduce greenhouse gas emissions, to study the impacts of climate change, and to demonstrate innovative mitigation policies. Future efforts include: training workshops, guidance documents, evaluation components, and operational results conferences. To date, eight States have completed inventories and are developing action plans and nearly 20 States and localities have completed projects that range from telecommuting demonstrations to studies of the impact of sea level rise on land use and development policies.

[This section should be part of a conclusion to the mitigation chapter]

Economic Impact

Many of the programs outlined here will encourage individuals and firms to invest in energy saving equipment or other technologies that yield significant cost savings over the long term. Comparing the magnitude of these investments with the value of energy savings indicates the overall cost-effectiveness of the **1994 NAP**. While investing over \$60 billion in greenhouse gas emission reductions between 1994 and 2000, individuals and firms realize over \$60 billion in energy savings between 1994 and 2000, and realize continued returns in the form of an additional \$207 billion in energy savings between 2001 and 2010.⁹ By stimulating investments in cost-effective opportunities for greenhouse gas emission reductions, the **1994 NAP** can increase the long-term profits for American business and help consumers save money.

⁹ Figures on the table are given in constant (real) 1991 dollars, but are not discounted. Discounting future savings will tend to lower the apparent cost-effectiveness of many of the options, but the effect of that adjustment will depend on the discount rate used and the time profile of investment and cost savings. It is not possible to determine how much of this expenditure represents new investment and how much represents a shift in the composition of investment from a macroeconomic perspective.

THE WHITE HOUSE
WASHINGTON

June 10, 1994

MEMORANDUM TO DISTRIBUTION

FROM: Heather Ross, NEC, Wesley Warren, OEP, Rosina Bierbaum, OSTP
RE: Climate Change Post-2000 Draft Proposal

As discussed in the Climate Change Management Committee meeting Wednesday, comments are due on the draft Post-2000 proposal by Wednesday, June 15. We welcome any comments on the draft proposal itself, and ask that you also provide us with a current status report on the relevant ongoing efforts in your agency. We will use these reports to discuss the various efforts underway, and how they fit into the Post-2000 process at our upcoming Long-Term Strategy Working Group meeting.

Please forward your materials to Jim Sailer of the NEC in Room 239 of the OEOB. His fax number is 456-2223. Please feel free to contact any of us if you have any questions.

Distribution:

Allison Biggs
Judith Burrell
Brian Burke
Joseph Canny
Eileen Claussen
David Doniger
Christine Ervin
Dirk Forrister
Peter Fox-Penner
T.J. Glauthier
Karl Hausker
Frank Kruesi
Alan Krupnick
Jim Mictus
Alicia Munnell
Mary Nichols
Rafe Pomerance

Dan Reifsnyder
Ray Squitieri
Sue Tierney
Bob Watson

H: The only comment
I have on the CCME Draft
is tabbed and is no more than
inserting specific reference to states
as an outreach group. States must
be specifically included for optical/

political purposes. Please call
Roxie Bierbaum ^{Bierbaum} ~ OSTP,
456 6077
66202 and ~~make~~ make sure, nicely,
that this small change is
made. Thanks,
Bri ^{done 6/19/08}

MEMORANDUM

TO: Brian Burke
FROM: Henrietta DeGroot ^{JD}
SUBJECT: Global Climate Change Meeting on 6/8/94
DATE: June 9, 1994

The organizers of the meeting presented a proposal and timeline (see attached) for managing the project. The following is a summary of the discussion to which I was present. Because I arrived late and was unfamiliar with the group's objectives, I would recommend that you talk to one of the group member for a better recap of their discussion. I was also unable to attribute comments to specific participants.

- . Comments on the draft are due by June 15, 1994. The group will meet again on June 22, 1994. A more detailed timeline of activities is attached.
- . There was quite a bit of discussion about what "least cost energy" means, and no conclusion was reached.
- . The group may want to consider recommending funding for some things in the near term to get reductions sooner (for example, joint implementation).
- . To stay on target with the budget process, recommendations need to be made as soon as possible. If recommendations are not made until the end of the year, they may not make it into the budget cycle until 1997.
- . Outreach is a critical part of the process and everyone needs to be involved. Each agency needs to identify its opportunities for outreach. Activities need to be tailored to the audience. We can't have a "one size fits all" approach.
- . There was some concern about the framework as it was presented. Some felt that it was appropriate for the pre-2000 effort, but that we need a new (I interpreted this to mean more global) structure for the post 2000 effort. The group facilitator said that she believed the framework is broad enough to meet the post 2000 objective.
- . While the group may want to pursue a more unified framework, many members felt that it is important to have targeted strategies for communicating with the U.S. and global communities.

- . It is important for the group to pay attention to what is going on internationally. "Domestic programs are not worth a damn if others around the world aren't acting sensibly." The group needs to have something on the table in August so that there can be international discussion leading up to the February deadline.
- . The expectation is that the final document will lay out how the group is thinking about the issues and how they are going to proceed.
- . It is important for the working groups (presented in the Outreach Section) to have representation from the people who know what is going on in each of the agencies.
- . The Department of Interior and EPA indicated that the budget process is not going well for them.

CLIMATE CHANGE POST 2000

CHARGE

"President Clinton is directing: The White House National Economic Council, the Office of Environmental Policy and the Office of Science and Technology Policy to co-chair a long-term strategy working group to examine all budget, technology, R&D, regulatory and economic policies that could impact greenhouse gas emission levels beyond the year 2000. The task force will make initial recommendations by the end of 1994."

APPROACH

- * Establish long-term strategy working group with representation from ongoing Administration climate change activities.
- * Develop integrating conceptual framework for scientific analysis and policy choice of long-run strategy.
- * Examine policies that could impact greenhouse gas emission levels beyond the year 2000, building as fully as possible on ongoing activities.
- * Develop additional tools and analyses as necessary to supplement those ongoing activities.
- * Conduct coordinated public outreach concerning Post 2000 effort.
- * Prepare year-end 1994 report synthesizing available results, identifying key ongoing work, and recommending next steps.

STRUCTURE

Climate Change Post 2000 Deputies Task Force

Co-chairs: Cutter, McGinty, Gibbons
Members: Agency Deputies
Responsibilities: Provide policy guidance; Make recommendations

Climate Change Long-Term Strategy Working Group

Co-Chairs: Ross, Warren, Bierbaum/Watson
Members: Representatives of ongoing building-block activities
Responsibilities: Examine policies; Prepare report; Keep CCMC advised of progress

Elements: Conceptual Framework
Analyses
Coordination

CONCEPTUAL FRAMEWORK

PURPOSE

Organize thinking about long-term strategy

- Evidence of problem
 - Approach to addressing problem
- "Stage Setting"
"Framework"

Identify information required

- Currently available best information and tools -- areas of agreement and disagreement
- Further information required -- how to obtain and incorporate

Bracket relevant range of choice

- Focus on key issues of policy debate
- Envelope for robust core measures

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Three papers orchestrated by OSTP and critiqued in three separate Washington workshops open to all stakeholders:

1. The Science of Global Change
2. The Physical Impacts of Change
3. The Economic and Other Valuation of Change

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Agreed conceptual framework for long-run strategy decision-making

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Base case -- current policy path
What ifs -- alternative targets and paths

III. Isolating the Critical Policy Issues: Information and Choice

Stakeholder application of framework using their best information

Range of answers
Areas of agreement
Sources of differences

Arena for policy choice

Relevant range of targets and paths
Critical policy elements

Remaining key information requirements -- what and when

ANALYSES

I. NEW ANALYSES Subgroups will be set up to analyze specific measures with potential to reduce greenhouse gas emissions significantly but that are not currently part of the Climate Action plan or other ongoing efforts (such as Car Talk, PCSD). Ideally, these measures would help the U.S. to serve both domestic needs and remain prominent in world trade. There will be a coordinated solicitation of proposals from agencies for measures that should fall into this category. E.g., six topics have been suggested from our preliminary work. If these were undertaken, proposed Subgroup participants could include...

- A. Biomass: USDA/DOE/OSTP/NEC
- B. Construction: HUD/DOE/OSTP
- C. Joint Implementation: generic issues and country-specific analyses. DOS/NSC/OEP/OSTP/NEC
- D. Technology Transfer: Joint Implementation and specific country analysis. DOS/NSC/OEP/OSTP/NEC
- E. CO2 scrubbing: DOE/OSTP
- F. Carbon sequestration: USDA/OSTP

Agencies are asked to submit candidate measures as soon as possible. In order to be considered in time for our December "initial recommendations", analyses will have to be completed by September.

II. BUILDING BLOCKS Many analyses are underway in the Federal Government that are complementary to the "Beyond 2000" analyses (such as "Car Talk", PCSD, DOS Adequacy Review, EPA's "more Tons", etc.). Representatives from each of these major groups will be asked to serve on the overall Long Term Strategy Working Group and to keep it updated on any emission reductions measures that should be included in the December "initial recommendations" or incorporated into the Integrating Analysis.

