file climate change

THE WHITE HOUSE

November 26, 1997

Paul M. Epstein, M.D., M.P.H.
Associate Director
Center for Health and the Global Environment
Harvard Medical School
Oliver Wendall Holmes Society
260 Longwood Avenue
Boston, Massachusetts 02115

Dear Paul:

Thank you for your thoughtful letter following the White House Conference on Climate Change. I appreciate greatly your generous comments about my speech and offer of future assistance.

With warm wishes to you and your family for a happy and healthy holiday season, I remain

Sincerely yours,

Hillary Rodham Clinton

Hillary Rodham Clinton

CENTER FOR HEALTH AND THE GLOBAL ENVIRONMENT
HARVARD MEDICAL SCHOOL

October 27, 1997

Hillary Rodham Clinton
The White House
Washington, D.C.

Dear Hillary,

Your speech at the October 6 White House conference on climate change was the best! You managed to capture the most pressing issues: the threats to food and biological security.

Concerning respiratory disease, the blaze and haze affecting Southeast Asia (deforestation compounded by the delayed monsoon season from El Nino), shows us that we, indeed, face surprises. There, the acute and chronic respiratory impacts are extensive, and there are economic impacts for trade, investment, transport and tourism.

Regarding malaria--the incidence of which has quadrupled in the past five years--on a recent trip to Kenya I learned that hundreds of previously unexposed children and adults died from malaria (often cerebral) in highland areas this past summer.

Moreover, the extreme weather events (prolonged droughts punctuated by sudden, heavy rains) may have more of a profound influence on natural biological controls and disease outbreaks than does the overall warming. Droughts decrease predators of pests, while rains provide new food supplies and new breeding sites.

Regarding food security, you touched upon the two areas of greatest concern to farmers: extreme weather events and pests. Agricultural entomologists now estimate that 42% of stored and growing crops are lost due to pests, pathogens, and weeds, amounting to a $247 billion loss annually. Droughts favor herbivores and crop pests (white flies, locusts and aphids) and rodents, while floods foster fungi. Thus unstable weather patterns could precipitate even greater losses in the future.

OLIVER WENDELL HOLMES SOCIETY · 260 LONGWOOD AVENUE · BOSTON, MASSACHUSETTS 02115
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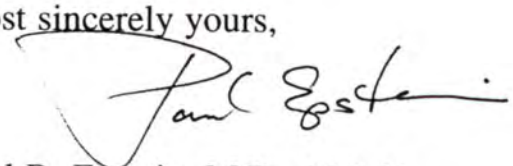
WEBSITE HTTP://WWW.MED.HARVARD.EDU/CHGE/

I hope you will continue to speak out on these issues, so central to child and family health; pre and post Kyoto. If there is an agreement in Japan, it will be an important milestone; and the subsequent review and "ratchet-up" process will undoubtedly reflect the evolving realities.

There is certainly resilience and resistance built into our ecosystems. But in the long run we must stop *burning* living and buried organic material (forests and fossil fuels), and learn how to nurture natural systems rather than forcibly *man*age them.

Thank you once again for focusing on these issues at the October 6 conference. Please let me know if there is any way I can be of assistance in the future. I have included several recent, relevant articles and letters.

Most sincerely yours,



Paul R. Epstein, M.D., M.P.H.
Associate Director
Center For Health And The Global Environment
Harvard Medical School

P.S. I do hope you are considering running in 2008!

The Boston Globe

THURSDAY, APRIL 10, 1997

p.A27

Warm and wet conditions spell trouble for the world.

Weather alert

PAUL LACHINE ILLUSTRATION

ERIC CHIVIAN and PAUL EPSTEIN

Last week's record snowstorm was another reminder that in recent years we have endured the most variable and extreme weather in memory. The same has been true in other parts of the country and the world: Witness the succession of storms and snow melts in the Pacific Northwest in January and the record-setting floods along the Ohio River last month.

This instability is considered to be an early manifestation of the warming of the atmosphere and the oceans over the last 100 years, resulting from our burning fossil fuels and rapidly increasing atmospheric carbon dioxide concentrations.

Worldwide, 1996 was the warmest year since global temperatures were first kept in 1856. For the Northeast, 1996 was the wettest year on record. What people don't realize is that these changes in climate carry unprecedented potential risks for human health.

For one: Warm, wet weather, especially warm winters and wet springtimes, produces ideal breeding conditions for mosquitoes, which in New England can carry Eastern equine encephalitis, a disease with a 50-percent mortality mainly affecting children and leaving many with severe, chronic neurological problems. Warm, wet conditions also favor increased populations of ticks, which can transmit several infections, including Lyme disease.

Prior to the 1970s, Lyme disease was unheard of, but in each subsequent decade the number of cases has steadily climbed. In 1994, the Centers for Disease Control reported 13,000 cases nationwide, a 26-fold increase over 1982.

While tick-borne diseases are highly sensitive to human settlement patterns and populations of host species like deer and mice, climatologic factors are likely to play an increasingly important role.

Higher global temperatures can also increase the number of heat-related deaths, as we saw in Chicago during the July 1995 heat wave, when more than 700 people died. Currently in Boston, there are about 90 people on average who die each summer from the heat. If global warming continues at its current pace, this figure may double by the year 2050. Additional illness and death may result from increasing levels of air pollution, exacerbated by the warming, affecting those with chronic respiratory diseases, such as children with asthma and the elderly with bronchitis and emphysema.

The world scientific community has warned that present trends of fossil fuel use may result in average global temperatures by the year 2100 that are 2 to 6 degrees warmer than they are now. It has been more than 120,000 years since the earth was this warm. Because species often live within narrow temperature ranges, such warming – and more extreme weather – may compromise food sources, affecting agricultural productivity and marine life, and threaten countless numbers of species with extinction.

In addition to the unforeseeable ecological consequences of such extinctions, direct implications for human health include the loss of valuable medical research models that help us understand human physiology and disease and the loss of potential new medicines.

Consider two New England species that may be endangered by greenhouse warming – the white birch and the dogfish shark. Researchers have found in the bark of white birch trees an acid that in laboratory tests has shown great promise in fighting malignant melanomas, a cancer that is increasing in incidence at a faster rate than any other in the United States, doubling in the past decade.

The fact that sharks rarely get infections or tumors, presumably the result of 400 million years of highly successful evolution of their immune systems, has led to the discovery of "squalamene" in the dogfish shark, an antibiotic that is highly potent against a wide variety of bacteria, fungi, and parasites and that seems to work through pathways different from those of all other known antibiotics.

As infectious agents are acquiring resistance to currently used medications, this discovery has special significance.

Finally, species loss may disrupt vital life support systems as species interact with one another and with their environments to provide such services as regulating the concentration of atmospheric gases and water vapor, maintaining soil fertility, filtering pollutants, breaking down wastes, and controlling pests.

With our failure to heed the warnings of the world's scientific community to reduce our burning of fossil fuels, we are in effect conducting a global experiment with all life on earth, including human life, the outcome of which no one can fully predict. What we can predict – about changes in the incidence and distribution of infectious diseases, about heat waves and air pollution, and about the effects of species loss – suggest a future with enormous dangers for human beings.

With a recognition of the medical consequences involved from our damaging the ozone layer, the world community agreed to control the release of ozone-depleting chemicals. Will it respond with the same urgency to the human health risks predicted from our changing the global climate and draft a strong treaty to control greenhouse gases?

Eric Chivian and Paul R. Epstein are faculty members at Harvard Medical School, where they direct the Center for Health and the Global Environment.

The New York Times

NEW YORK, MONDAY, JANUARY 13, 1997

Also beyond the greater New York metro

Look to Weather for Clues to Malaria Comeback

To the Editor:

"Malaria Makes a Comeback, and Is More Deadly Than Ever" (front page, Jan. 8) captures the multiple factors — population movements, chemical resistance, lapsed public health vigilance and environmental change — influencing the resurgence of malaria. Mosquitoes, the transmitters of the disease, are indeed quintessential opportunists and adapt readily in disturbed environments.

As co-author of the World Health Organization report discussed in your article, I offer several recent findings. Consistent with model projections that global warming could hasten the geographic spread of malaria and dengue fever, these devastating diseases are now occurring at high altitudes in Latin America, central Africa and Asia. Cerebral malaria has occurred in Nairobi, Kenya, while dengue fever is found in the mountains around San José, Costa Rica.

Moreover, highland malaria and dengue fever are occurring in the context of upward migration of plants on many continents and summit glacial retreat in Latin America, Europe, central Africa and Asia. A recent study in the journal Nature confirmed that the freezing levels in the mountains have indeed shifted upward about 500 feet since 1970, representing a warming of close to 2 degrees Fahrenheit.

As we enter a year of debate concerning climate change (the convention will be held in Kyoto, Japan, in December), it is prudent to examine the potential consequences associated with continued warming and climate instability. Your article says that malaria "hinders economic development"; epidemics are growing ever more costly in terms of health, development, trade and tourism.

Lars Leetaru

While the resurgence of infectious disease has multiple social, biological and environmental roots, meteorological factors may play an increasing role in the future. We may be vastly underestimating the social and economic damages associated with epidemics and extreme weather events as well as the potential benefits to society as a whole of changing our environmental and energy policies.

PAUL R. EPSTEIN, M.D.

Boston, Jan. 8, 1997

The writer is associate director of the Center for Health and the Global Environment at Harvard Medical School.

File

WHITE HOUSE CONFERENCE

ON CLIMATE CHANGE

The Challenge of Global Warming

October 6, 1997

Staff Copy

White House Conference on Climate Change: The Challenge of Global Warming

October 6, 1997

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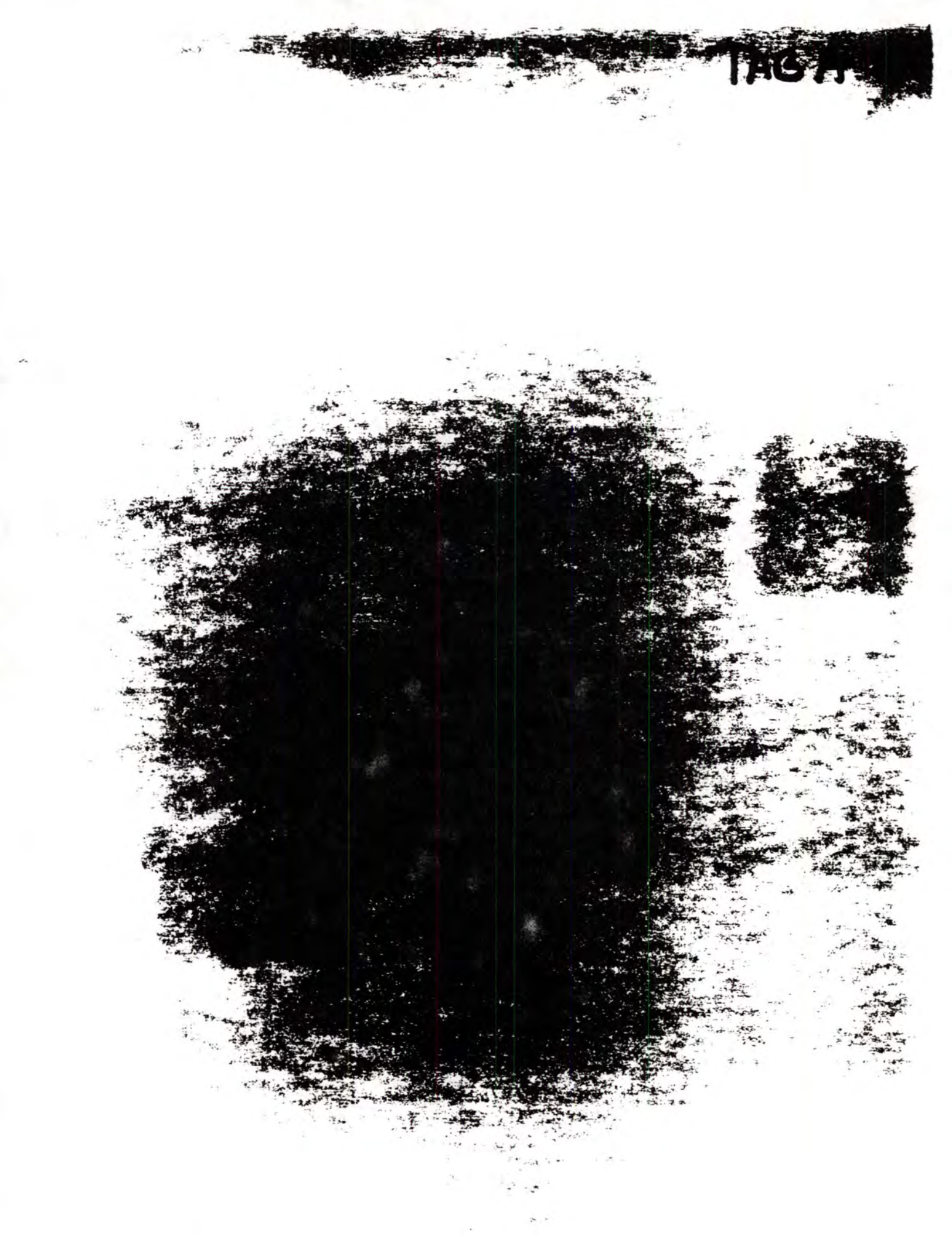


THE WHITE HOUSE

WASHINGTON

October 5, 1997

White House Conference on Climate Change

DATE: October 6, 1997
LOCATION: Georgetown University (Gaston Hall)
TIME: 10:00 a.m.-4:30 p.m.
FROM: Todd Stern

I. PURPOSE

To engage in a substantive discussion of global climate change science and policy with key stakeholders.