Working Groups: none needed; coordinate through Long Term Strategy Group

III. INTEGRATION TOOL (2000-2025) The ongoing DOE-mandated National Energy Policy Plan/EPACT analyses will be the core of our integration effort; we hope to include a few scenarios specifically for the "Beyond 2000" process to characterize a range of US emission trajectories for the next 2 decades. DOS will identify targets under discussion in international negotiations under the climate treaty. Results from the "new analyses" and "building blocks" measures will feed into this technical analysis. This integration tool will allow us to compare emission reduction options in a consistent fashion across economic sectors of the United States.

Working Groups

- A. IAT: OSTP\DOE\EPA:
- B. Non-energy measures: OSTP\EPA\USDA
- C. Others? Non-personal transportation?

OUTREACH COORDINATION

As part of the post-2000 process, the Administration needs to seek input from several major sources including outside groups and Congress. The outreach strategy in each case will change depending upon the nature and timing of the part of the post-2000 process under consideration. Outreach activities will be coordinated overall by OEP. Stakeholders

The following is a partial list of Administration initiatives that are underway that could contribute to the post-2000 process, including providing opportunities for public comment on related issues. The Working Group will be responsible for closely coordinating with these other initiatives to support the post-2000 process where possible.

(1) Department of State Adequacy Review -- August 1994

The Department of State is considering a public conference on issues related to Adequacy to be co-hosted by EPA and DOE in August. The Conference could provide a listening forum to solicit public views.

(2) EPACT Title XVI and the National Energy Policy -- Summer 1994 to Spring 1995

DOE will be conducting a series of hearings around the country about national energy issues with a target of issuing a NEP by next spring. Also, because the NEP will make energy predictions about 30 years into the future, the NEP process could offer opportunities to analyze climate change policies in the post-2000 period.

(3) President's Council on Sustainable Development -- July 1995

The PCSD is expected to issue a report next summer concerning sustainable development scenarios for energy and transportation. The PCSD may offer ready-made networks of broad-based experts to comment on post-2000 proposals.

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Working Subgroups

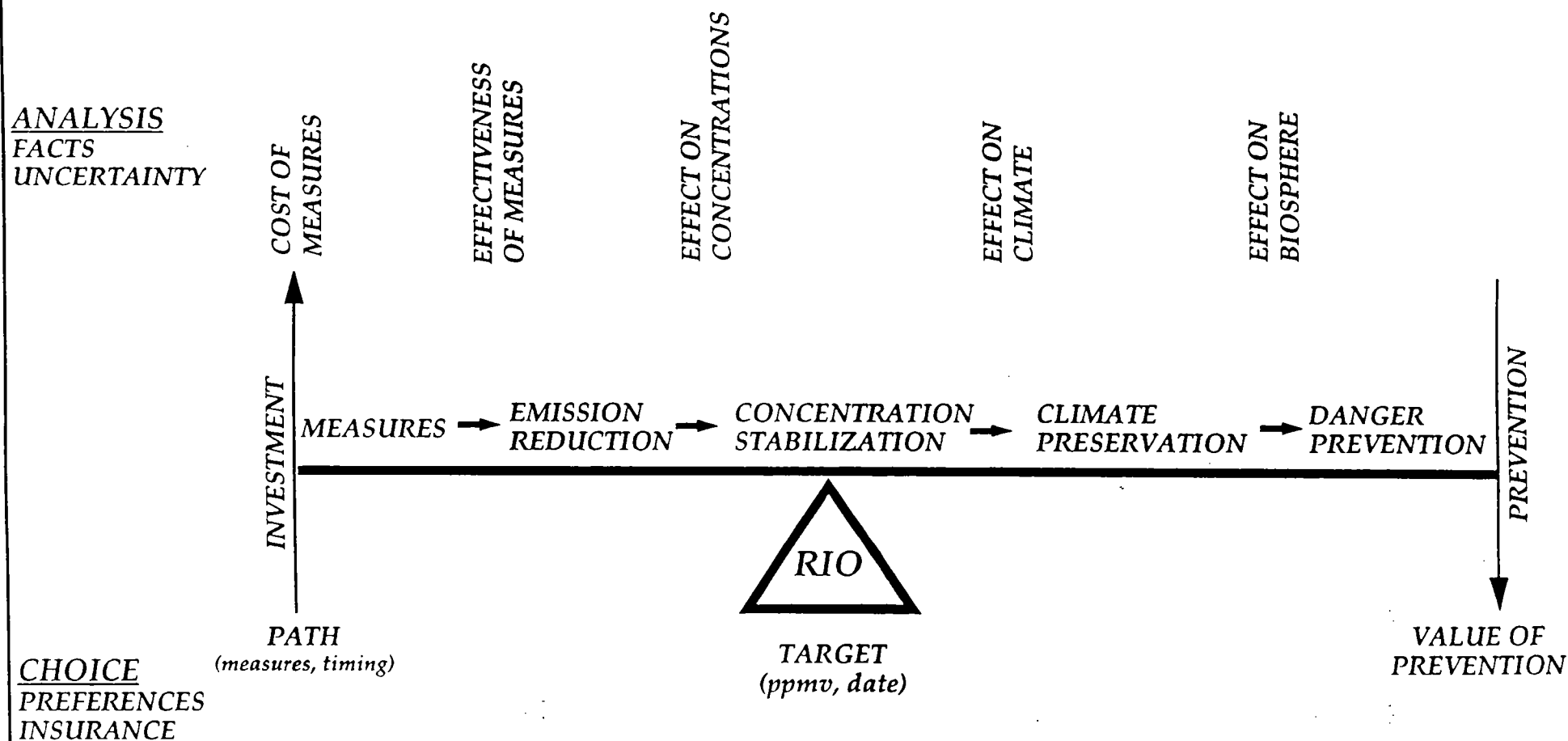
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In addition, an interagency analysis team will be established at the outset of the process and given ongoing responsibilities. This panel will be modelled after the IAT that developed consistent methods for analyzing proposals as part of the Climate Change Action Plan process.

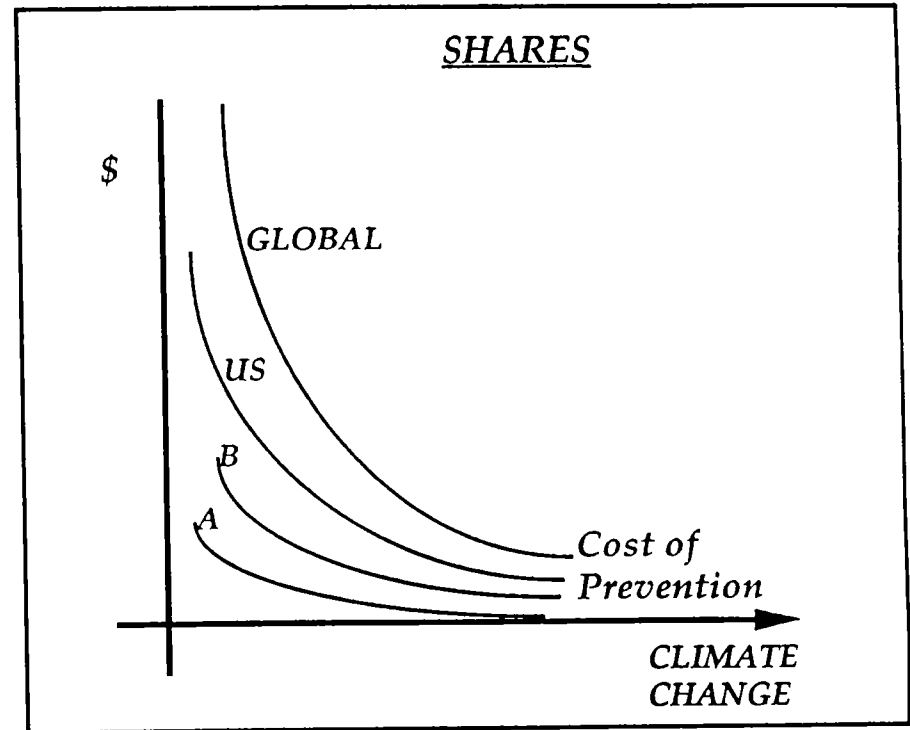
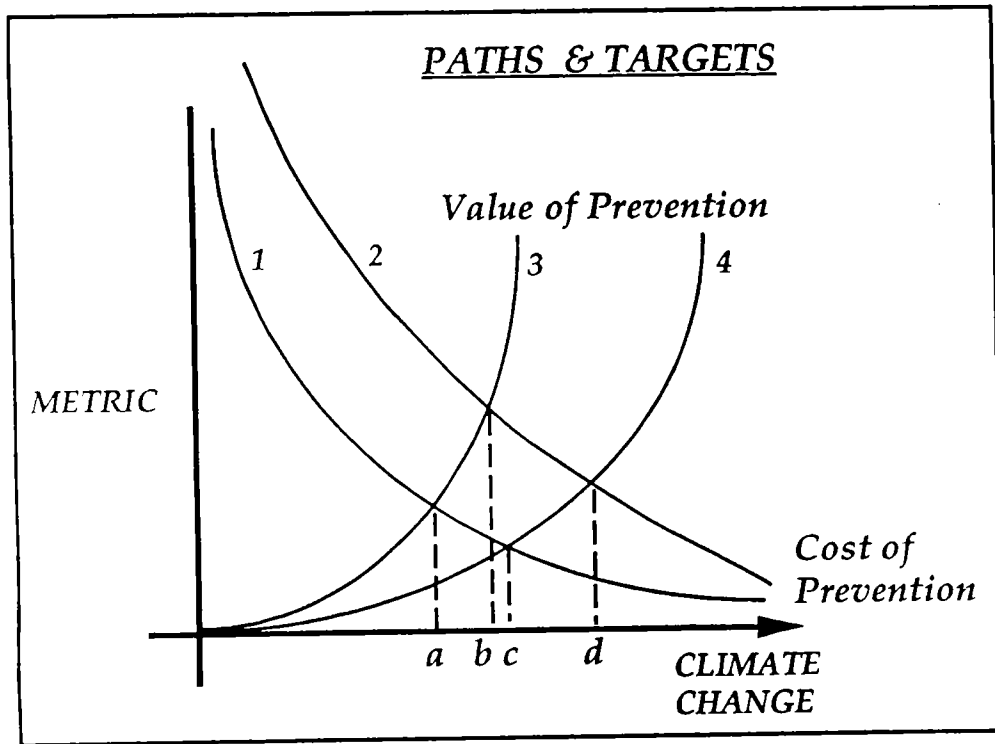
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End of Dec.	Final report with recommendations complete

CLIMATE CHANGE FRAMEWORK FOR SCIENTIFIC ANALYSIS AND POLICY CHOICE



CLIMATE CHANGE FRAMEWORK FOR SCIENTIFIC ANALYSIS AND POLICY CHOICE



TARGET

a
b
c
d

(1,3)
(2,3)
(1,4)
(2,4)

PATH

low cost high value
high cost high value
low cost low value
high cost low value

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not currently happening

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mechanism to add up all the tons

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Wes

critical if the process is to be successful

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End of July	Draft of science paper
Mid August	Draft of impacts paper
End of August	Draft of economics paper
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End of Sept.	Final analyses due
End of Oct.	Draft report prepared
End of Dec.	Final report with recommendations complete

more formal notice + comment period by the public

Arlene Irene

Issue — what is going on internationally "domestic programs aren't worth a damn if others around the world aren't acting sensibly."

need something on the table in august so that there can be an international discussion to get the right answer in February.

Alan

concern about framework raised
it was appropriate for the pre 2000
effort, but we need a new structure
for the post 2000

group facilitator says this framework
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objectives - it is global, even though
'global' isn't explicitly stated in the
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Framework may be one ^{\$} & global
but there must be targeted
strategies - a global one & a
domestic one

document will lay out how we
are going to think about it, how
we are going to proceed & where
the uncertainties lie, where we
need more information

Budget - I didn't follow the discussion
real well sounds like glia GCC funding
for interior looks bad - especially
in the senate - funding for EPA
is not much better Waxman & Dingell

are concerned that GCC funding may come at the expense of more conventional clean air methods

Waxman is restrained in his ability to help

Dingle uses the opportunity to play them against each other

need to find a way to get "green lights" partners to speak w/ their congressional reps

need comments on draft in 1 week
much discussion about what "least cost
energy" means. ~~Does it only include~~
the cost of the fuel or ~~was~~ is it a
broader interpretation of the environmental
impacts."

some things we may want to fund
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if they aren't made until ~~the~~ the end of
the year, they may not make it in
the budget cycle until 97.

Outreach

not a one size fits all
everyone needs to be involved in conducting
outreach what have you done on outreach.
how are you tailoring it

each agency needs to identify other
opportunities for outreach.

in ~~the~~ 2 week Group will meet again

THE WHITE HOUSE

WASHINGTON

June 7, 1994

MEMORANDUM TO DISTRIBUTION

FROM: Wesley Warren, OEP

RE: Climate Change Managment Committee Meeting Agenda

The Climate Change Managment Committee will meet on Wednesday, June 8 at 4:00 p.m. in Room 474 (the Indian Treaty Room) of the Old Executive Office Building. The following will be the agenda for discussion at that meeting. Look forward to seeing you there.

I. CLIMATE CHANGE ACTION PLAN (CCAP) POST-2000 PROCESS

- Joint NEC, OEP, OSTP staff draft proposal on a process that will: (1) create a conceptual framework; (2) evaluate options; and (3) solicit expert opinion and public participation.

II. BUDGET UPDATE

- Outlook for Appropriations

III. UPDATE ON DEVELOPING MEASUREMENTS AND MILESTONES TO TRACK PROGRESS IN IMPLEMENTING CCAP

IV. AGENCY UPDATES AND ANNOUNCEMENTS

DISTRIBUTION:

Brian Burke
Eileen Claussen
Judith Burrell
Christine Ervin
T.J. Glauthier
Karl Hausker
Frank Kruesi
Alan Krupnick
Jim Lyons
Alicia Munnell
Mary Nichols
Rafe Pomerance
Heather Ross
Sue Tierney
Bob Watson

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20500

This is a package that will be handed out at the Berlin Climate Treaty negotiations this week. Copies will also be sent to key members of Congress with a cover letter from Jack Gibbons.

Rosina Bierbaum, OSTP (456-6077)

Climate Change

State of Knowledge

- Water scarcity in Middle Eastern and African countries is also likely to be exacerbated by climate change.

Coastal Resources

- A 50 cm rise in sea level by the year 2100, which is within the range projected by the IPCC, could inundate more than 5,000 mi² of dryland and an additional 4000 mi² of wetlands in the U.S. if no protective actions are taken.
- Areas at highest risk from sea level rise are areas currently experiencing high erosion rates and those with very low elevations, such as parts of the U.S. Atlantic and Gulf coasts.
- Internationally, many low-lying areas such as parts of the Maldives, Egypt, and Bangladesh would be completely inundated and uninhabitable by a similar sea level rise.

Health

- Climate change may shift the range of infectious diseases.

with likely increased risks of malaria and dengue in the United States. Changing temperatures and precipitation patterns may produce new breeding sites for pests and pathogens.

- Climate change may increase heat-stress mortality, particularly in the very young and very old.

Agriculture

- Large areas of the eastern and central United States face moderate to severe drying. Drought could become more frequent, particularly in the Great Plains.
- Changes in management practices and technological advances might reduce or eliminate many of the potentially negative impacts of climate change in the agricultural sector.
- Agriculture production in developing countries is likely to be more vulnerable to climate change given that they have relatively fewer economic resources.

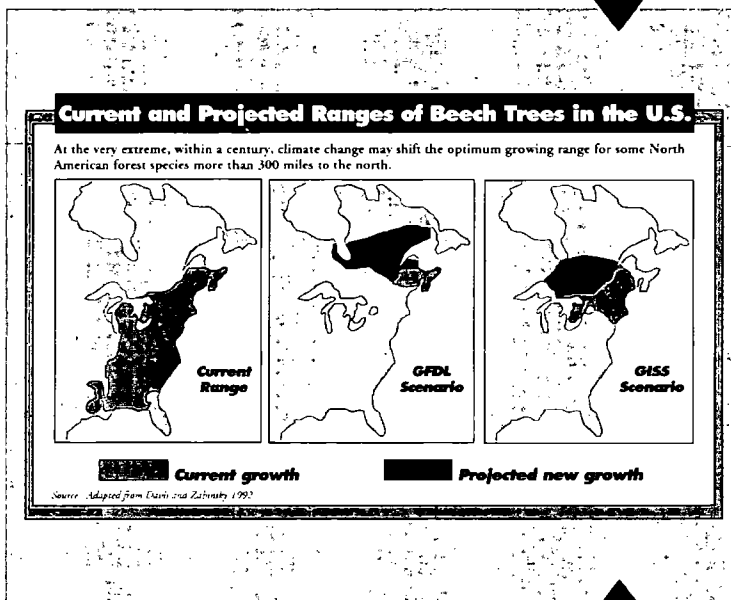
Forests

- Climate change over the next several decades might shift the ideal range for some North American forest species by as much as 300 miles to the north, exceeding the ability of forests and other ecological communities to migrate.

- Forest damage from fire and diebacks driven by drought, insects and disease could increase.
- The most vulnerable forest resources are those in regions subject to increased moisture stress, as in the dry continental interiors.

Energy and Transportation

- Warmer temperatures will increase cooling demand but decrease heating requirements.



- Changes in water availability may affect reliability of hydropower output.
- Warming should lead to fewer disruptions of winter transportation, but increased droughts and floods may interfere with water transport.