Objectives for the Conference: (1) To enhance the basic national understanding of the climate change issue by providing a clear articulation of the science and by presenting the key aspects of an effective response; (2) to help stimulate a national dialogue on the issue of global climate change by bringing together the people from around the country who have thought the most about the issue and who have the greatest amount at stake in any response we choose; (3) to build support for developing a climate change policy based on the principles of binding targets, flexible implementation mechanisms, and global participation.

II. BACKGROUND

The White House Conference on Climate Change: The Challenge of Global Warming is the highlight of your outreach effort on this issue in the lead-up to the Kyoto meeting this December.

The Conference will include some 200 invited guests from a broad range of interests, including industry, organized labor, the environmental and scientific communities, leading economists, Congress, and state and local officials. In addition, the Conference will be broadcast live via satellite to more than 30 locations across the country.

The Conference follows on a series of events that have included you, the Vice President, members of the Cabinet, and other senior Administration officials. These include the July 24 scientists' roundtable hosted by you and the Vice President; your meetings with business CEO's and environmental leaders; some twenty events across the country featuring the Cabinet (including Secretaries Daley, Peña, Slater, Cohen, Babbitt, and Glickman, and Administrator Browner), numerous meetings with key constituencies hosted by Todd Stern, Katie McGinty, Gene Sperling, Dan Tarullo, and other members of your climate team; and most recently the weathercasters event last week.

Still, your opening remarks will be your first opportunity to speak to the American people about this issue in a substantive way. Interest in global climate change is higher than it has ever been, both because of the upcoming Kyoto meeting and the efforts you have undertaken over the last few months. The weathercasters event, for example, scored some 400 television hits nationwide.

While we are not announcing any new policy at the Conference, the audience will be paying very close attention to everything you say for a hint of how you might be leaning. You should be careful of any comments that imply support for a particular target and timetable or that seem to favor a particular implementation regime.

Topics for discussion: After opening remarks from the Vice President and you, the Conference will be divided into four panel discussions covering the scientific, technological, international, and economic aspects of climate change. Additionally, there will be lunchtime breakout sessions where invited guests will have the opportunity to discuss climate change with members of your Cabinet and other senior White House officials.

You will be present for the first two panels -- the first on the science of climate change and the second on existing and developing technologies that have the potential to reduce greenhouse gas emissions.

The Vice President will remain for the two afternoon panels.

At the panel tabs that follow in this book, you will find descriptions and goals of the panels, bios of the panelists, and a script.

III. PARTICIPANTS

Pre-brief Participants:

Todd Stern, Katie McGinty, Gene Sperling, Dan Tarullo, Jim Steinberg, John Podesta, Erskine Bowles, Jack Gibbons, Janet Yellen.

Event Participants:

The event will include roughly 200 invited guests from industry, labor, the environmental and scientific communities, Congress, and state and local governments, as well as leading economists, authors, and others who bring substantive knowledge to the issue. A complete list is attached.

Also in attendance will be approximately 230 Georgetown University students along with several faculty.

IV. PRESS PLAN

The entire conference, with the exception of the lunchtime breakout sessions, will be OPEN PRESS.

V. SEQUENCE OF EVENTS

- YOU and the Vice President enter Gaston Hall.
- Father O'Donovan welcomes the attendees and introduces the Vice President.
- The Vice President makes remarks and introduces YOU.
- YOU make opening remarks.
- YOU and the Vice President lead a panel discussion on the science of climate change.
- YOU and the Vice President lead a panel discussion on technology.
- YOU depart.
- Breakout sessions during a working lunch hour, led by Cabinet Officers.
- Prof. Robert Gallucci introduces the First Lady to open the afternoon session.
- The First Lady speaks about Children's Health Day and climate change.
- The Vice President leads a panel discussion on international issues.
- The Vice President leads a panel discussion on economic issues.
- The Vice President makes very brief closing remarks.
- A reception is held in the Indian Treaty Room.

VI. ATTACHMENTS

Conference Agenda
Panel by panel descriptions, bios, and scripts
List of Participants (to be forwarded)
Remarks (to be forwarded)
Background
Articles

[redacted]

[redacted]

White House Conference on Climate Change:
The Challenge of Global Warming
October 6, 1997

10:00 - 10:05
Father O'Donovan, Georgetown University: ***Introduces the Vice President***

10:05 - 10:15
Vice President Gore: ***Welcome attendees, Remarks, Introduces the President***

10:15 - 10:30
President Clinton: ***Opening Remarks***

10:35 - 11:35
Panel I: The Science of Global Warming and Climate Change

Presentation: **John Holdren,** Professor, Department of Earth and Planetary Sciences and the John F. Kennedy School of Government, Harvard University. Head of Research and Development Panel, President's Committee of Advisors on Science and Technology (PCAST).

Panelists: **Robert Watson,** Chair of the Intergovernmental Panel on Climate Change (IPCC); Director for Environment, World Bank.
Tom Karl, Senior Scientist, NOAA, National Climatic Data Center.
Diana Liverman, Chair, National Academy of Sciences Committee on Human Dimensions of Global Change; Director, Latin American Studies Program, University of Arizona.
Don Wilhite, Director, National Drought Mitigation Center, University of Nebraska.

11:45-12:45
Panel II: The Role of Technology in Reducing Greenhouse Gas Emissions

Presentation: **Federico Peña,** Secretary of Energy.

Panelists: **Mary Good,** Managing Member, Venture Capital Investors, LLC; Under Secretary of Commerce for Technology, U.S. Department of Commerce, 1993-1997.
Tom Casten, President & CEO, Trigen Energy Corporation.
Michael Bonsignore, Chairman and CEO, Honeywell Corporation.
Mason Willrich, CEO, EnergyWorks.
Kurt Yeager, President, Electric Power Research Institute.
Larry Papay, Bechtel Corporation

1:00-2:00
Lunch: Breakout Discussions with the Cabinet

2:15-2:20
Robert Gallucci, Dean of the School of Foreign Service: ***Introduces the First Lady***

2:20-2:30
First Lady Hillary Rodham Clinton: ***Remarks***

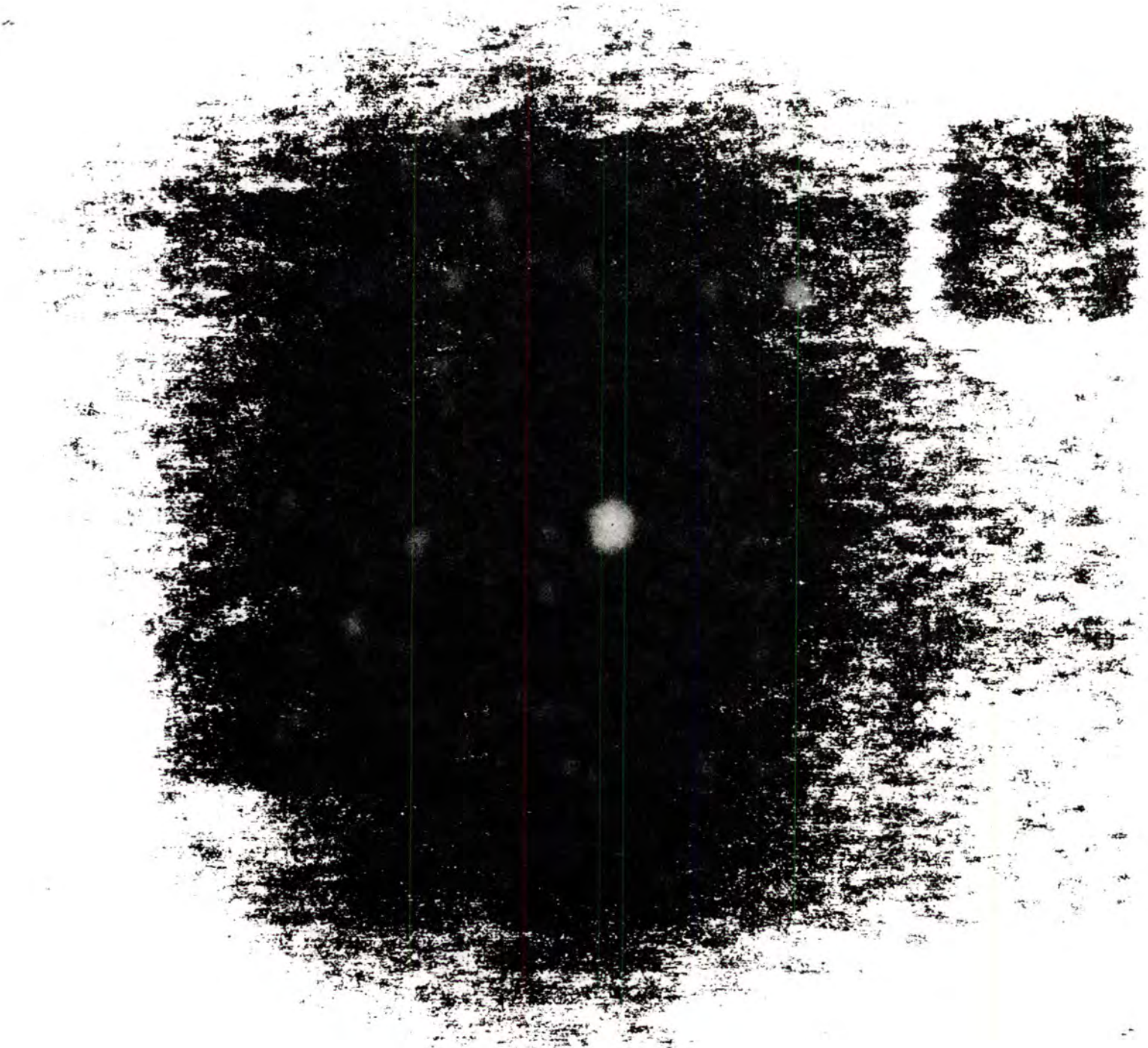
2:35-3:35
Panel III: The Kyoto Conference and U.S. National Interests

Presentation: **Madeleine Albright,** Secretary of State.
Panelists: **James D. Wolfensohn,** President, World Bank.
Richard Schmalensee, Professor of Economics and Management, Massachusetts Institute of Technology; Director of MIT Center for Energy and Environmental Policy Research; member of Council of Economic Advisers, 1989-91.
Daniel Yergin, President, Cambridge Energy Research Associates; author of "The Prize: The Epic Quest for Oil, Money and Power," winner of the Pulitzer Prize.
E. Linn Draper, Chairman, President, and Chief Executive Officer, American Electric Power.
Fred Krupp, Executive Director, Environmental Defense Fund.
Mae Jemison, President, Jemison Group, Inc. and Jemison Institute for Advancing Technology in Developing Countries at Dartmouth College. Former NASA astronaut.
Jessica Tuchman Mathews, President, Carnegie Endowment for International Peace.

3:40-4:40
Panel IV: Climate Change Policy and the U.S. Economy

Presentation: **Larry Summers,** Deputy Secretary of the Treasury.
Panelists: **Robert Repetto,** Vice President and Senior Economist, World Resources Institute. Co-author, "The Costs of Climate Protection: A Guide for the Perplexed."
William Nordhaus, Whitney Griswold Professor of Economics, Yale University. Author of "Efficient Use of Energy Resources," "Managing the Global Commons."
Robert Stavins, Professor of Public Policy and Chair of Environment and Natural Resources Program, the John F. Kennedy School of Government, Harvard University.
John Sweeney, President, AFL-CIO.
Richard Sandor, Chairman & Chief Executive, Centre Financial Products Limited; Vice-Chair of Chicago Board of Trade.

Tab C



Panel One

The Science of Global Warming and Climate Change

Participants

The President

The Vice President

Dr. John P. Holdren

Mr. Thomas R. Karl

Dr. Diana M. Liverman

Dr. Donald A. Wilhite

Dr. Robert T. Watson

Description and Goals

Description of the Panel

This panel brings together several of the leading scientists on the issue of global climate change and its potential impacts. We have selected individuals that represent the broad consensus of scientific opinion on the range of subjects being covered.

There is no "global warming skeptic" among those who will speak, and we may be criticized for this by some in industry and the Congress. Given the limited time frame and number of panel slots, we felt it was inappropriate to give a platform to someone from the small minority who question the basic science of climate change. This would send a misleading message to the public about the level of scientific consensus that exists on the issue.

There are, to be sure, real uncertainties regarding some important climate change issues, such as how much temperatures will rise if we stay on a business-as-usual path (current estimates are quite imprecise, 2-6.5 degrees F) or what impacts are likely. The scientists on the panel will be very clear about what we know and what we don't, and the skeptics' main points will be specifically addressed by the head of the authoritative international scientific body on climate change (the Intergovernmental Panel on Climate Change).

Goals of the Panel

The purpose of this panel is to provide a clear and understandable presentation on the state of scientific knowledge on the issue of global climate change.

We want people to come away understanding that climate change is a serious problem and that, although there is still much we don't know yet, what we do know should compel us to take appropriate action.

Suggested Script

The *VICE PRESIDENT* will introduce the five scientists on the panel, and then turn it over to **Dr. John Holdren**, who will make an opening presentation.

John Holdren - Professor of Environmental Science and Public Policy, Harvard University; chair of the PCAST study on U.S. energy research and development needs in relation to the economic, environmental, and security challenges of the next century. *Dr. Holdren will deliver a soup-to-nuts presentation on climate change science, focusing on the basic physical science, the level of certainty about how humans may be affecting climate, and about how much change is likely in the next century and what that change could mean for society.* (15 minutes)

The *VICE PRESIDENT* should ask a lead-in question of Tom Karl. **Tom, you've studied precipitation patterns worldwide. Is there evidence that changes are taking place?**

Tom Karl - Senior Scientist, National Oceanographic and Atmospheric Administration. *Mr. Karl has analyzed a wealth of data on precipitation trends worldwide over the past century and will present his conclusions that some noticeable changes are apparent, including in the United States.*

Suggested follow-up for *YOU*: **Tom, I've spent an awful lot of time talking to people around the country who believe something very unusual is going on with the weather. Some people have experienced several "storms of the century" just since I came into office. Can we attribute this to climate change?** (Karl has a great list of recent U.S. weather events and the billions of dollars they have cost.)