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

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

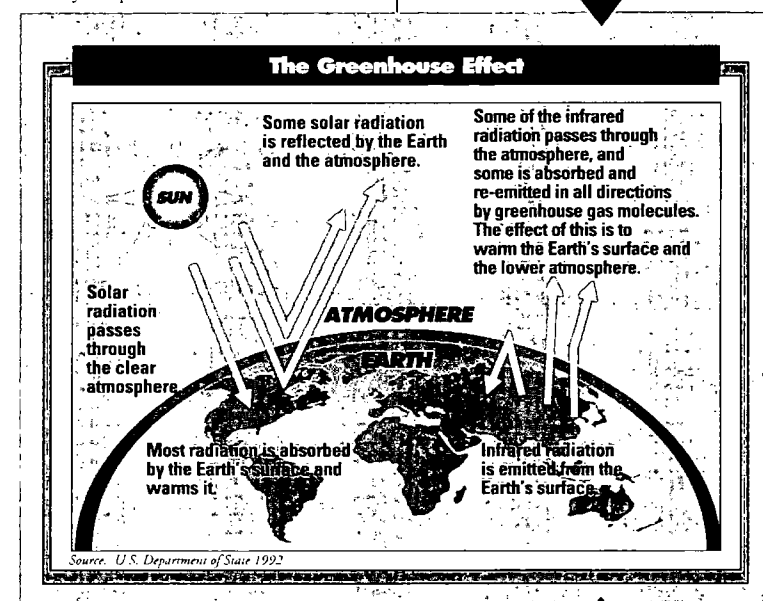
The Climate System

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

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

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

Since the pre-industrial era, atmospheric concentrations of carbon dioxide have increased by nearly 30 percent, methane



concentrations have doubled, and nitrous oxide concentrations have risen by 15 percent. These increases result in a radiative forcing or heat-trapping of energy equivalent to about 2.8 watts per square meter (Wm⁻²). A significant fraction of warming may have been masked by increased levels of traditional air pollutants—sulfates and carbonaceous aerosols, particularly in the Northern Hemisphere—which reflect incoming solar radiation and alter the reflective properties of clouds. Aerosols are short-lived and vary regionally, hence they should not be regarded as a simple offset to greenhouse gas forcing. Calculations suggest that the projected increases in atmospheric concentrations of greenhouse gases

alone will result in an additional radiative forcing of about $3 - 8 \text{ Wm}^{-2}$ by 2100. For a given concentration of greenhouse gases, the resulting increase in radiation can be predicted with precision; but the resulting impact on climate is more uncertain.

Model calculations, based on plausible ranges of future emissions and climate sensitivities, suggest that the global surface temperature could increase an average of $0.9 - 5.0^\circ\text{C}$ by 2100, with significant variation by region. This estimate does not account for offsets from aerosols which would somewhat lower these values. Global-average temperature changes of this magnitude would be greater than recent natural fluctuations and would occur at a rate significantly faster than any observed changes in the last 10,000 years. The U.S. and high latitudes are projected to warm more than the global average.

Model calculations also suggest that the rate of evaporation will increase as the climate warms, leading to an increase in average global precipitation. While precipitation at high latitudes is expected to increase, much of the precipita-

tion increase may fall over the oceans. The models also suggest that the frequency of intense rainfall will increase and there will be a marked decrease in soil moisture over some mid-latitude continental regions during the summer.

Sea level is projected to increase by several tens of centimeters by the end of the next century, due primarily to the thermal expansion of the oceans and the melting of glaciers and ice sheets.

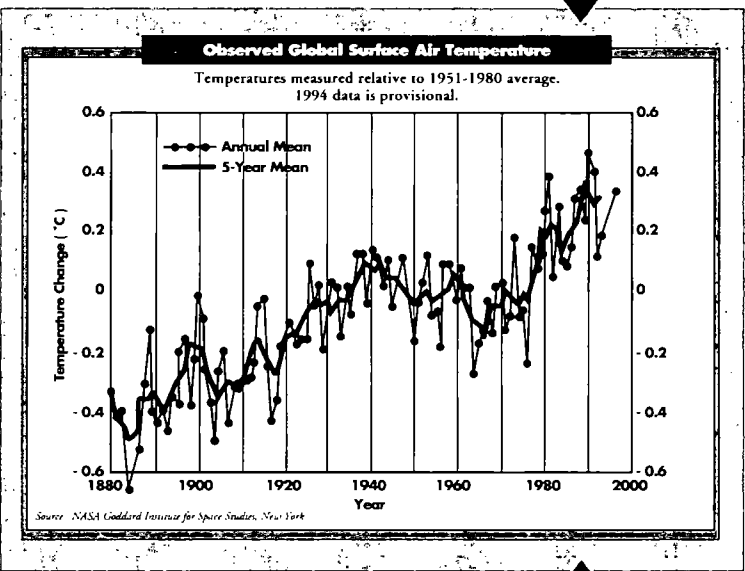
Calculations of climate change at the regional scale are significantly less reliable than average global values, and it is unclear whether climate will become more variable. The frequency and intensity of extreme weather events of critical importance to ecological systems (droughts, floods, frosts, cloudiness, the frequency of hot or cold spells, and the intensity of associated fire and pest outbreaks) could increase.

Global mean surface temperatures have increased between 0.3 and 0.6°C over the past century, despite marked regional, seasonal and diurnal differences.

There is consistency between the observed global average temperature trend over this period and model simulations of the warming due to greenhouse gases if allowance is made for the increasing evidence of a cooling effect due to anthropogenic aerosols and stratospheric ozone depletion. However, the warming is also at the upper end of the range of temperature fluctuations observed in the pre-industrial record. Thus, the observed temperature increase could be largely due to natural variability; alternatively, variability-

ty and other human factors could have offset a still larger human-induced warming. The unequivocal detection of the enhanced greenhouse effect from observations is likely to require another decade or more of data.

The nine warmest years this century have all occurred since 1980. 1994 was the third or fourth warmest year on record, suggesting the atmosphere has rebounded from the transient cooling of 0.5°C caused by Mt. Pinatubo and simulated by the models.

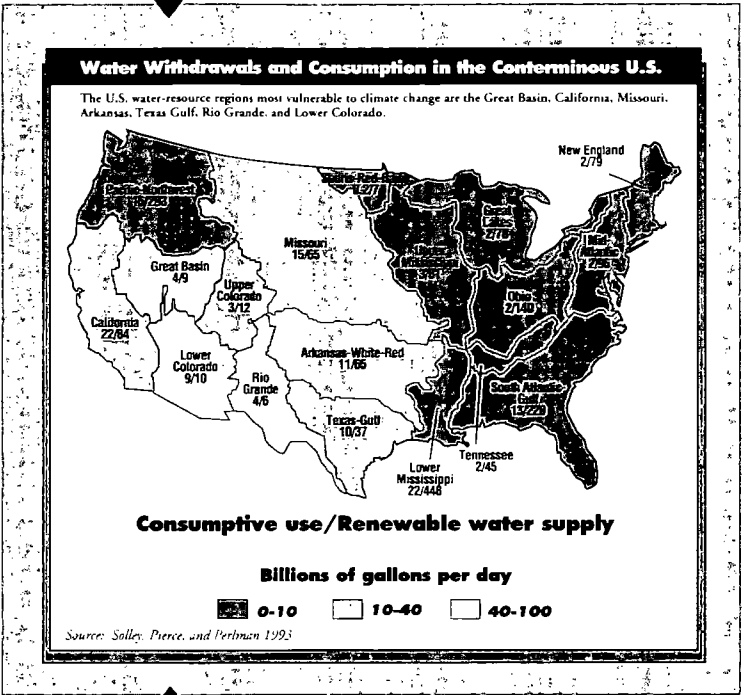


Several ancillary pieces of evidence consistent with warming, such as a decrease in Northern Hemisphere snow cover, a simultaneous decrease in Arctic sea ice, continued melting of alpine glaciers, and a rise of sea level, have also been corroborated. The frequency of extreme rainfall events has increased throughout much of the country, suggestive of an intensification of the hydrologic cycle.

Carbon cycle models imply that limiting atmospheric concentrations of CO_2 to any level below 750 parts per million by volume (ppmv), about three times the pre-industrial level, would require

emissions worldwide to eventually drop below 1990 levels. The longer emissions continue to increase, the greater reductions would eventually have to be to stabilize concentrations at a given level.

While much is already known about the greenhouse effect, substantial reduction of key uncertainties (detailed quantification of the



timing, magnitude and regional patterns of climate change) may require a decade or more. Accurate predictions are limited by our knowledge of the future emissions and atmospheric concentrations of carbon dioxide, aerosols and other greenhouse gases, the role of clouds and water vapor, and the role of the oceans.

Impacts of Climate Change

Climate change poses threats to resources both domestically and internationally. These threats

could have significant, but uncertain, socioeconomic consequences. Changes in temperature, precipitation and sea level driven by climate change can add to existing stresses on resources caused by other influences such as population growth, land-use changes, and pollution.

Overall, various strategies for coping with climate change can be identified for "intensively managed" systems (such as agriculture, water resources, and developed coastlines). For these systems, technological and management options exist to some extent today, although they may be costly to implement. By comparison, fewer options can be identified for natural systems (such as wetlands and wilderness areas).

Temperature changes of the magnitude expected from the enhanced greenhouse effect have occurred in the past, but the previous changes took place over centuries or millennia instead of decades. Rates of natural migration and adaptation of species and communities appear to be much slower than the predicted rate of climate change. As a result, populations of many species and inhabited ranges could change as the climate to which they are adapted effectively shifts northward or to higher elevations.

One of the consequences of global climate change may be increases in the frequency of extreme weather events, particularly droughts and floods. These events, when they do occur, can be costly. For example:

- Damages from the Mississippi River flooding in 1993 are estimated to range from \$10 billion to \$20 billion.

- Almost \$4 billion in federal payments went to farmers suffering crop losses during the 1988 drought.

Examples of the kinds of effects that may result from climate change include:

Water Resources

- Changes in precipitation and increased evaporation from higher temperatures can affect water supplies and water quality, posing threats to hydropower, irrigation, fisheries, and drinking water.
- Floods are more likely because the frequency of intense rainfall is predicted to increase.
- Droughts are likely to be more severe because warmer temperatures increase evaporation rates and thereby lead to drier soils during periods of little or no rain.
- Climate change would be likely to add to the stress in several U.S. river basins such as the Great Basin, California, Missouri, Arkansas, Texas Gulf, Rio Grande, and Lower Colorado.

Climate Change

Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change was established by the United Nations Environment Programme and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the climate-change issue. To date, the IPCC has produced:

- A comprehensive assessment of climate change which evaluated alterations to the chemical/physical/biological components of the climate system, potential and alternative response measures (IPCC 1990). This report became a standard work of reference, widely used by policy-makers, scientists, and other experts.
- A supplementary review of research on these same issues prepared for the U.N. Conference on Environment and Development (IPCC 1992).

- A special report prepared for the first meeting of the Conference of the Parties to the U.N. Framework Convention on Climate Change covering radiative forcing of climate, greenhouse gas emissions scenarios, and methods for conducting national inventories of emissions of sources and sinks of greenhouse gases and assessments of climate change impacts (IPCC 1994).

Together, these reports have established a common basis of scientific opinion that was used by governments to negotiate the Framework Convention on Climate Change and will be used as a basis for the discussions by the Conference of the Parties.

Organization/Process

The IPCC operates at two overlapping but distinct levels: as a formal intergovernmental body and as a scientific and technical assessment body.

Government representatives meet in formal plenary sessions to approve the topics for assessment and the overall workplans for preparation of the reports. They also review and accept the detailed scientific and technical reports as well as approve on a line-by-line basis the Panel's "Summaries for Policymakers" which highlight the policy implications of the detailed reports. It is through this intergovernmental review and approval mechanism that the work of the IPCC is connected to international and national policy concerns. The detailed reports themselves are prepared through the enthusiasm and cooperation of scientists and

technical experts from around the world. These experts come from many countries and are trained in disciplines from atmospheric chemistry to economics. They include university professors, researchers working in private industry and at national laboratories, and scientific experts affiliated with non-governmental organizations. The teams of experts which draft the individual

Current Work

In 1991, after some reorganization, the IPCC committed itself to producing a Second Assessment Report in 1995, covering the same comprehensive range of topics covered in the 1990 report. This report is being prepared by three working groups. Working Group I, which is co-chaired by the United Kingdom and Brazil, is charged with assessing the state of science with respect to the functioning of the climate system and possible changes to it resulting from human activities. Working Group II, co-chaired by the United States and Zimbabwe, is assessing potential impacts, adaptation, and mitigation measures in a broad range of ecological and socio-economic systems. Working Group III, co-chaired by Canada and South Korea, is focusing on assessments of the economic implications of climate change, including an evaluation of future trends in emissions of greenhouse gases.

sections of the reports are structured to include the broadest range of scientific opinions possible. Because the process of assessment involves reviewing the most up-to-date scientific information, reconciling competing views where possible, and characterizing the disagreements when achieving consensus is not possible, IPCC reports have identified climate change issues which deserve the priority attention of the research community in the future. Hundreds of experts are involved in preparing the different chapters of the reports; literally thousands are involved in providing expert peer review.

Climate Change

The Clinton Administration Program

The Clinton Administration is strongly committed to addressing the challenge of climate change, with cost-effective policies that are good both for the environment and the economy. We support policies that provide insurance to reduce the risks posed by climate change. Our approach has three pillars. First, policies are based on sound science. We strongly believe that policies should be based on mainstream science, on the views of either skeptics or alarmists. Second, our policies are based on partnerships with the private sector-industry nongovernmental organizations. This issue will be addressed in close cooperation with all stakeholders. Finally, we believe that climate change requires international solutions. Climate change is a global problem and must be addressed by the global community.

Sound Science

The United States has based its climate change policies on the conclusions of the Intergovernmental Panel on Climate Change, which has provided an authoritative international consensus on the science of climate change.

The U.S. Global Change Research Program (USGCRP) provides a major contribution to the research base on which the IPCC assessments rely. The USGCRP was formally established by Congress in 1990 to coordinate the resources and research activities of a dozen federal agencies, especially national research activities and U.S. participation in international research activities supporting programs such as the World Climate Research Programme, the International Geosphere-Biosphere Programme, and the Human Dimensions Programme. The USGCRP, funded at \$1.8 billion in FY 1995, coordinates a broad agenda of research, supporting the Mission to Planet Earth, ozone depletion studies, and work on the human dimensions of global change. Questions that drive the USGCRP's climate change research include:

- What is the climate's response to increasing concentrations of aerosols and greenhouse gases?
- What are the impacts of climate change on society and the environment?
- How can society mitigate future climate change or adapt to its consequences?

Based on these questions, research focuses on observing and documenting Earth system behavior; understanding the processes that influence changes in the

Earth system; developing and applying models to predict climate change; evaluating the effects of climate change on agriculture, forests, water resources, coastal regions, ecosystems, and other natural resources; and improving the capabilities to mitigate adverse consequences and capitalize on any beneficial opportunities that climate change may present.

Recent Accomplishments of the USGCRP

- Climate models successfully simulated the transient cooling of the lower atmosphere in response to the sulfates emitted by the eruption of Mt. Pinatubo.
- The improved ability to forecast El Niño and resulting shifts in tropical and subtropical precipitation is helping farmers in North and South America to plan better and thereby boost yields and reduce economic disruptions.
- Model simulations of changes in climate over the last 100 years match observed patterns more closely when both greenhouse gases and the regional concentrations of sulfate aerosols are taken into account.
- Combined satellite and surface measurements recently identified an unexpected absorption of 25-40 watts per square meter of radiation by the atmosphere. This new information will lead to a reanalysis of the Earth's radiation balance and the role of clouds in climate change.
- Observations show that since 1970, precipitation over the U.S. has increased by about 5 percent compared with the previous 70 years, primarily in the autumn. In addition, the frequency of extreme rainfall events (more than 2" per day) has increased throughout much of the country.
- Arctic ecosystems exposed to elevated levels of carbon dioxide only increased productivity for a few years, suggesting that the CO₂ fertilization effect may be short-lived.

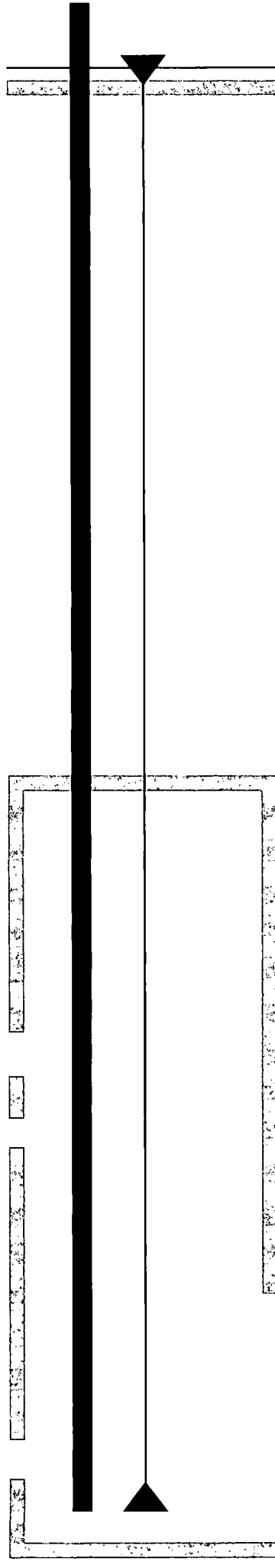
Because the importance of climate change depends largely on the physical and economic impacts on human society, USGCRP has started to shift its funding toward increased evaluation of the socioeconomic implications of climate change.

Partnerships with the Private Sector and State Governments

To meet the challenge of climate change, we must involve business, non-governmental organizations, and government at all levels.

"We must take the lead in addressing the challenge of global warming, which could make our planet and its climate less hospitable and more hostile to human life."