YOU should ask a lead-in question of Diana Liverman. **Dr. Liverman, recognizing that it is hard to specifically predict the impacts of climate change on particular regions, are there things we can generally say about how climate change might affect the average American?**

Diana Liverman - Professor at the University of Arizona, Chair of the National Academy of Sciences Committee on the Human Dimensions of Global Change and Co-Chair of the Scientific Advisory Committee of the Inter-American Institute for Global Change. *Dr. Liverman will talk about the potential impacts of climate change on several regions of the country, focusing on water resources and agriculture.*

Suggested follow-up for the *VICE PRESIDENT*: **Dr. Liverman, how might climate change affect our Canadian and Mexican neighbors?**

YOU should ask a lead-in question of Don Wilhite: **Dr. Wilhite, I understand your work has focused on the relationship between climate change and droughts. What sorts of conclusions have you drawn?**

Donald Wilhite - Director, National Drought Mitigation Center and International Drought Information Center; Director of Western Drought Coordination Council and a climatologist at the University of Nebraska-Lincoln. *Dr. Wilhite will discuss the relationship between climate change and drought and will provide some regional texture by talking about possible impacts on certain areas of the U.S.*

Suggested follow-up question for the ***VICE PRESIDENT***: **Don, are there actions we can take that both help us prepare for climate change and also improve our capacity to respond to droughts today?**

The ***VICE PRESIDENT*** should ask a lead-in question of Dr. Robert Watson. **Dr. Watson, as the chair of the leading international scientific body on the science of climate change, how do you respond to the skeptics who say this is not a real problem?**

Dr. Robert Watson - Director for Environment, World Bank. Head of the Intergovernmental Panel on Climate Change (IPCC). *Dr. Watson will specifically address the main arguments of the climate change skeptics, including the satellite record and the issue of solar variability (i.e. sun spots).*

YOU should FINISH the discussion by asking a final question of John Holdren: **John, given the uncertainties that do exist, can we wait for better scientific information before taking action.** (Holdren will use the "supertanker" analogy he used at the science roundtable in July.)

Additional Science Questions If Needed

For Holdren:

Can you speak to what you see as the link between climate change and international security?

For Karl or Watson:

You've said some kinds of extreme weather events will increase. What about hurricanes?

It looks like we are headed into a powerful El Nino. Is there any link between climate change and El Nino?

For Wilhite or Liverman:

I've heard some people say that world agriculture will be able to adapt to climate change and that we'll just have a greener world---what do you say to that?

For any panelist:

How might some of the impacts you are describing -- such as sea level rise and changing floods and droughts affect the rest of the world -- in particular, the developing countries ?

For Holdren or Watson:

Many argue that we should just wait for the promise of new technology to get us out of this mess. How would you respond?

Panel I: The Science of Global Warming and Climate Change

John P. Holdren. Professor, Department of Earth and Planetary Sciences; Teresa and John Heinz Professor and Director of the Program on Science, Technology, and Public Policy in the John F. Kennedy School of Government, Harvard University.

Dr. Holdren is a member of President Clinton's Committee of Advisors on Science and Technology (PCAST). He currently chairs a PCAST study of the entire U.S. energy R&D portfolio in relation to the economic, environmental, and security challenges of the next century. He is also Distinguished Visiting Scientist at the Woods Hole Research Center, Chair of the Committee on International Security and Arms Control of the National Academy of Sciences, and Chair of the Executive Committee of the Pugwash Conferences on Science and World Affairs. He was previously Professor of Energy and Resources in University of California, Berkeley's campus-wide interdisciplinary graduate program in energy and resources, which he co-founded in 1973. He is a member of the National Academy of Sciences, the AAAS, and the California Academy of Sciences, among others. In 1981 he received one of the first MacArthur Foundation Prize Fellowships. In December of 1995 he delivered the Nobel Peace Prize acceptance lecture on behalf of the Pugwash Conferences.

Thomas R. Karl. Senior Scientist, NOAA, National Climatic Data Center.

Mr. Karl is a Fellow of the American Meteorological Society and Chairman of the National Academy of Sciences Climate Research Committee. He has received numerous awards for his scholarly work on climate, including the Helmut Landsberg Award, the Climate Institute's Outstanding Scientific Achievements Award, the Department of Commerce's Bronze and Gold Medals and the NOAA Administrator's Award. He is currently an Editor for the Journal of Climate and an Associate Editor for Climatic Change. He has been a lead author of each of the Intergovernmental Panel Assessments of Climate Change since 1990. He is currently Co-Chair of NOAA's Decadal-to-Centennial Strategic Planning Team.

Diana M. Liverman. Director of the Latin American studies program, University of Arizona; Chair, National Academy of Sciences Committee on the Human Dimensions of Global Change; Co-Chair, Scientific Advisory Committee, Inter-American Institute for Global Change.

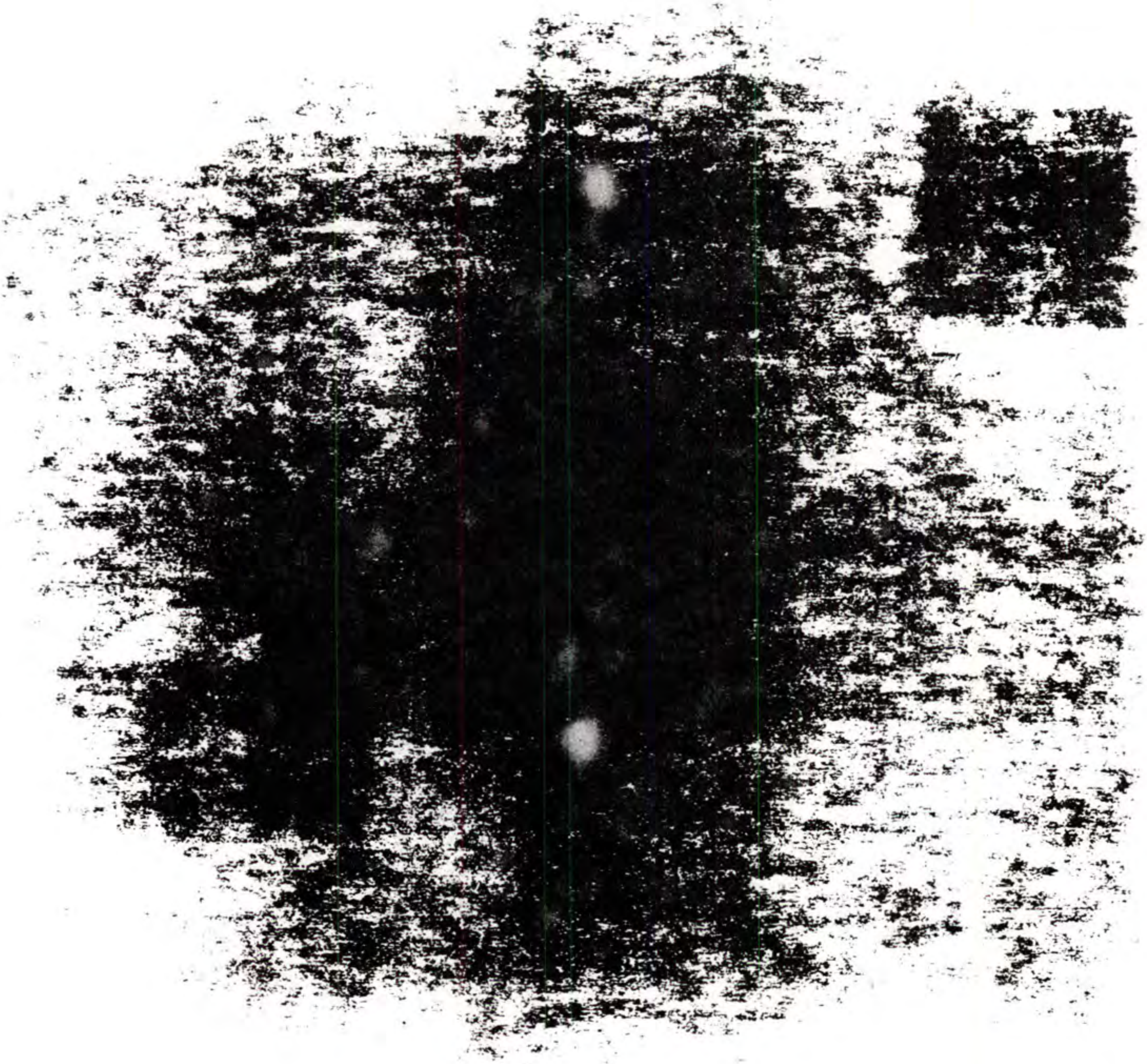
Trained as a geographer, Dr. Liverman has published widely on drought, climate impacts, resource management, and environmental policy, and her current research examines the social causes and consequences of global and regional environmental change, especially the impacts of climate change and variability on water resources and agriculture in the Americas. Dr. Liverman is also associated with the University of Arizona's Department of Geography, the Institute for the Study of Planet Earth, and the Udall Center for Studies in Public Policy. In addition, she is the Co-Editor of *Global and Planetary Change* and a member of the National Research Council Panel on Human Dimensions of Seasonal to Interannual Climate Prediction.

Donald A. Wilhite. Director, National Drought Mitigation Center & International Drought Information Center, University of Nebraska-Lincoln; Professor in the Atmospheric Sciences section of the School of Natural Resources, University of Nebraska-Lincoln.

Dr. Wilhite is also the administrative director of the newly formed Western Drought Coordination Council and a climatologist at the University of Nebraska-Lincoln who focuses on how governments and societies can reduce their vulnerability to drought. He pursues research on climate and development, the policy implications of climate variability and climate change, drought management and preparedness, and the effects of climate on society. He also conducts training seminars and workshops across the United States and around the world to help prepare for drought.

Robert T. Watson. Director for Environment and Head of the Environment Sector Board, World Bank; Chair, Intergovernmental Panel on Climate Change.

Before joining the World Bank, Dr. Watson was Associate Director for Environment in the White House Office of Science and Technology Policy. Dr. Watson also has served as Director of the Science Division and Chief Scientist for the Office of Mission to Planet Earth at the National Aeronautics and Space Administration. He played a key role in the negotiation of global environment conventions and the evolution of the Global Environment Facility (GEF). He also served as Chairman of the GEF's Scientific and Technical Advisory Panel, and he is the Chair of a number of international scientific assessments, including the UN Environment Programme/World Meteorological Organization International Scientific Assessment of Ozone, and UNEP's Global Biodiversity Assessment. He has received many national and international awards and prizes for his contributions to science, including the American Association for the Advancement of Sciences Award for Scientific Freedom and Responsibility in 1993.



Panel Two

The Role of Technology in Reducing Greenhouse Gas Emissions

Participants

The President

The Vice President

Secretary of Energy Federico Peña

Mary Good

Tom Casten

Michael Bonsignore

Mason Willrich

Kurt Yeager

Larry Papay

Description and Goals

Description of the Panel

This panel includes business people who will talk about the specific ways in which technology can help reduce greenhouse gas emissions -- for example, through the more efficient use of fossil fuels or through the use of alternative fuels.

An initial presentation from Secretary Peña will provide an overview of the sources of U.S. greenhouse gas emissions and of the kinds of technologies that are available. Speakers will then address the opportunities for technological advances in the sectors most responsible for greenhouse gas emissions, including transportation, manufacturing, and utilities.

Topics will include energy-efficiency, the development of renewable energy sources, the potential for environmental technology exports, and the role of government in stimulating the development of new technologies.

There is a real debate among those who are interested in climate change about the potential of technology to bring down the cost of emissions reductions. Many economists are skeptical, at least in the near term. Others, including many environmentalists and renewable energy advocates, claim that new technologies will make substantial emissions cuts possible at relatively low cost. The panel will not directly address this question but instead will explore the kinds of opportunities that different technologies present.

Goals of the Panel

This panel is designed to broadly explore the role that technology can play in an effective response to the challenge of global climate change.

We want the audience to recognize the substantial opportunities that exist in developing cleaner energy sources, in using energy more efficiently, and in promoting American technologies overseas.

Suggested Script

The ***VICE PRESIDENT*** will turn to **Secretary of Energy Peña** who will make a brief presentation framing the discussion.