President Clinton, Earth Day 1993



Nowhere is this commitment reflected more strongly than in the President's Climate Change Action Plan (CCAP). Released in October 1993, the CCAP implements President Clinton's commitment to reduce U.S. greenhouse gas emissions to 1990 levels by the year 2000.

The CCAP demonstrates that government and the private sector can work together to better the economy and the environment. It is expected to produce energy savings of over \$60 billion by the year 2000 and create clean jobs for the future. Great strides have been made in the last year by the Department of Energy, the Environmental Protection Agency, the Department of Agriculture, and the Department of Transportation. Some of the highlights include:

- By joining Climate Challenge, 248 electric utilities, representing 53 percent of U.S. electric generating capacity, have committed to undertake voluntary measures to reduce their greenhouse gas emissions by 44 million metric tons by the year 2000.
- 500 new participants have joined Green Lights since October 1993, for a total of more than 1,650. These participants have reduced lighting electricity consumption by an average of 47 percent, saving approximately \$90 million.
- Climate Wise, being carried out jointly by EPA and DOE, is designed to stimulate emission reductions across all sectors of the economy. Several industrial companies, representing 3 percent of U.S. industrial energy use, have become partners in Climate Wise and pledged to reduce annual emissions by 20 million tons of carbon equivalent by the year 2000.
- Motor Challenge, which helps companies install high-efficiency motor systems, has recruited over 200 partners, established a national technical assistance hotline, and is soliciting sites for 25 showcase technology demonstrations. These showcases will rapidly transfer high-efficiency motor systems throughout industry.
- Corporate response to WasteWise, which encourages voluntary source reduction and recycling of business waste, has attracted over 300 businesses; and more than 750 waste reduction programs are underway.
- Twenty-nine grants have been awarded through the National Industrial Competitiveness for Energy, Environment and Economy (NICE³) program. These grants will improve industrial process efficiency, reduce waste, and cut greenhouse gas emissions in several key industries.
- Natural Gas Star, designed to reduce methane losses from gas transmission and distribution lines, has expanded to include over 35 corporate partners representing over 55 percent of transmission company pipeline miles, 25 percent of distribution company pipeline miles, and 35 percent of all service connections.
- The State and Local Outreach Program awarded grants to 18 states. The state grants are to complete greenhouse gas inventories or to develop comprehensive mitigation strategies essential for laying the foundation for actual reduction efforts. In total, 24 states have participated in the program. The effort now has seven cities in the "Green Fleets" initiative and 25 cities are targeted for the "Cities for Climate Protection" program. To illustrate the potential for localities, one medium-sized city has

estimated that it can reduce emissions by the greenhouse gas equivalent of 4.8 million metric tons of carbon.

- Seven joint implementation projects are underway which encourage renewable energy, fuel switching, energy efficiency and improved forest management in developing and transition economy countries.

International Solutions

The United States is also demonstrating leadership under the Framework Convention on Climate Change and in other international fora. The cornerstones of the Administration's policy include:

- Promoting actions to strengthen the international response under the Framework Convention and working with other nations to determine appropriate goals for the next century.
- Encouraging a strong international process to review national plans. The United States is also helping to build the capacity for appropriate actions in nearly 60 developing countries and transition economies through the U.S. Country Studies program.
- Demonstrating the benefits of joint projects through the U.S. Initiative on Joint Implementation, the first such program in the world.
- Promoting the development and diffusion of beneficial technologies.
- Supporting reform of international institutions, including working with the multilateral development banks, to better assist their clients to fulfill their obligations under the Convention.
- Strengthening the newly restructured Global Environment Facility (GEF) to effectively serve as the operating entity of the Convention's financial mechanism. The United States is committed to ensuring the success of the GEF in responding to the threat of climate change.

The Climate Change Action Plan

A Menu of Climate Action Opportunities

Residential Sector

- "Golden Carrots" Market Pull
- Enhanced Appliance Standards
- Home Energy Rating Systems and Energy Efficient Mortgages
- Upgrade Residential Building Standards
- Energy Value Homes
- Energy Partnerships for Affordable Homes

Commercial Sector

- Energy Star Buildings and Rebuild America
- Green Lights
- Partnership for Technology Introduction

Energy Sector

- Climate Challenge
- EPA's Energy Star Transformers
- Renewable Energy Commercialization

International, State and Local Programs

- US Initiative on Joint Implementation
- State and Local Outreach Program
- "Cool Communities" Program

Industrial Sector

- Climate Wise
- NICE³
- WasteWiSe
- Motor Challenge
- Energy Analysis and Diagnostic Centers
- Fertilizer Nitrogen Use
- Reduce Pesticide Use

Transportation Sector

- Federal Parking Cash Out
- Transportation Efficiency Strategy
- Promote Telecommuting

HFC, PFC, & NOx Emissions

- Create Partnerships to Eliminate HFC-23 Emissions
- Launch Partnership with Aluminium Producers
- Improve Efficiency of Fertilizer Nitrogen Use

Methane Reduction & Recovery

- Natural Gas Star
- Increase Stringency of Landfill Rules & Expand Landfill Outreach Program
- Coalbed Methane Outreach Program
- RD&D for Methane Recovery from Coal Mining
- RD&D for Methane Recovery from Landfills
- AgStar Program
- Ruminant Livestock Methane Program

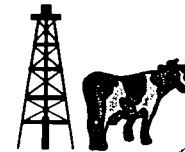
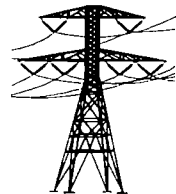
Forestry Sector

- Reduce Depletion and Accelerate Tree Planting in Non-Industrial Private Forests
- Promote Recycling and Pollution Prevention in the Pulp and Paper Industry

"This is a call for...American ingenuity and creativity."

The Climate Change Action Plan

CFCs



Climate Change

Climate Challenge

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

Program participants report their greenhouse gas emissions to DOE annually, along with information describing their Climate Challenge actions and achievements.

The Sacramento Municipal Utility District (SMUD) has committed to reduce greenhouse gas emissions 30 percent below its 1990 level by the year 2000. SMUD's strategy includes the following:

- Expanding current wind plant from 5 megawatts to 50 megawatts.
- Planting 500,000 shade trees.
- Expanding SMUD's electric vehicle fleet from 48 to 240 and adding 200 public electric vehicle charging stations.
- Offering incentives for customers to buy energy-efficient lights, geothermal ground source heat pumps, solar water heaters, and high-efficiency air conditioners and refrigerators.

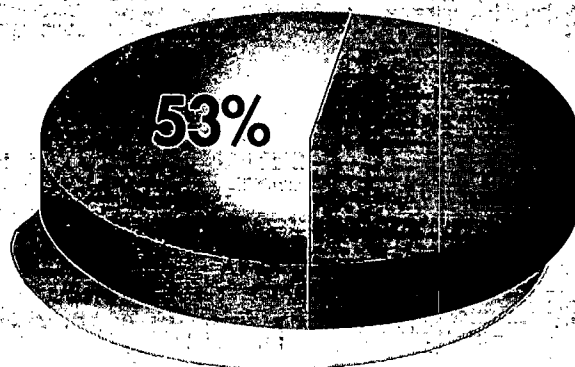
"This voluntary, flexible initiative is the best way to tap the utility industry's technical skills and problem solving capabilities, while obviating the need for costly command-and-control requirements."

E. Linn Draper, Jr.
Chairman
American Electric Power

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

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

U.S. Electricity Generation by Climate Challenge Partners



248 utilities representing 53% of U.S. electricity generation

Facts and Figures

Current number of Climate Challenge partner utilities: 248

Expected reduction in carbon-equivalent in the year 2000: 44 MMTCE*

*Some of the reductions in greenhouse gas emissions cited under this program may result from participation in a number of U.S. Climate Change Action Plan programs.

Climate Change

U.S. Initiative on Joint Implementation

The U.S. Initiative on Joint Implementation (USIJI) is a program designed to encourage international partnerships to reduce greenhouse gas emissions. The Program stems from Article 4(2)(a) of the Framework Convention on Climate Change which allows Parties to meet their obligations "jointly with other Parties." The primary purpose of the USIJI is to help establish an empirical basis for considering approaches to joint implementation internationally and help realize the enormous potential for joint implementation to combat global warming to promote sustainable development.

Facts and Figures

Seven USIJI pilot projects have already been approved, representing investments of approximately \$40 million. Expected reductions of carbon equivalents because of the pilot projects range from several thousand to millions of metric tons.

Projects approved so far:

Costa Rica: Project to Stabilize Existing and Expand Forest Cover

Czech Republic: Fuel Switching for a District Heating System

Honduras: Rural Solar Electrification

Russia: RUSAFOR – Saratov Afforestation Project

Belize: Forest Preservation and Management

Costa Rica: Plantas Eolicas S.A. Wind Facility

Costa Rica: ECOLAND: Esquinas National Park

Eight other proposals are being further developed for the USIJI Evaluation Panel.



Activities currently underway as part of USIJI include review and processing of proposals, provision of public recognition and technical assistance to program participants, and research on approaches to joint implementation.

Comments from USIJI Participants

"It is imperative that businesses reduce their emissions in a cost-effective manner, utilizing market-based approaches wherever possible. We are demonstrating that, through working in partnerships, we can accomplish a great deal."

Richard A. Abdoo, Chairman and CEO
Wisconsin Electric Power Company
 Partner, Belize and Czech Republic USIJI pilot projects

"This pilot project represents our effort to find innovative solutions to a challenge that knows no territorial boundaries."

John Sawhill, President and CEO
The Nature Conservancy
 Partner, Belize USIJI pilot project

"This project is a godsend for our city, because it allows us to clean up the severe air pollution that threatens the health of our people while contributing to the international effort to reduce greenhouse gas emissions."

Milan Kunc, Mayor, City of Decin
Czech Republic
 Partner, Czech Republic USIJI pilot project

One of the USIJI pilot projects in Costa Rica, the Plantas Eolicas S.A. Wind Facility, will develop a 20 megawatt privately owned and operated wind plant. Electricity generated by 55 U.S.-manufactured wind turbines will displace electricity currently generated by the burning of fossil fuel. The project will constitute the largest private power project in Costa Rica and the first commercial-scale wind project in Latin America.

ClimateChange

Green Lights

The U.S. Environmental Protection Agency's (EPA) Green Lights program encourages the widespread use of energy-efficient lighting through voluntary, profit-based partnerships. Lighting accounts for 20-25 percent of all electricity sold in the U.S. Green Lights partners agree to survey 100 percent of their facilities and to upgrade 90 percent of their square footage that can profitably upgraded without compromising lighting quality. EPA provides a range of support systems to help participants obtain information on energy-efficient lighting technology, financing options, and public recognition.

With help from Green Lights, Chevron retrofitted lighting in a 250,000 square foot record-keeping warehouse. With annual energy cost savings of \$116,000, Chevron expects a payback period of a little over one year for the project, with an internal rate of return of 100 percent.

Facts and Figures

Current number of Green Lights participants: 1,676

Percent of Fortune 500 corporations participating in Green Lights: 20 percent

Average lighting electricity reduction in completed upgrades: 47 percent

Square footage of participants committed to Green Lights: 4.3 billion square feet

Kilowatt-hour savings per year: 1,151 million kwh

Electric bill savings per year: \$89.7 million

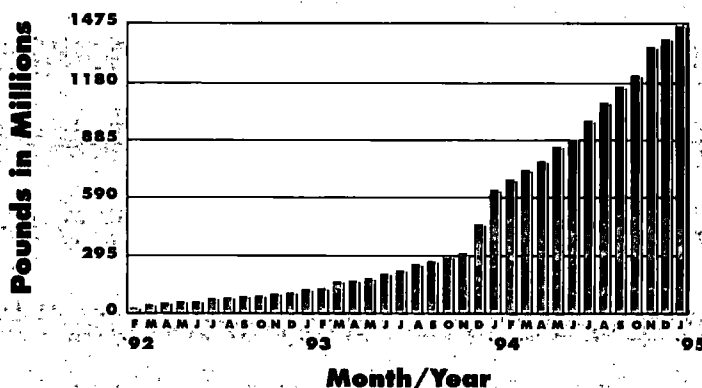
Average internal rate of return: 30 percent

Expected reduction of carbon equivalent in the year 2000: 7.5 MMTCE*

*Only 2.5 MMTCE are scored under the U.S. Climate Change Action Plan because Green Lights began before 1993.



Carbon Emissions Avoided Because of Green Lights Upgrades



"Our retrofit program would not have gotten off the ground without the assistance of the Green Lights staff. They have provided us with information on utility incentives, ballast and lamp disposal methods, and technical issues. The most vital piece of information I have received from Green Lights is the technical data describing the different types of lighting equipment. This tremendous resource has given me confidence in choosing the most cost-effective technologies."

Gary McAvoy
Energy Manager
Melville Corporation

"Through JCPenney's partnership with EPA, we have implemented responsible and cost-effective lighting conservation measures in our stores, avoiding the discharge of many tons of pollutants into the atmosphere. We have improved lighting quality for our customers and associates and have reduced our overall cost of lighting."

Alan Ross
Energy Programs Manager
JCPenney Company, Inc.

March 1995

Climate Change

Climate Wise



Climate Wise encourages comprehensive emissions reduction plans by its partners.

As part of its Climate Wise pledge, Georgia-Pacific has agreed to:

- Establish energy management teams.
- Improve boiler controls and operation.
- Reduce waste wood sent to landfills.
- Increase carbon sequestration through a forestry program.
- Decrease transportation emissions.

As part of its Climate Wise pledge, Johnson & Johnson has agreed to:

- Reduce equivalent energy use by 10 percent by 1996.
- Complete commitments to Green Lights and WasteWiSe.
- Participate in Motor Challenge.
- Reduce nonhazardous production waste by 50 percent and hazardous waste by 10 percent by the year 2000.
- Conduct an annual Earth Day and Energy Awareness Week.
- Reduce office waste by 50 percent.

Climate Wise, a joint program of the U.S. Environmental Protection Agency (EPA) and Department of Energy (DOE), targets industrial sector actions to stimulate greenhouse emission reductions. Through Climate Wise, EPA and DOE provide information on the full range of U.S. Climate Change Action Plan initiatives to help industries identify a comprehensive set of actions that are most appropriate for them.

Climate Wise Pledge Highlights



DuPont

- Pledge of 18 MMT reduction by 2000 in CO₂ equivalent
- Savings of \$31 million/year starting in 1995

AT&T

- Pledge of 170,000 tons by 2000 in CO₂ equivalent
- Savings of \$50 million/year by 2000

Facts and Figures

Climate Wise participants include DuPont, AT&T, Quad Graphics, Martin Marietta, Weyerhaeuser, Georgia Pacific, Johnson & Johnson and Fetzer Vineyards. Together, these companies represent more than 3 percent of U.S. industrial energy use and a carbon-equivalent reduction commitment of more than 20 million metric tons.* These participating companies expect to achieve savings of more than \$50 million annually beginning in 1995.

*Some of the reductions in greenhouse gas emissions cited under this program may result from participation in a number of U.S. Climate Change Action Plan programs.

"The Martin Marietta Corporation is pleased to add its pledge to the principles and voluntary action initiatives of the Climate Wise program. We feel it is both a matter of good business practice and prudent environmental action to address sooner, rather than later, an issue of the potential of global warming."

Charles E. Camahan
Vice-President
Corporate Environment
Health and Safety
Martin Marietta Corporation

ClimateChange

Motor Challenge

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

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

- *Showcase Demonstrations* prove the cost-effectiveness of high-efficiency electric motors in various industrial applications.
- *The Information Clearinghouse* serves as a one-stop shop to provide access to a toll-free hot line for technical assistance, an electronic bulletin board, decision tools, training materials, and information about upcoming conferences.
- *Motor Challenge Partnership* involves conferences, seminars, and training designed to get the best information about electric motor-driven systems into the hands of people that can use it.
- *The Electric Motor Systems Database* will consist of reliable data concerning electric motor-driven system performance in real-world applications.
- *Market Transformation Strategies* will leverage the substantial market position of large industrial motor system users to create a demand pull for high-efficiency motor-system equipment.

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

Cumulative Motor Challenge Partnerships



Facts and Figures

Number of Motor Challenge partners: 285

Expected reduction in carbon equivalent in the year 2000: 6 MMTCE

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

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

Climate Change

The State and Local Outreach Program

The State and Local Outreach Program forms partnerships with state and local governments to help them build their capacities for understanding the impacts of climate change and reducing emissions of greenhouse gases. State and local authorities are critical players in the effort to reduce greenhouse gas emissions, as they have jurisdiction over activities that create direct and indirect impacts, including land transportation, building codes, and waste management. Moreover, states and localities account for a significant percentage of global emissions of greenhouse gases. For example, carbon dioxide emissions from the top 10 emitting cities account for 9 percent of the nation's total.

Facts and Figures

A total of 24 states are completing or have completed greenhouse gas emissions inventories to establish a baseline and to forecast future emissions, while another five to eight states are expected to join this effort by mid-1995. State partners range from heavily industrialized states to rural and agriculturally-based states to coastal states that may be vulnerable to sea level rise.

The information gathered serves as a foundation for states to develop and implement the comprehensive mitigation programs and policy options that comprise State Action Plans. Eight states are working on or have completed such plans and nine states have implemented innovative demonstration projects.

Local authorities join the State and Local Outreach Program through initiatives developed and coordinated by the International Council for Local Environmental Initiatives (ICLEI) and Public Technology Inc. (PTI). Through the Urban CO₂ Reduction Program, 14 international cities became charter members, including the U.S. cities of Portland, Denver, Minneapolis and St. Paul, Chula Vista, as well as Dade County, Florida. This effort gave rise to two innovative programs, "Green Fleets" and "Cities for Climate Protection," which are engaging local authorities in voluntary efforts that garner energy savings, budgetary savings, and reductions in greenhouse gas emissions.