Secretary of Energy Federico Peña - *The Secretary will provide a broad overview of where U.S. greenhouse gas emissions come from and talk about the promise of technology to reduce these emissions, given, in particular, adequate research and development budgets.*

YOU should ask a question of Tom Casten. **Tom, it always amazes me to hear how much energy we *waste* in this country every year. Can you talk about your work in trying to recapture some of this lost energy?**

Tom Casten - President and CEO, Trigen Energy Corporation. *Casten will describe his company's work in recapturing waste energy to heat houses and buildings and discuss the impact and potential market of this technology in the U.S.*

The ***VICE PRESIDENT*** should ask a question of Kurt Yeager. *Kurt, how can we reduce greenhouse gas emissions in facilities, such as power plants, that use fossil fuels?*

Kurt Yeager - President, Electric Power Research Institute (EPRI). EPRI is a research institute funded by a number of electric utilities. *Yeager will discuss such technologies as high-efficiency coal or natural gas power plants, carbon sequestration and direct hydrogen production.*

YOU should ask a question of Mary Good. **Mary, from the Secretary's presentation it seems quite apparent that we need to find ways of reducing energy consumption in our transportation system. What are some of the specific opportunities you see in this field?**

Mary Good - Former Under Secretary of Commerce for Technology, 1993-1997; now Managing Member, Venture Capital Investors, LLC. *Ms. Good will sketch the potential for technological advances to reduce emissions in the transportation sector, focusing on such initiatives as the Partnership for a New Generation Vehicle (PNGV).*

YOU should ask a question of Michael Bonsignore. **Michael, I know Honeywell is actively involved in making more efficient products and systems. Do you see significant export potential for environmental technologies that can reduce greenhouse gas emissions?**

Michael Bonsignore - Chairman and CEO of Honeywell. *Bonsignore will talk about the energy savings available through the use of high efficiency products and systems, as well as the great potential of the environmental technology export market for U.S. business.*

The *VICE PRESIDENT* should ask a question of Mason Willrich. **Mason, I know you are involved in the alternative energy field. What do see as the potential for alternative energies to reduce our total emissions of greenhouse gases?**

Mason Willrich - CEO of EnergyWorks, a joint venture between PacifiCorp, a major electric utility, and Bechtel, an international engineering firm. EnergyWorks develops alternative energy projects domestically and internationally. *Willrich will talk about the potential of alternative energies such as wind, solar and biomass.*

YOU should ask a question of Larry Papay. **Larry, can you describe some of the longer-range technologies that may hold promise for reducing greenhouse gas emissions, and the role you think the government should play in both developing and diffusing technology?**

Larry Papay - Senior Vice President and General Manager of Bechtel Technology and Consulting, Bechtel Group, Inc. Bechtel is one of the world's leading engineering firms. Papay is a member of the PCAST Task Force on R&D headed by John Holdren, which has just finished a major report on federal support for R&D. *Papay will talk about the promise of technologies that are still on the drawing board, as well as the role of the federal government in supporting R&D.*

YOU should ask an additional question that could be handled by Kurt Yeager or Mary Good. **Let's bring the average American into this. What kinds of things can people or do in their homes or businesses to reduce their use of energy through the use of products that are available right now?** (*She will talk about such things as buying more fuel efficient, appliances, insulation, more efficient lighting, etc*).

If time permits, the *VICE PRESIDENT* or *SECRETARY PEÑA* could ask follow-up questions to panelists:

To Mason Willrich: **The Intergovernmental Panel on Climate Change and Shell International estimate that renewable energy can supply up to 50% of world energy use by 2050. What would it take to achieve that vision (in terms of timing and investment)?**

To Larry Papay: **How does the technology agenda you laid out match what other countries are doing?**

To Michael Bonsignore: **Which energy sector offers the greatest opportunity for overall improvement in energy efficiency through the widespread use of automated controllers?**

Panel II: The Role of Technology in Reducing Greenhouse Gas Emissions

Federico F. Peña. United States Secretary of Energy.

Secretary Peña served as Secretary of Transportation from 1993 through 1997, and mayor of Denver from 1983 to 1991. At the Department of Energy, he is committed to ensuring progress in the agency's vital missions in national security, science and technology, energy resources, environmental quality, and further invigorating U.S. economic competitiveness in the world economy. His reputation as a builder of consensus among business, community and government leaders is well known; as mayor of Denver he led an urban and economic renaissance and managed to reverse Denver's mid-1980s decline. Secretary Peña also served as a Colorado legislator and a civil rights attorney.

Mary L. Good. Managing Member, Venture Capital Investors, L.L.C.; Under Secretary for Technology, Department of Commerce, 1993-1997.

In addition to her role as Under Secretary for Technology, Dr. Good chaired the National Science and Technology Council's (NSTC) Committee on Technological Innovation, and served on the NSTC Committee on National Security. Prior to joining the Administration, she was the Senior Vice-President of Technology at AlliedSignal Inc., and, prior to her career in industry, was a Professor of Chemistry at the University of New Orleans and a Boyd Professor of materials science at Louisiana State University. She was appointed to the National Science Board by President Carter in 1980 and again by President Reagan in 1986, and was the Board's chairman from 1988 until 1991 when she received an appointment from President Bush to become a member of the President's Council of Advisors on Science and Technology (PCAST). In 1997, Dr. Good received the highest award given by the American Chemical Society, the Priestly medal.

Thomas R. Casten. President and CEO, Trigen Energy Corporation.

Trigen uses its expertise in thermal engineering and proprietary co-generation processes to convert fuel to various forms of thermal energy and electricity at more efficient conversion rates than conventional conversion processes. From 1964-1968, Mr. Casten was an officer in the U.S. Marine Corps, Force Engineers, and spent one year in Vietnam. He has served on the Board of Directors and as President of the International District Energy Association. He has authored numerous reports and articles on co-generation and district heating, and has been called upon to give testimony before Public Service Commissions, State Assembly Committees, and U.S. Congressional Committees.

Michael Bonsignore. Chairman and Chief Executive Officer, Honeywell Inc.

Mr. Bonsignore joined Honeywell in 1969. In 1982 he relocated to Brussels, Belgium, as president of Honeywell Europe, S.A., where he was responsible for profit and loss and business

development of all of Honeywell's businesses in Europe, the Middle East and Africa. In 1987, he returned to the U.S. and became President of Honeywell's international operations later that year. In 1993, he was named Honeywell's Chairman of the Board and Chief Executive Officer. Mr. Bonsignore is a member of the U.S.-Russia Business Council, the Investment and Services Policy Advisory Committee (INSPAC) to the U.S. Trade Representative, the United States-China Business Council, and the Alliance to Save Energy Board.

Mason Willrich. Chairman of the Board, EnergyWorks, L.L.C.

EnergyWorks is a joint venture of Pacificorp and Bechtel which provides distributed systems and services to industrial and commercial customers worldwide. Mr. Willrich is also a Principal of Nth Power Technologies, Inc., a venture capital limited partnership which invests in early stage companies offering new products and services to energy utilities, their customers, and suppliers. He was formerly Chief Executive Officer of PG&E Enterprises and, prior to that, director for international relations at the Rockefeller Foundation. In addition, Willrich was a Professor of Law at the University of Virginia, director of its Center for the Study of Science, Technology and Public Policy and Assistant General Counsel, U.S. Arms Control and Disarmament Agency. He is a member of the advisory board of the School of Earth Sciences, Stanford University, and the Advisory Council of International and Area Studies, University of California, Berkeley. In 1994-1995, he served as Vice Chair of the U.S. Department of Energy Task Force on Strategic Energy R&D.

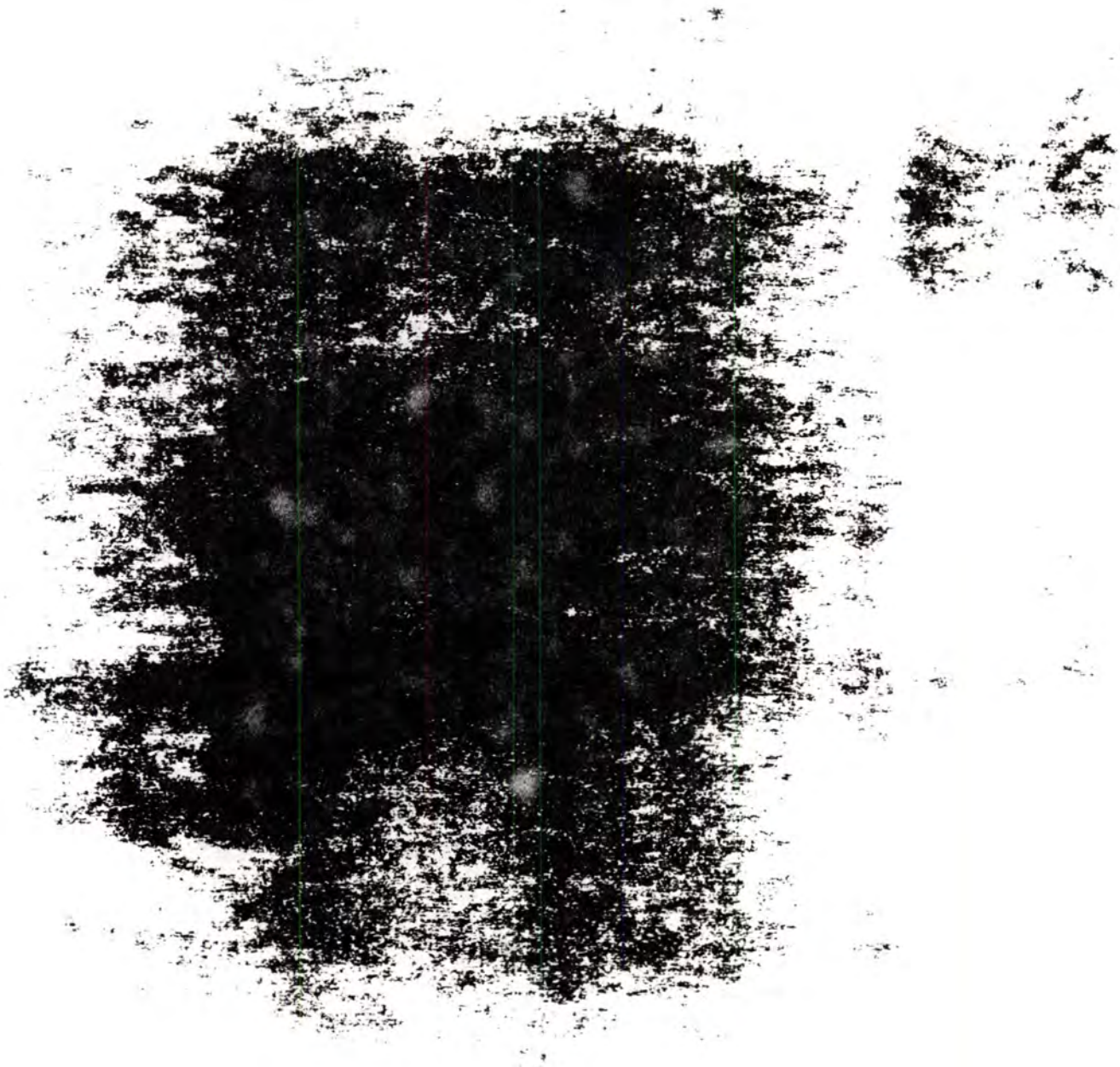
Kurt E. Yeager. President and Chief Executive Officer, Electric Power Research Institute.

Mr. Yeager has served as the Director of the Energy R&D Planning for the U.S. Environmental Protection Agency's Office of Research. Prior to that he was the Associate Head of the Environmental Systems Department at the MITRE Corporation. Mr. Yeager is a Fellow of the American Society of Mechanical Engineers. He has served on the Executive Board of the National Coal Council as well as several National Academy of Engineering Committees and the Energy Research Advisory Board to the Secretary of Energy.

Lawrence T. Papay. Senior Vice President and General Manager of Bechtel Technology and Consulting, Bechtel Group, Inc.

Previously, Dr. Papay served as Senior Vice President of Southern California Edison (SCE). Prior to his work at SCE, he conducted research for NATO and Euratom on the utilization of plutonium in reactors and supervised operations of the Massachusetts Institute of Technology (MIT) research reactors. He is a member of the National Academy of Engineering, the National Research Council Board on Energy and Environmental Systems, the President's Committee of Advisors on Science and Technology (PCAST) Task Force on Energy R&D, the National Science Foundation Industrial Panel, and the American Nuclear Society.

TABLE



Panel Three

The Kyoto Conference and U.S. National Interests

Participants

The Vice President

Secretary of State Madeleine Albright

James Wolfensohn

Richard Schmalensee

Daniel Yergin

Mae Jemison

C. Linn Draper

Fred Krupp

Jessica Tuchman Mathews

Description and Goals

Description of the Panel

This panel includes leading experts on the subject of the Kyoto negotiations and the international aspects of climate change.

An initial presentation from Secretary Albright will stress the importance of building a broad international consensus for realistic and effective action to address climate change. Speakers will then briefly address several topics, including how to ensure that all countries take on equitable commitments that protect the environment without disadvantaging the economy of any particular nation or group of nations.

Specific issues will include: the role of developing countries in addressing climate change; the challenge this poses for those countries; how "flexibility measures" like joint implementation and trading work; and how these provisions can help protect the environment, allow these countries to grow, and provide significant export opportunities for American businesses. The discussion will end with a review of why it is in our national interests to take action on climate change.

Defining the appropriate nature of developing country commitments is one of the critical issues in the climate change policy debate. Since the majority of current and historic emissions come from the industrialized world, industrialized nations agreed to the 1995 Berlin Mandate, which declared that developing countries would not be asked to take on new commitments, including quantified targets. This has been the subject of intense criticism within the U.S. In the long-term, a treaty that does not include all countries will provide no environmental benefit because emissions from developing countries over the next century will be larger than those of the industrialized world. A more aggressive move to encourage developing country commitments, however, could endanger an agreement at Kyoto.

Goals of the Panel

This panel should provide support for our view that, on the one hand, developing countries deserve to be treated differently from industrialized countries, but that they nonetheless need to take on binding commitments of their own; otherwise efforts to deal with climate change will be futile. Panelists should also articulate the importance of international flexibility measures, and, finally, demonstrate why efforts to address climate change are in the U.S. national interest.

Suggested Script

The ***VICE PRESIDENT*** will introduce Secretary Albright, who will make the framing presentation.

Madeleine Albright - *Secretary of State Albright will describe why Kyoto needs to provide a framework for the international community to address climate change. She will outline the core elements of U.S. policy: binding targets, emissions trading, joint implementation, and developing country commitments. She will frame the panel's work as discussing the role of developing countries, what can be done to help them grow sustainably, and why paying attention to these issues is in the US national interest.*

The ***VICE PRESIDENT*** should ask a question of James Wolfensohn. **We've heard a lot in the last several months about developing countries not taking commitments at Kyoto. Why is that? What role should they play in an international framework to address the issue?**

James Wolfensohn - President of the World Bank. *Mr. Wolfensohn will describe why developing countries are likely to be more vulnerable than developed countries to the effects of climate change; argue that developing economies must not be unduly restricted, and discuss how we can help address poorer nations' through the transfer of environmental technologies to the developing world.*

The ***VICE PRESIDENT*** should ask a question of Richard Schmalensee. **What do you think about developing country participation?**

Richard Schmalensee - Professor of Economics, MIT; member of Council of Economic Advisers, 1989-91. *Schmalensee will explain why developing countries must be part of any international agreement, and what might result if we sign a treaty that doesn't include them. He'll also speak about why the Kyoto treaty, even if successful, can only be the first step in trying to address climate change.*

SECRETARY ALBRIGHT should ask a question of Daniel Yergin. **Dr. Yergin, we've heard that developing countries have to take on commitments, but also must be allowed to grow. What are their energy needs? Of the energy options open to them, which are most likely to help them reduce greenhouse gases?**

Daniel Yergin - President, Cambridge Energy Research Associates; author of "The Prize: The Epic Quest for Oil, Money and Power," winner of the Pulitzer Prize. *Yergin will describe the enormous growth and energy demands in the developing world, and the energy choices these countries face: coal, natural gas and oil, renewables, nuclear. He will point to natural gas as the least carbon intensive option currently available at a large enough scale to make a difference for developing nations.*

SECRETARY ALBRIGHT should ask Mae Jemison a question. **Dr. Jemison, you've done a lot of work on getting sustainable energy projects to people at the grass roots level in the developing world. Can these economies grow sustainably? How can sustainable energy programs help the world's poorest inhabitants?**

Dr. Mae Jemison - President, Jemison Group, Inc. and Jemison Institute for Advancing Technology in Developing Countries at Dartmouth College; former NASA astronaut. *Dr. Jemison will describe efforts to bring energy to remote villages in the developing world, discuss the lack of institutional capacity to address these issues, and note how local needs and practices must be considered when planning different energy systems.*

The ***VICE PRESIDENT*** should ask C. Linn Draper and Fred Krupp to discuss "flexibility measures" such as international trading and joint implementation. **We often talk about an agreement that includes flexible, market-based mechanisms, such as joint implementation and trading. How do they work?**

C. Linn Draper - President of American Electric Power, one of the largest U.S. power utilities. *Dr. Draper will describe how "emissions trading" and "joint implementation" systems work, and the enormous export potential for American businesses and technology in helping developing nations grow their economies in a way that limits emissions.*

The ***VICE PRESIDENT*** follows up with Mr. Krupp. **Fred, do these kinds of efforts really hold promise for protecting the environment? How do these provisions help developing nations and also advance our own efforts at reducing emissions?**

Fred Krupp - President of the Environmental Defense Fund. *Mr. Krupp will affirm that international trading and joint implementation systems can be established in an effective way, that they do provide significant gains to the environment, and that they can help to bring developing countries into cooperation in addressing climate change.*

SECRETARY ALBRIGHT should ask Jessica Matthews a question. **Jessica, I know that you have studied many aspects of this issue, from the science to the foreign policy considerations. What are the broader national security interests that the U.S. has in seeking this agreement?**

Jessica Tuchman Mathews - President, Carnegie Endowment for International Peace. *Dr. Mathews will describe how our national security interests could be adversely affected if we failed to acct, noting the particular pain and dislocation that developing countries could experience and how this could adversely affect us in a highly interconnected world (i.e. the boat doesn't sink at one end).*

If time permits, ***SECRETARY ALBRIGHT*** could direct a follow-up question to **Richard Schmalensee** and then ask others to comment: **You have written about the importance of not letting a short-term focus on emissions reductions obscure the need to develop a broader policy architecture for reducing emissions. Can you explain what you mean?**

International Panel
Additional Questions (if time permits)

'97 OCT 6 -7:48

For Draper and/or Krupp:

Many developing countries have thus far expressed opposition to the joint implementation programs Linn Draper has discussed. Why do you think that is and do you think there is any promise of their shifting that position?

For Wolfensohn on "flexibility" issues:

How do you think credit should be shared between a company from an industrialized nation and a developing nation in a joint implementation project?

Could you see the World Bank playing any role in international trading or joint implementation?

For Krupp, Draper and/or Matthews:

We all saw the recent forest fires in Indonesia. How does deforestation contribute to climate change? Can reforestation projects be part of the solution?

For Schmalensee:

The European Union has proposed to reduce emissions by 15% from 1990 levels by 2010. Have they articulated any plans as to how they would reach that goal? To what extent do they rely on cooperative agreements with industry? Do you think their proposal is realistic?

You suggest that the Kyoto conference might provide a modest step in addressing emissions. Could you spell out some of the longer term steps you would suggest?

For Mathews:

I have heard some critics say that we would be yielding American sovereignty if we sign onto a climate change treaty. Is that true?

Panel III: The Kyoto Conference and U.S. National Interests

Madeleine Albright. United States Secretary of State.

Secretary Albright previously served as the U.S. Permanent Representative to the United Nations and as a member of President Clinton's National Security Council. She was formerly the President of the Center for National Policy, a non-profit research organization which promotes the study and discussion of domestic and international issues. She has also taught courses in international affairs, U.S. foreign policy, Russian foreign policy, and Central and Eastern European politics at Georgetown University's School of Foreign Service.

James D. Wolfensohn. President, World Bank.

Mr. Wolfensohn has been president of the World Bank since June 1995. He established his career as an international investment banker with a parallel involvement in development issues and the global environment. His last position prior to joining the World Bank was as President and Chief Executive Officer of James D. Wolfensohn Inc. Before setting up his own company, he was Executive Partner of Salomon Brothers in New York and head of its investment banking department. Previously, he was Executive Deputy Chairman and Managing Director of Schroders Ltd. in London, President of J. Henry Schroders Banking Corporation in New York, and Managing Director of Darling & Co. of Australia.

Richard Schmalensee. Gordon Y. Billard Professor of Economics and Management, Massachusetts Institute of Technology; Member, President's Council of Economic Advisers, 1989-1991.

Dr. Schmalensee is also Deputy Dean of MIT's Sloan School of Management and Director of MIT's Center for Energy and Environmental Policy Research. He is a Research Associate of the National Bureau of Economic Research and a Fellow of the Econometric Society and of the American Academy of Arts and Sciences. He has served as a member of the U.S. EPA's Environmental Economics Advisory Board and as chairman of its Advisory Council on Clean Air Act Compliance Analysis. Prior to joining the MIT faculty in 1977, Dr. Schmalensee taught at the University of California, San Diego.

Daniel Yergin. President, Cambridge Energy Research Associates (CERA); Vice Chairman, The Global Decision Group.

Dr. Yergin received the 1992 Pulitzer Prize for General Nonfiction for his work *The Prize: The Epic Quest for Oil, Money & Power*, which has been translated into twelve languages and was made into an eight-hour international television series. He is coauthoring a new book with Dr. Joseph Stanislaw entitled, *The Commanding Heights: The Battle Between Government and the Marketplace That Is Reshaping the Modern World*. He received the 1997

U.S. Energy Association's prestigious United States Energy Award and served as Chairman of the U.S. Department of Energy's Task Force on Strategic Research and Development. Dr. Yergin is also a member of the Secretary of Energy's Advisory Board, Co-Chair Committee of the U.S. National Petroleum Council, and Vice Chairman of the Global Decision Group.

E. Linn Draper, Jr. Chairman, President and Chief Executive Officer, American Electric Power Company & American Electric Power Service Corporation.

Dr. Draper is President of Ohio Valley Electric Corporation and its subsidiary, Indiana-Kentucky Electric Corporation, which provides energy for the U.S. Department of Energy's uranium-enrichment facility in Piketon, Ohio. He was formerly Chairman, President, and Chief Executive Officer of the Gulf States Utilities Company. He is a member of the National Academy of Engineering and Director of the Nuclear Energy Institute and the Institute of Nuclear Power Operation. Dr. Draper has also served as an Associate Professor and Director of the Nuclear Engineering Program at the University of Texas.

Fred Krupp. Executive Director, Environmental Defense Fund (EDF).

In 1978, while a private practice attorney in New Haven, Mr. Krupp helped found the Connecticut Fund for the Environment, a leading state environmental group. He joined EDF in 1984 and was a key figure behind Congressional passage of the Clean Air Act. A member of the President's Council on Sustainable Development and the President's Advisory Committee on Trade Policy and Negotiations, he also serves on the boards of the H. John Heinz III Center for Science, Economics and the Environment and the National Environmental Education and Training Foundation. He has also been a member of the National Commission on Superfund, and the President's Commission on Environmental Quality.

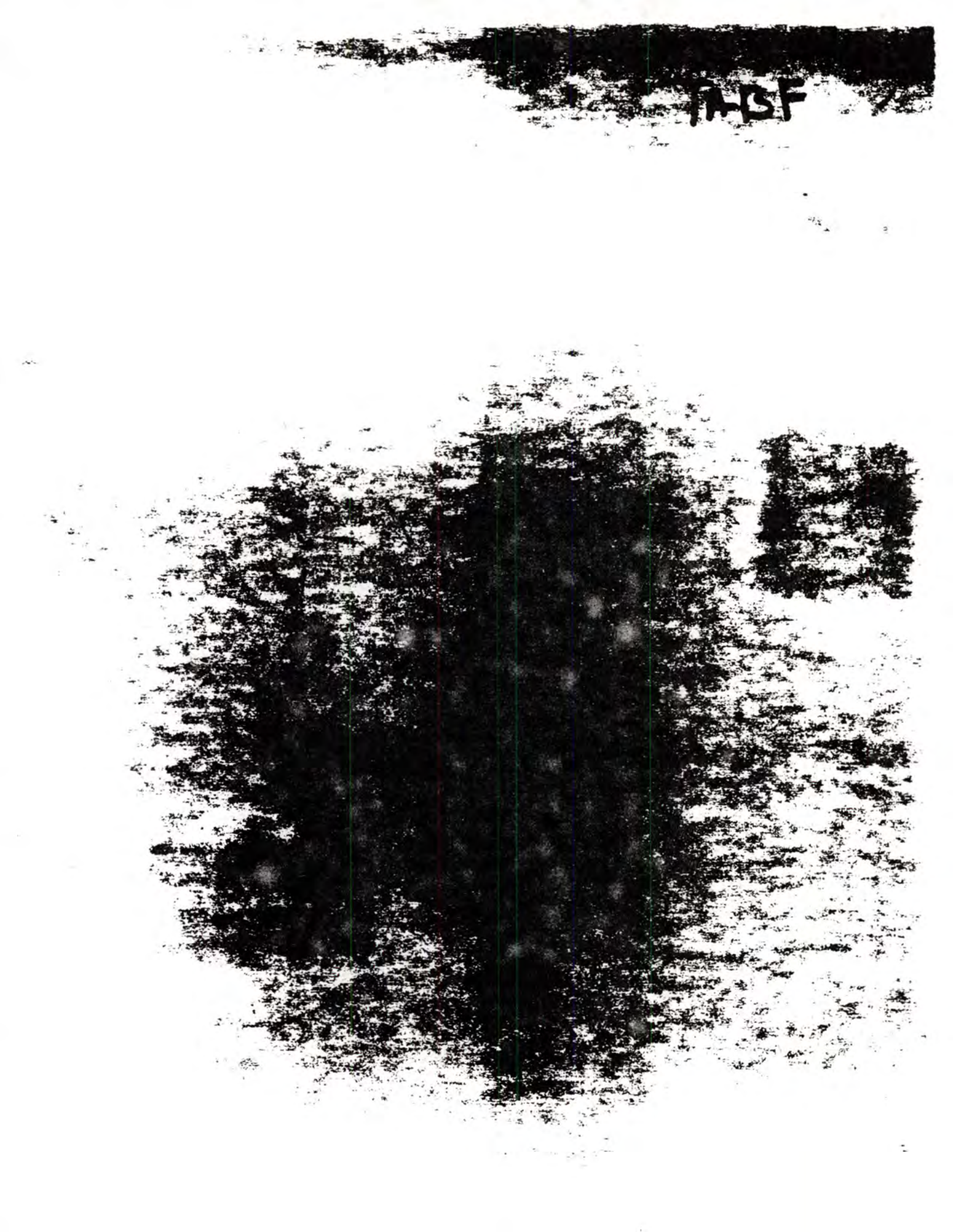
Mae C. Jemison. President, The Jemison Group, Inc.

Dr. Jemison served as a National Aeronautics and Space Administration (NASA) astronaut for six years and is the first woman of color to have gone into space. She is a Professor in Environmental Studies and the Director of the Jemison Institute for Advancing Technology in Developing Countries at Dartmouth College. She is also on the National Research Council Space Station Review. The Jemison Institute has extensive experience working in Africa, internationally, and in the technology fields.

Jessica Tuchman Mathews. President, Carnegie Endowment for International Peace.

Dr. Mathews was previously Senior Fellow at the Council on Foreign Relations, researching the role of non-state actors in international relations and later served as Acting Director of the Council's Washington program. From 1980-1982 she was a member of the editorial board of *The Washington Post*, where she covered energy, environment, science, technology, arms control, health, and related issues before becoming Vice President and Director

of Research of the World Resources Institute. She served as Director of the Office of Global Issues at the White House NSC as well as Deputy to the Undersecretary of State for Global Affairs. She has also served as a Congressional Science Fellow of the American Association for the Advancement of Science and is a member of the Environmental Advisory Committee of Air Products Corporation, the Council on Foreign Relations, and the Trilateral Commission.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Panel Four

Climate Change Policy and the U.S. Economy

Participants

The Vice President

Deputy Secretary of the Treasury Lawrence Summers

Robert Repetto

William Nordhaus

Robert Stavins

John Sweeney

Richard Sandor

Description and Goals

Description of the Panel

This panel brings together leading economists who have studied the climate change issue and who have a range of views about the economic impacts of various policy options to reduce emissions. Also represented is organized labor which is very concerned about the impacts of climate change policies on American jobs and competitiveness. Lastly, we have an expert who can speak to the feasibility of a carbon emissions trading program.