States and localities become partners in the State and Local Outreach Program by developing inventories of greenhouse gas emissions, forming action plans to reduce greenhouse gas emissions, and implementing innovative pilot projects. By identifying and implementing cost-effective measures and policies to reduce greenhouse gas emissions, states and localities can simultaneously save energy, save money, foster technology-oriented business

"Through the State and Local Outreach Program we will find a variety of ways to reduce greenhouse gases which will also create jobs and stimulate the Maine economy... We need to be thinking ahead, identifying opportunities for Maine and for the country and we need to be aggressive and innovative in capturing this green production for Maine."

Mark DesMeules
State of Maine
Planning Office

"The State and Local Outreach Program provided the financial resources and knowledge base from which the State of South Carolina developed an implementation plan to mitigate the direct impact of medium- and long-range climate variability on key natural resources. The information and expert evaluation provided by this unique EPA program supported all our activities at the state and local level."

David J. Smith
State Climatologist
South Carolina Department of Natural Resources

growth that helps create jobs, and improve quality of life by alleviating such dilemmas as traffic congestion, shrinking landfill capacity, and air pollution.

The Outreach Program supports the energy and innovative ideas of states and localities by providing a host of activities and services. These include technical and financial assistance, workshops, guidance documents, software tools, and analytic models. In addition, the National Partners workshop will provide training and education for all Outreach Program partners, while the

Partners in the Outreach Program

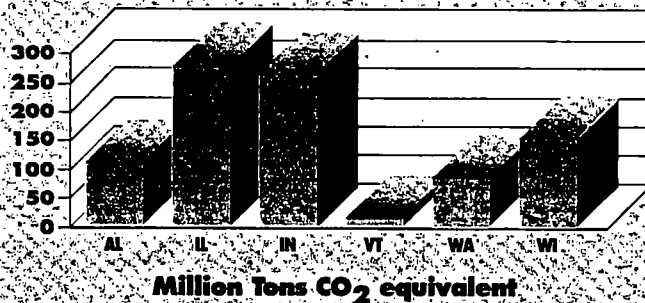
Annual National Partners Conference will recognize and highlight partners' most significant approaches and achievements. In an educational pilot project focusing on achieving energy efficiency through lighting equipment standards, Minnesota estimated that it could reduce annual carbon emissions by 35,000 tons while also saving \$1.95 million per year.

In a demonstration project, Washington estimated that if 15 percent of the Puget Sound workforce telecommuted 2 days per week, 14 million gallons of gasoline and 7,000 tons of CO₂ emissions would be saved each year.

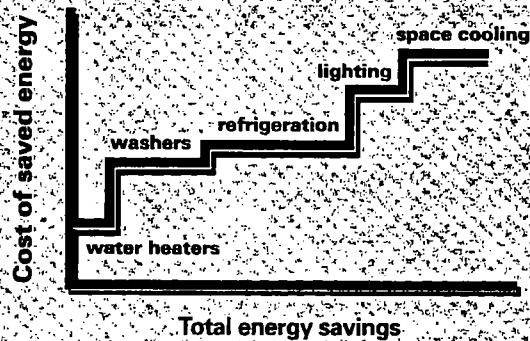
The "Planet Protection Program," jointly developed by the Outreach Program, EPA's Atlanta office and the National Hardware Retail Association, is reaching the public through educational materials. It also trains store employees to assist homeowners in making informed decisions about energy-saving products.

The "Environmental Justice and Sustainable Communities Project" provides funding and technical support to low-cost, grass roots endeavors targeted toward low-income neighborhoods and disadvantaged communities. In 1995, eight projects will help low-income residents improve their quality of life while simultaneously reducing their emissions of greenhouse gases.

• Develop greenhouse gas inventories

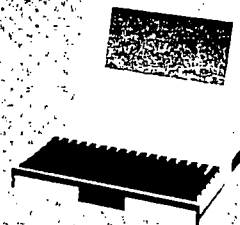


• Evaluate mitigation options



California demand-side management model

• Implement demonstration projects



Washington would save 14 million gallons of gas and 7,000 tons of CO₂ annually if 15 percent of its workforce telecommuted.

Climate Change

Waste Wi\$e

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

The WasteWi\$e program has encouraged Aetna Life and Casualty Company to boost its previously existing recycling program. Since joining WasteWi\$e as a charter member, Aetna has set up a voluntary waste management team to conduct an assessment of their in-house recycling programs. Aetna has also made specific commitments to reduce waste and increase recycling.

Baxter International has targeted reduced packaging as one of their WasteWi\$e goals. Through packaging redesign and working with their suppliers, Baxter is committed to reducing their use of packaging 15 percent worldwide by 1995.

Preliminary reports of 1994 achievements indicate that WasteWi\$e partners are reducing, reusing and recycling millions of pounds of materials (e.g. paper, plastic, glass, metal, and wood). Production and consumption of these materials generate substantial greenhouse gas emissions. By reducing, reusing and recycling, WasteWi\$e partners are helping to reduce emissions of greenhouse gases.

WASTE Wi\$E



"What the WasteWi\$e initiative means to Aetna is the ability to revitalize our current waste reduction program and to generate interest in new activities. It is with renewed vigor that we begin this venture with WasteWi\$e."

Kathleen Murray
Vice President
Aetna Life and Casualty Co.

"Implementing WasteWi\$e-type projects saved us \$24 million in 1993 alone, through reductions in packaging and other solid wastes. These initiatives serve us, our customers, our shareholders, and the environment."

William R. Blackburn
Vice President of Corporate Environmental Affairs and
Chief Environmental Counsel
Baxter International, Inc.

Facts and Figures

Current number of WasteWi\$e partners: 376

Current number of WasteWi\$e membership-based endorsers: 12

Climate Change

The NICE³ Program

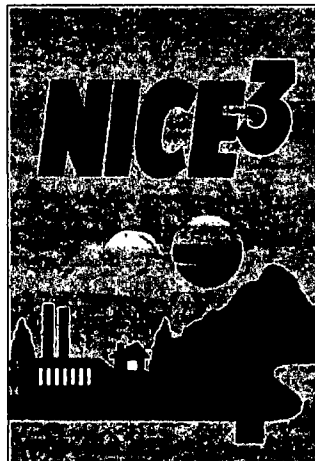
The National Industrial Competitiveness through Energy, Environment, Economics Program (NICE³) is a cost-shared grant program which is operated jointly by the U.S. Department of Energy and the Environmental Protection Agency. The goals of the program are to catalyze cleaner production and manufacturing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

NICE³ is implemented through a competitive solicitation process leading to grant awards through which federal funds must be matched. Industry applicants must submit project proposals through a state energy, pollution prevention, or business development office. NICE³ awardees are expected to commercialize the process or technology developed.

Through the NICE³ program, Chrysler Corporation's assembly plant in Newark, New Jersey is developing powder, coatings that could eventually replace liquid-paint-spray systems in auto manufacturing. The plant currently generates more than 91 tons per year of volatile organic compounds, carbon dioxide, and nitrous oxide emissions. Chrysler expects to be able to eliminate these emissions and save nearly \$4 million annually from reduced materials use, energy consumption, and waste disposal.

AMPCO Metal Manufacturing in Ohio modified the existing method of heating a continuously heated holding furnace, resulting in a reduction of 89 percent in process energy and more than 50 percent in waste, while paying back the investment in about one year.

AAP St. Mary's in Ohio has introduced a more efficient technology for remelting the aluminum chips that result from machining cast aluminum automobile wheels. Energy consumption is reduced by 50 percent, waste is reduced by 90 percent and simple payback is about 1.5 years.



"I believe the NICE³ Program is an excellent opportunity for federal and state agencies to form partnerships with industry which will benefit all parties and protect the environment at the same time."

Tommy Thompson
Governor of Wisconsin

Facts and Figures

Number of NICE³ partners: 120

Number of NICE³ projects: 29

Average private sector investment generated by each \$1 of federal funding: \$4-5

Climate Change

Rebuild America

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

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

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

Rebuild America will help replicate the success of existing community partnerships, such as a project started in Osage, Iowa in 1974 to reduce electricity use.

The project has saved the community \$1.2 million annually. customers have been given three rate reductions over the past 18 years, and no new generating capacity has been needed for the community.

Working together with the U.S. Conference of Mayors, DOE recently announced the Rebuild America "Energy-Smart Challenge" to challenge U.S. mayors to initiate energy efficiency programs for their cities.

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

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

Rebuild America partners will include:

- Utilities
- Business Leaders
- Trade Associations
- Financial Institutions
- Educational Institutions
- Economic Development Agencies
- Public and Private Building Managers
- Energy and Environmental Organizations
- State and Local Government and Energy Offices

Facts and Figures

Percentage of U.S. carbon emissions caused by building energy use: 35%

Expected reduction in carbon equivalent emissions by the year 2000: 1.6 MMTCE

Expected cost savings in 2000: \$650 million/year

Number of organizations requesting applications to prepare investment proposals for Rebuild America financial partnerships: 450