Due to the scale, complexity, and long time horizons of the climate change issue, assessing the economic costs of various policy options is extremely difficult. Estimates of what it would cost to reach a given target and timetable, such as 1990 levels in 2010 or 2020, vary widely. A labor-funded study by the Economic Policy Institute predicts that 1990 levels in 2010 could produce job losses of between 1.5 and 2.9 million and steep energy price increases. On the other hand, a recent study by the Department of Energy suggests that technology, coupled with a domestic emissions trading scheme, can reduce the cost substantially (Your economic advisors take issue with assumptions made in both studies). While there are no definitive answers here, the panelists represent several different philosophies, from a "go slow" approach that would argue for moderate targets over the long-term (Nordhaus) to a more aggressive approach that would support earlier and more stringent targets (Repetto).

You should also know that Robert Stavins was quoted in the *New York Times* on October 3, speaking favorably about a paper produced by Resources for the Future entitled "Something for Everyone: A Climate Policy that both Environmentalists and Industry Can Live With." The article endorses a "hybrid system" in which emissions would be capped through a tradeable permit system, but which would include a safety valve to put a ceiling on the cost of carbon. If the market price were about to go above a designated ceiling, the government would step in and sell permits at the designated price. Stavins said about this article: "This would be a way to initiate a broad but realistic commitment." A copy of this article can be found in Tab I of this book. The Vice President should explore this idea with Stavins.

Goals of the Panel

The purpose of this panel is to have a somewhat free-flowing and interactive dialogue about the potential economic implications of various policy options for reducing greenhouse gas emissions.

We want people to understand that the Administration is very concerned about the economic implications of potential emissions reduction strategies and that we are striving to find a flexible approach that provides needed environmental benefits without sacrificing economic growth.

Suggested Script

The ***VICE PRESIDENT*** announces the beginning of the final panel of the day on climate change policies and the U.S. economy. **He turns to Larry Summers for an opening presentation.**

Larry Summers - *Deputy Secretary Summers takes several minutes to frame the panel discussion by first making it clear that binding emissions targets will be a core element of the U.S. policy position. Within that construct, he raises the question of how we reduce emissions without hurting the economy. He may refer to several potential policy tools that economists have discussed, including tradeable emissions permits, carbon taxes, or higher efficiency standards on appliances, vehicles, etc. He closes by introducing the panelists.*

The ***VICE PRESIDENT*** should ask a question of Bob Repetto. **Bob, what is the optimal approach that would allow us to act aggressively to reduce emissions without damaging the economy? How would a policy along these lines be structured?**

Robert Repetto - Vice President and Senior Economist, World Resources Institute; co-author "The Costs of Climate Protection: A Guide for the Perplexed." *Repetto will take the position that we can move aggressively to cut emissions without damaging the economy if we adopt several key policies. These policies include a comprehensive system of international emissions trading and joint implementation. He may also argue that if we don't act soon, the result will be the installation of another generation of non-climate-friendly technologies.*

LARRY SUMMERS should ask a question of William Nordhaus. **Bill, what do you think is the best way to go about reducing emissions?**

William Nordhaus - Professor of Economics, Yale University; author of "Efficient Use of Energy Resources," and "Managing the Global Commons." *Nordhaus will suggest that moving too fast could have major negative impacts on the economy. He will argue for more of a "go slow" approach and for the use of efficient policies such as auctioning and trading of emissions permits. He is likely also to say that the world does not have an effective legal mechanism for establishing a credible international trading regime.*

The ***VICE PRESIDENT*** should ask Robert Stavins for his opinion. **Bob, what are your thoughts on this?**

Robert Stavins - Professor of Public Policy and Chair of Environment and Natural Resources Program, the John F. Kennedy School of Government, Harvard University. *Stavins will state his view that flexible approaches to emissions reductions, if well designed, can greatly reduce the costs, by as much as 90%.*

Follow-up question for the *VICE PRESIDENT*: **Bob, you were quoted last week in the *New York Times* as supporting a kind of "safety valve" mechanism whereby we would cap the cost of a given policy. Can you explain this idea?**

The ***VICE PRESIDENT*** should ask a question of John Sweeney: **John, I know that organized labor has serious concerns about how a policy to deal with climate change could affect American workers, but I know you also recognize that this is a real issue that needs to be dealt with. What kind of policy would you recommend to address the environmental problem we face while protecting our economy and our workers.**

John Sweeney - President of the AFL-CIO. *Sweeney will present labor's view that any climate change policy (and corresponding treaty that we may adopt) must not harm American workers or competitiveness and that it must achieve real environmental benefits (i.e. that developing countries must take on binding obligations). He may refer to the EPI study which claims that a target and timetable of 1990 levels by 2010 could cost nearly 3 million jobs.*

LARRY SUMMERS should ask a question of Richard Sandor: **Richard, we're hearing a lot about the concept of emissions trading. Many people aren't quite sure what it means or how it would work. Maybe you could give us a feel for your experience with the acid rain trading program and discuss what lessons it may teach us regarding carbon dioxide?**

Richard Sandor - Vice-Chair of Chicago Board of Trade; Chairman and CEO, Centre Financial Products Ltd. *Sandor will discuss his experience with the sulfur dioxide trading system established to control acid rain, explaining what it is, that the costs of reductions have been substantially lower than expected, and why businesses prefer it to a tax.*

Time permitting, *LARRY SUMMERS* should ask any of the economists if they wish to follow up on a particular part of the discussion.

Economics Panel
Additional Questions (if time permits)

For Sandor:

Could you elaborate on exactly how a carbon trading system would work? What sorts of companies would be required to have permits?

For Sweeney:

I share your concern about developing country participation. If we are successful in getting developing nations to take on commitments, do you think they should be responsible for obligations similar to ours? Can they take on these kinds of obligations and still be expected to grow their economies?

For Repetto, Nordhaus and/or Stavins:

How much might an *international trading* system help us in reducing the costs to the U.S. of greenhouse gas emissions?

What are the administrative challenges in setting up an *international trading* system?

How much might a *joint implementation* system help us in reducing the costs to the U.S. of greenhouse gas emissions?

What are the administrative challenges in setting up a *joint implementation* system?

For Nordhaus:

I'd be interested to hear how you calculate the costs of NOT acting. Are there any costs that the economic models don't capture?

You've laid out the slowest approach for acting. If we stretch out the timetable for taking action, don't we make it harder over the longer term to reduce our emissions?

Panel IV: Climate Change Policy and the U.S. Economy

Lawrence H. Summers. Deputy Secretary of the Treasury.

In addition to his role at Treasury, Deputy Secretary Summers serves as the American Deputy in the G-7 international economic cooperation process. From 1993 to 1995, he served as Under Secretary of the Treasury for International Affairs. He was elected Chairman of the Organization for Economic Cooperation and Development's Working Party Tree in 1994. Prior to joining the Clinton Administration, he served as Vice President of Development Economics and Chief Economist of the World Bank. He was Nathaniel Ropes Professor of Political Economy at Harvard University from 1987 until 1993 and was the youngest tenured Professor in the University's history. He is the recipient of the John Bates Clark Medal, the National Science Foundation's Alan Waterman Award, and is a fellow of both the Econometric Society and the American Academy of Arts and Sciences. Mr. Summers served as Domestic Policy Economist on the President's Council of Economic Advisers during 1982 and 1983 and on the MIT faculty from 1979-1982.

Robert C. Repetto. Vice President, World Resources Institute (WRI); Director, Program in Economics & Population, WRI.

Dr. Repetto is a member of the U.S. EPA's Science Advisory Board and the National Research Council's Board on Sustainable Development. His publications include many research papers on the economics of sustainable development. Prior to joining WRI, he was an associate professor in the School of Public Health at Harvard University. Previously, he was a member of the World Bank's Resident mission in Indonesia, economic advisor to the planning and development board for the government of East Pakistan, staff economist for the Ford Foundation in New Delhi, India, and an economist for the Federal Reserve Bank of New York. In 1994 he received the Society for Conservation Biology's Distinguished Achievement Award. He is a member of the Editorial Boards of *Environmental & Resource Economics* and *Environmental Taxation and Accounting*, as well as the Advisory Board of the *Journal of Environment & Development*.

William D. Nordhaus. Whitney Griswold Professor of Economics, Yale University; Member, President's Council of Economic Advisers, 1977-1979.

Dr. Nordhaus has served as Provost of Yale University and on the executive committees of the American Economic Association and the Eastern Economic Association. He is currently a Senior Advisor of the Brookings Panel on Economic Activity, a Fellow of the American Academy of Arts and Sciences, and current or past editor of a number of scientific journals. His research has focused on economic growth and natural resources, as well as the question of the extent to which resources constrain economic growth, and he has been working on the economics of global warming for the past 20 years.

Robert N. Stavins. Professor of Public Policy, Faculty Chair, Environment and Natural Resources Program, John F. Kennedy School of Government, Harvard University.

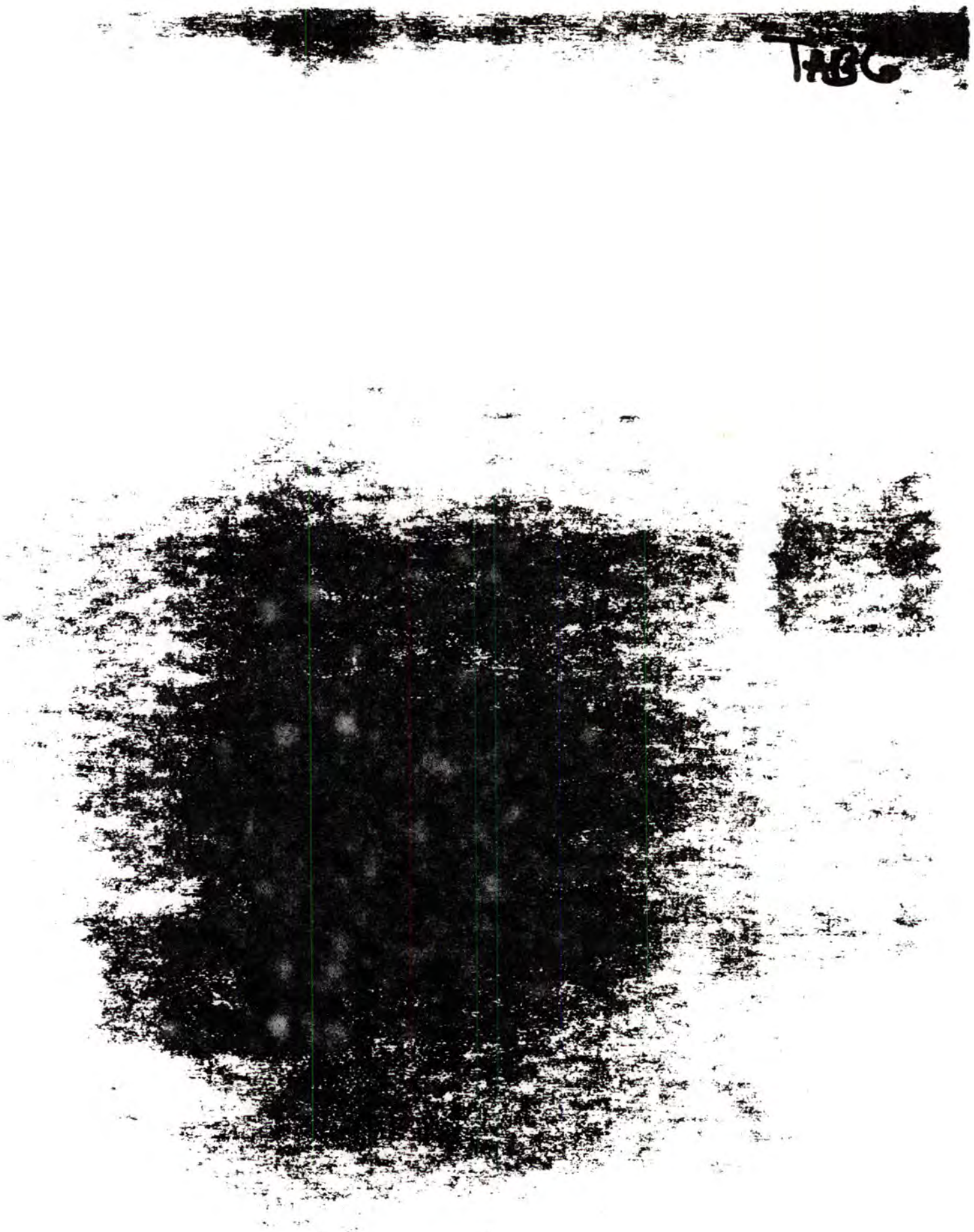
Dr. Stavins is a University Fellow of Resources for the Future and a member of the Environmental Economics Advisory Committee of the U.S. EPA's Science Advisory Board, the EPA's Clean Air Act Advisory Committee, the Intergovernmental Panel on Climate Change (IPCC), the Board of Directors of the Association of Environmental and Resource Economists, and the Editorial Council of *The Journal of Environmental Economics and Management*. He is also a contributing editor of *Environment*, and the Academic Advisor for Environmental Programs of the Foundation for American Communications. Prior to taking his current position at Harvard, Dr. Stavins was a staff economist at the Environmental Defense Fund.

Richard L. Sandor. Chairman and Chief Executive Officer, Centre Financial Products Limited (CFPL).

CFPL specializes in providing risk management services, trading services, and in developing new financial, commodity, and environmental markets. In addition to his positions at CFPL, Dr. Sandor is also currently Second Vice Chairman of the Chicago Board of Trade and is widely recognized as a founder of the interest rate derivatives markets now traded worldwide. He has also designed revolutionary market mechanisms for the catastrophe insurance industry and for market-based environmental protection programs. He currently serves as Chairman of the Board of Hedge Financial, is a member of the Board of Directors for the Center for Sustainable Development in the Americas, and is an expert advisor to the UN Conference on Trade and Development on tradable entitlement for the reduction of greenhouse gas emissions. He was a Non-Resident Director of the Chicago Board of Trade and Chairman of its Clean Air Committee which developed the first spot and futures markets for sulfur dioxide emission allowances and supervised the annual allowance auctions conducted on behalf of the U.S. EPA.

John J. Sweeney. President, AFL-CIO.

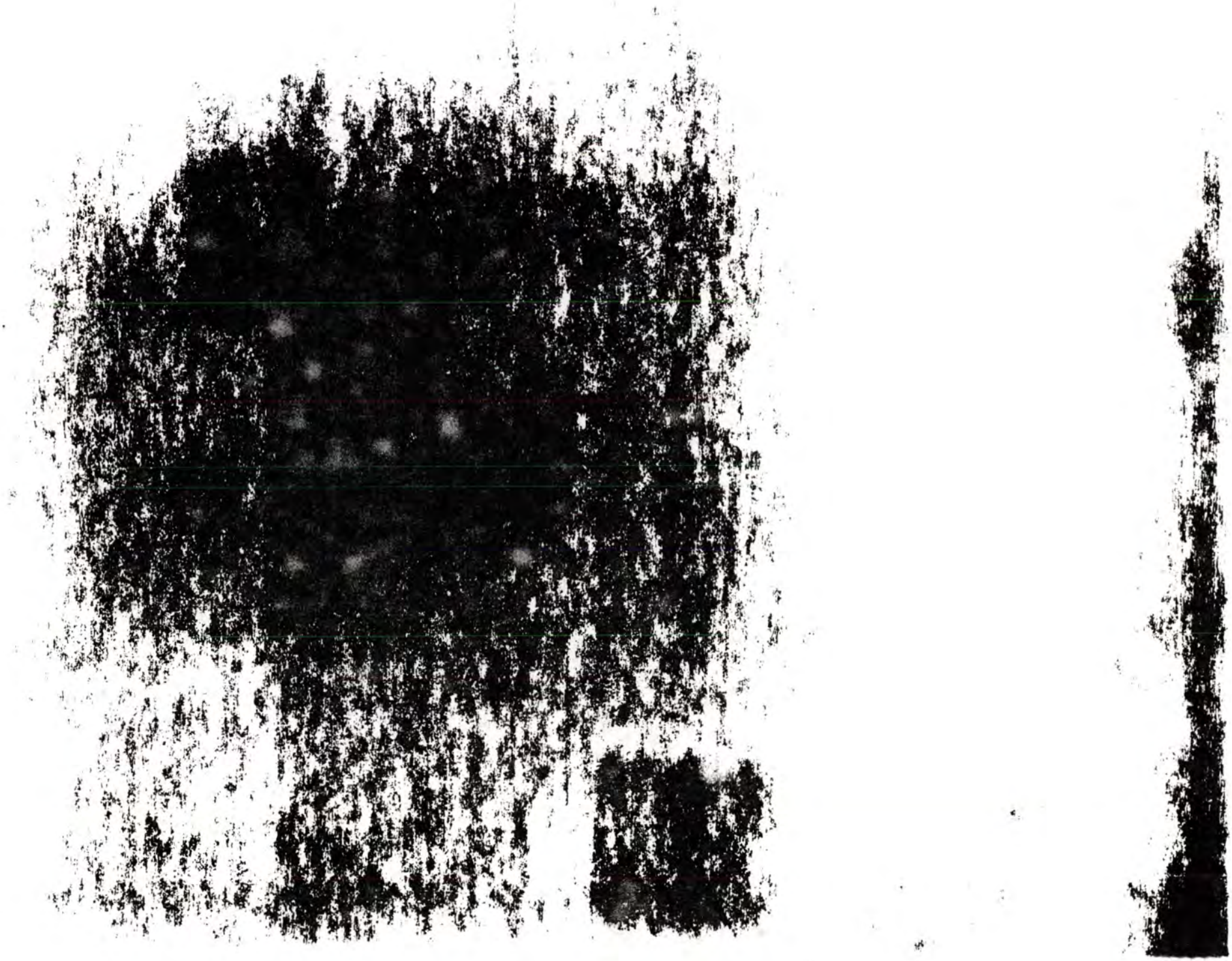
Mr. Sweeney was elected President of the AFL-CIO in 1995. Prior to rising to that position, Sweeney was Vice President of the AFL-CIO and Chair of the Executive Council committees on Health Care and Organizing and Field Services. In 1996, he authored *America Needs A Raise, Fighting for Economic Security and Social Justice*. He also co-edited the UNA-USA Economic Policy Council's *Family and Work: Bridging the Gap*.



THE LIST OF PARTICIPANTS

IN THE WHITE HOUSE CONFERENCE ON CLIMATE CHANGE

WILL BE FORWARDED



CLIMATE CHANGE:
BASIC BACKGROUND ON THE SCIENCE

The greenhouse effect: Scientists have long understood that the presence of certain gases in nature (principally water vapor, carbon dioxide, methane, and nitrous oxide) act like a greenhouse by trapping heat and keeping the Earth's temperature an estimated 60 degrees Fahrenheit warmer than it would otherwise be, thus sustaining life as we know it.

Human activities have enhanced this greenhouse effect by increasing the concentrations of these gases markedly since the Industrial Revolution. The concentration of carbon dioxide (CO2), the most important greenhouse gas, has increased 30% from 280 parts per million (ppm) to 360 ppm. Current projections indicate that a business as usual path will result in CO2 concentrations of 700 ppm by the end of the next century. This would be the highest CO2 level in more than 50 million years.

Where is there scientific consensus: There is no serious scientific debate about the proposition that (1) greenhouse gases are rapidly building up in the atmosphere as a result of human activities, (2) that these increased concentrations will change our climate, and (3) that these changes could have serious and disruptive consequences.

Where are there scientific uncertainties: No one knows for sure exactly how much or how fast the planet will warm. Scientists estimate a range of temperature increase of 2.0 - 6.5 degrees F by 2100, with a best guess of 3.5 degrees. By way of comparison, a cooling in average temperatures of just 9 degrees produced the last Ice Age.

No one is exactly sure how the climate will react to predicted warming and where the most noticeable impacts will be felt. The majority of scientific opinion suggests that as CO2 concentrations approach a level of 550 ppm (or double pre-industrial levels), a number of largely negative impacts are likely. These include, but are not limited to, human health problems (increased fatalities from heat stress and the expansion in the geographic ranges of certain infectious diseases), more extreme weather such as floods and droughts, sea level rise, and the loss of a number of animal and plant species.

While the planet has clearly warmed in the past century, no one can say for certain exactly how much of this warming, or of observed climate changes, is due to human influences. The weight of scientific opinion is that human activities *have* already started to warm the planet. The intergovernmental panel of over 2000 climate experts that speaks most authoritatively on the science of this issue, states that the "balance of evidence suggests a discernible human influence on global climate."

Evidence of Climate Change Over the Past Century

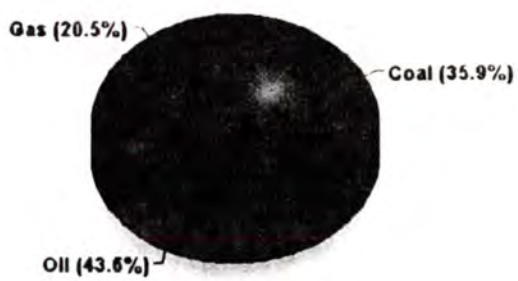
- Average global temperature has increased by about 1 degree F.
- Sea level has risen by 4-10 inches.
- U.S. rainfall has increased 6%, an amount of water equal to half the yearly flow of the Mississippi River.
- Mountain glaciers are melting worldwide. For example, Glacier National Park has lost 70% of its glacial area in the last 100 years.
- The ten warmest years of the century have occurred since 1980, and 1995 was the hottest year ever on record.

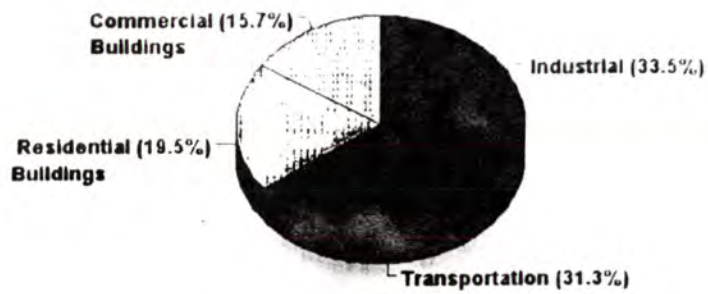
What is the ultimate solution to climate change: The ultimate goal of any overall climate change strategy must be to stabilize atmospheric concentrations of greenhouse gases. Stabilizing *concentrations* is different from stabilizing *emissions*. Were we to freeze global emissions at today's level, the concentration of greenhouse gases in the atmosphere would continue to rise. This is largely because such gases remain in the atmosphere for long periods of time. Stabilizing concentrations at any reasonable level is a long-term process that will require reducing emissions over time. Kyoto, therefore, should be looked at not as an effort to find a complete solution to climate change, but rather as an important next step toward getting the world on a more sustainable emissions path.

No policy determination has yet been made about what concentration level is acceptable. The pre-industrial level of CO2 in the atmosphere was about 280 parts per million (ppm). Today, it stands at 360 ppm. Most of the work done by the Intergovernmental Panel on Climate Change (IPCC) on the potential impacts of global warming assumes a level of 550 ppm or roughly twice the pre-industrial level. The IPCC estimates that if current emissions trends continue, we will reach 550 ppm sometime in the next century, with concentrations further increasing to almost 700 ppm by 2100.

Sources of Greenhouse Gases

- **CO_2 released by consumption of coal, oil, and gas is responsible for 85% of U.S. greenhouse gases**
- **U.S. greenhouse gas emissions are now 10% above 1990 levels and are projected to be 28% above 1990 levels by 2010 because of growing demand for energy.**
- **Transportation, Industry, and buildings are each responsible for about a third of US greenhouse gases. Residential buildings are responsible for slightly more than half of the total contribution buildings.**
- **Coal produces 72% more greenhouse gases than natural gas per unit of energy delivered; oil 22% more.**
- **Recent forecasts show coal falling 11% by 2010 and gas prices 5%. Gasoline prices are nearly constant.**
- **Oil remains the single largest source of CO_2 and 73% of oil is used in transportation. Coal burning produces 36% of CO_2 and 85% of coal is used to generate electricity.**
- **In these accounts, the CO2 produced to generate electricity is charged to the sector using the electricity. Taken together, emissions of electric production sold to all sectors is 36% of U.S. CO2 .**



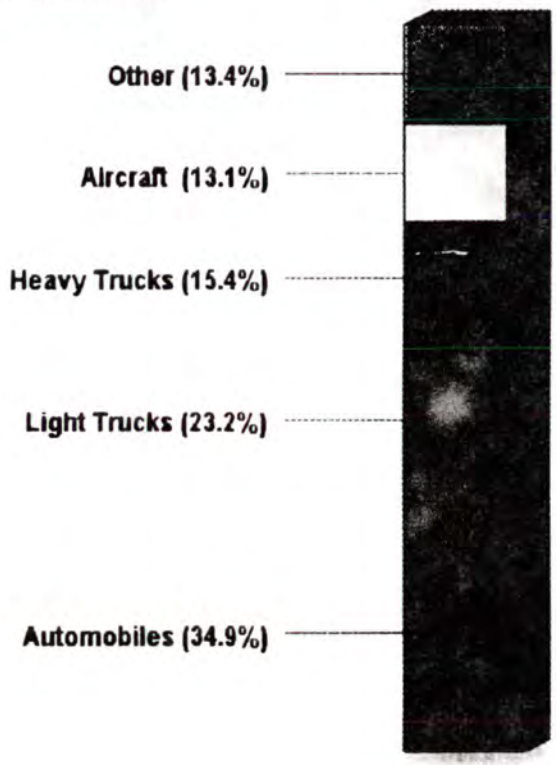


Transportation

- **Transportation contributes 31% of U.S. CO2 and output is growing 1.8% per year (10 million tons per year) – twice as fast as industry and buildings -- because vehicle miles traveled have been increasing by nearly 3%/year and because nearly half (44.5%) of all passenger vehicles sold are now sport-utility vehicles and other "light trucks" which get, on average, 25% fewer miles per gallon than automobiles.**

- **More than 98% of all transportation energy comes from petroleum**

Percent of all U.S. CO2 Production



Options

--------- **Largely oil and gas pipelines**

--------- **Goal of a new NASA/FAA/DOD program is to reduce fuel use per passenger mile by 35% in 10 years with improved aircraft and air traffic control**

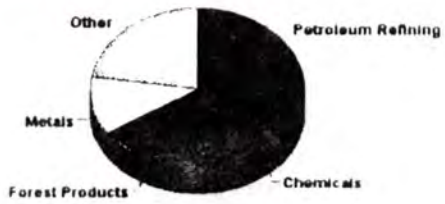
--------- **New initiative on heavy diesel trucks can increase efficiency 50%**

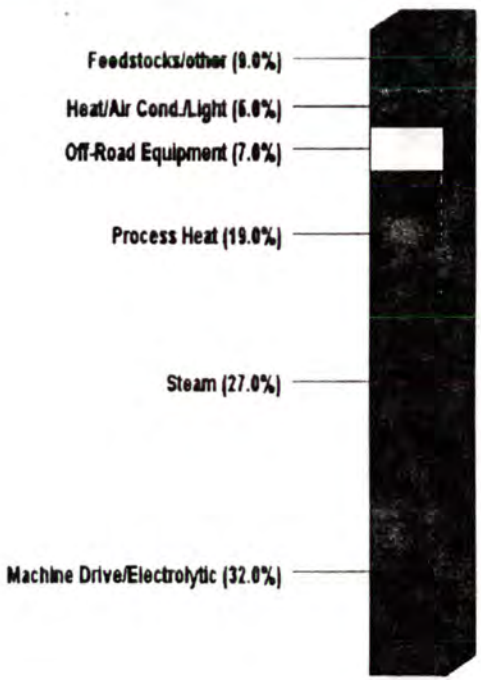
--------- **New initiative would expand PNGV to include designs for sport utility vehicles. This could double the efficiency of these vehicles.**

--------- **The PNGV initiative has a goal of reducing automobile fuel use per mile driven by a factor of three. Funding will increase confidence that the goal will be met.**

Industry

- **Manufacturing industries produce a third of all CO2 – an amount which is expected to 4 million metric tons per year.**
- **80% of all industrial CO2 comes from petroleum refining, Chemicals, Paper, lumber and other forest products, and metals (dominated by steelmaking).**
- **While overall growth of industries is expected to average 2.1% during the next 15 years, output from the energy intensive industries responsible for most of CO2 production is expected to be 1.3%. Growth is much faster in information-intensive industries**





-------- **In the future, some biomass products could be substituted for oil/gas**

-------- **Savings much like those available for commercial buildings**

-------- **New diesel technology can be applied to many of these uses**

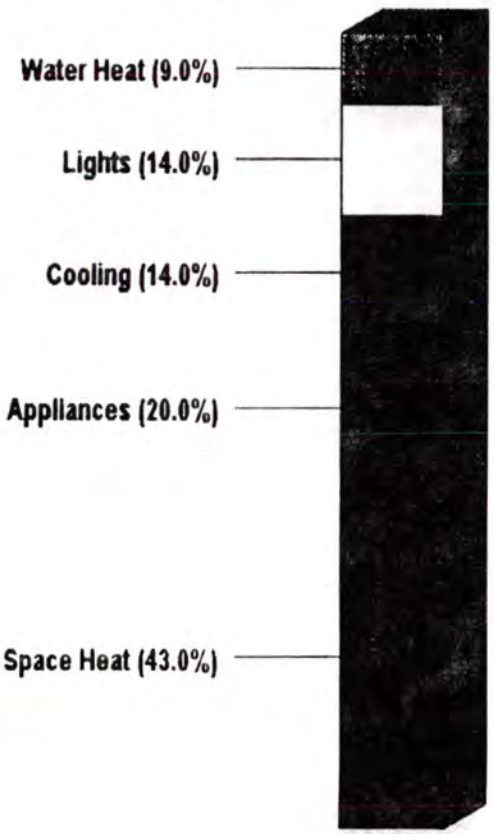
------- **Steam and process heat dominate the energy use chemical manufacturing, paper production, and many other energy-intensive operations. Available industrial natural gas turbines produce electricity and process heat and produce 1/3 to 1/2 as much CO_2 as conventional systems. Regulatory changes are needed to encourage high-efficiency, new units. New chemical processing techniques and use of biomass instead of fossil fuel can lead to further gains.**

------- **Motors, compressed air, and other machines providing mechanical power can be improved significantly using improved control strategies, more efficient designs and components.**

Buildings

- **Residential buildings produce 19% of U.S. CO2 and emissions are expected to grow 1% annually (2.6 MMT/year). Energy demand is greatest for heating, electrical appliances (refrigerators, clothes dryers), and air conditioning.**

- **Commercial buildings produce 15% of U.S. CO2 and emissions are expected to grow 1% annually (2.1 million metric tons per year). Energy demand is greatest for lighting, electric equipment (computers, fax machines, copiers), and air conditioning.**



-------- **Best available appliance technology can increase efficiency 25-30%**

-------- **Energy for residential lighting can be cut by 50% and commercial lighting by 25% using existing technology. Advances in bulbs, controls, and daylighting will lead to greater savings.**

-------- **Existing technology can reduce commercial air conditioning and ventilation 48%. With improved building designs can lead to greater savings**

-------- **Refrigerator and freezer efficiency can be increased 25-30% using available technology. Growing energy use in electronic equipment at home and in offices (TVs, computers, fax and copiers) need attention. Labeling is key**

-------- **With improved building designs (such as PATH homes), new buildings can be much more efficient. In the future, fuel cells and gas turbines for buildings will be able to provide heat, hot-water, and electricity. Residential heating units can be made 10-25% more efficient and commercial heating 48%. Energy star labels are critical.**

Electric Generation

- **Electric utilities produce 23% of U.S. CO2 and input is increasing rapidly (1.4 %/year or 4.2 million metric tons per year). The increase results largely from rapid growth in demand for electricity in buildings. Electricity used for residential, commercial, and industrial buildings represents over 2/3 of U.S. demand for electricity.**

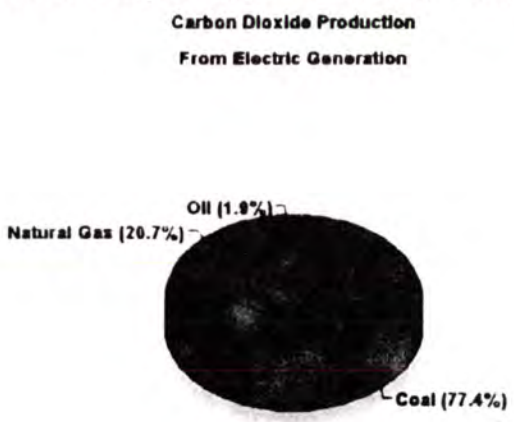
- **On average, the electric energy produced by an electric generator is about third of the energy in the fuel consumed. The remaining energy is released as waste into the air or local bodies of water.**

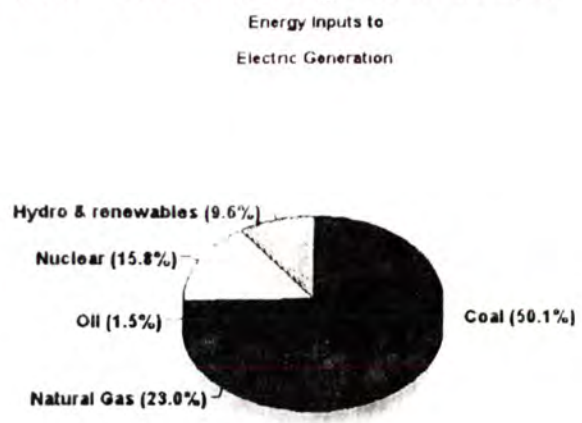
- **Sweeping regulatory changes are transforming this industry from a heavy regulated monopoly to one where generation of electricity is likely to be highly competitive. The result is likely to be much increased use of natural gas in high-efficiency turbines. The administration's approach to deregulation will be one of its most important climate change actions.**

- **An increasing fraction of generation is expected to be done close to the industrial or commercial sites where the power is needed. This will makes it much easier to use the heat from electric generation which would otherwise be wasted.**

- **In the near-term, regulatory reform and incentives to reduce carbon output could increase use of existing natural gas electric generators and encourage replacement of coal with natural gas CO_2 from electric generation could be reduced as much as 23% using these methods, given a CO_2 tax of $50/ton. Mixing wood waste and other biomass materials with coal and using wind equipment could lead to an additional 2% reduction.**

- **Over the long term, photovoltaics, wind, biomass, and advanced nuclear could make major contributions.**





Background Information on Energy Supply and Demand Technology

Basics

- Energy use is divided into three roughly equal parts: transportation, industry and buildings (including homes, office buildings, schools and other buildings).
- More than 2/3 of all electricity goes to buildings for lighting, appliances, air conditioning, and other uses.
- Oil is still about 40% of US energy use. Coal and gas are each about 25% and the rest is nuclear, and other sources.

Transportation

Automobiles and light trucks dominate transportation energy use (57%) and use of petroleum. Energy use is growing both because Americans are driving more (growth in "vehicle miles traveled" has averaged nearly 3%/year for decades) and because there is much greater use of "light trucks" such as sport utility vehicles and mini-vans as substitutes for cars. The CAFE standard for cars is 27.5 mpg but light trucks are held to a 20.6 mpg standard. Gasoline prices are the lowest in a generation.

The energy used in cars is divided roughly equally into: energy used to push air aside; energy used to accelerate the car (and eventually lost by heating brake pads); and other losses including tire rolling resistance of tires, and operating air conditioners. The drive trains of cars are only able to get about 15% of the energy in gasoline to the wheels; the rest is lost in the engine and transmission.

Technology to make the PNGV car more efficient include:

- reducing the weight of the car 40% by substituting aluminum or composite materials (high-tech plastics) for steel. This reduces the energy needed for acceleration.

- reducing the air-resistance with good aerodynamic designs. Air resistance can be cut in half with clever design.

- recapturing the energy lost in braking by using "hybrid" designs. Hybrid cars use both a fuel-powered engine and an electric motor to provide power. Typically an onboard engine to charge a battery and the battery provides extra power when needed. When you brake, the electric motor doubles as an electric generator and recharges the battery.

- using a much more efficient engine -- such as an advanced diesel or a fuel cell -- to charge the battery in a hybrid. Diesels have the problem of producing particulates when used with conventional diesel fuels but can meet stringent emissions

standards with other fuels (methanol or the synthetic diesel fuels the petroleum companies are considering). Fuel cells can achieve much higher efficiencies but are unlikely to be economic for 5-10 years.

Buildings

In buildings, the bulk of energy goes for electric appliances, heating and cooling equipment, lighting, and water heating. There is enormous potential for increases in efficiency.

Refrigerators waste huge amounts of energy through poor designs (poor insulation, hot motors installed where heat can leak into the refrigerated compartments, etc.) The refrigerator standard now set for 2001 -- and accepted by the manufacturers -- would require makers of refrigerators to build products which use exactly one fourth the electricity of comparable units in 1974.

Compact fluorescent bulbs (installed throughout the old EOB) use about a fifth of the energy as the incandescent bulbs they replace. Much more of the electric energy is converted to light instead of heat. Further improvements in bulbs are possible and lighting controls can ensure that daylight is used when available.

Improved building designs, higher efficiency air-conditioning and heating units, and even simple things like using white roofs in hot climates and planting trees on the south side of buildings, make it likely that homes can use half today's energy.

The biggest near term potential here is simply waiting for existing appliances to wear out (typical lifetimes for refrigerators and water heaters are 15-20 years) and replace them with state-of-the art products.

Fuel cells can be used in buildings to convert natural gas into electricity and heat with total "cogeneration". A cogeneration unit can put 30-40% of its fuel in electricity and capture 40-50% of the waste heat for a total efficiency of 80-90%.

Industry

In industry, there are many potential improvements. Some of the biggest include:

- Using modern "cogeneration" technology to provide both heat and electric power in factory settings. In these units, fuel is used to generate electricity. Typically less than half of the energy in the fuel is converted to electricity and the rest ends up as heat. In cogeneration units, this heat is captured in the form of steam or hot water and used in other operations where heat is required. Petroleum refining, chemical production, paper and other industries need enormous amounts of heat These units are now becoming available in small sizes (small enough to put into a fast food restaurant).

- High-temperature chemical processes in industry can be replaced by lower-temperature processes using advanced catalysts (devices which accelerate chemical reactions) and biocatalysis -- using natural cellular processes to accelerate reactions.

- In many industrial processes, nearly half the energy going to electric motors is wasted because of poor controls. Instead of controlling the speed of a motor driving a pump, for example, many plants control the flow of liquids by clamping down on valves. New motor controls and computer-based system designs can yield huge gains.

Electricity

The bulk of all US electric generation is still in the form of large coal-burning plants. Almost all new installations of electric generation, however, have been natural-gas based combined cycle plants because these plants are much more economic, cleaner, and can be installed quickly. A combined cycle plant is one which combines two different electric generation technologies. In modern units the first stage uses natural gas to fire a gas turbine (essentially an airplane engine) which drives an electric generator. The exhaust gases from the gas turbine are very hot and can be used to generate steam for the second stage. The steam is used in a steam turbine to generate more electricity.

Typical coal plants today are about 33% efficient, the state-of-the-art combined cycle units for sale by GE and Westinghouse are 60% efficient and 62% efficiency seems likely in the near future. For generations, it was assumed that the bigger plants would always be more efficient. This was the basis for regulation as a "natural monopoly". We now see that it may be possible to have highly economic units in small sizes which can be located in factories and buildings --particularly if cogeneration is employed.

Markets for new electric power generators in the US have been weak because most electricity is used in buildings where overall demand increases with population growth not economic activity.

There have been no new nuclear power plants ordered since the late 1970s primarily because investors were concerned by high costs. Nuclear power plants use the heat generated when uranium atoms split to boil water into steam -- the conversion of steam to electricity is much like coal.

New concepts for electric power that would greatly reduce carbon dioxide emissions include:

- Use of biological materials (grass, wood chips, etc) as a substitute for coal--biomass energy. There the problem is the price of the materials. Competition is probably possible if coal prices rise 10-30% but instead coal prices are forecast to fall 10% during the next decade. (Because the biomass is regrown, it is considered a 'zero net carbon' source.)

- Use of windmills or photovoltaic cells (the "solar cells" now used in spacecraft, to operate roadside telephones, and other uses), or "solar thermal" units (solar thermal units use

sunlight to heat fluids which are then used to power turbines). All of these should be able to provide electric power at 3.5-5 cents per kilowatt hour but will have a tough time competing with natural gas combined cycle plants which are producing power at a little over 3 cents.

- Fusion reactors plan to use the heat generated when two hydrogen atoms fuse to become helium to boil steam. Scientists have yet to demonstrate that this process -- which is the principle of the hydrogen bomb -- can be operated under contained conditions. Best estimates suggest that its 40 years off -- if then.

Removing Carbon dioxide

Unlike most pollutants, the carbon dioxide responsible for climate change is very difficult to eliminate from exhausts. Several methods have been proposed for removing carbon dioxide from the atmosphere which range from the simple to the exotic. They include:

- Growing trees or setting aside land (as in the conservation reserve program run by the USDA) which allows carbon to accumulate in the soil or in standing timber.

- Stripping carbon dioxide from fuel at the wellhead and injecting the carbon dioxide into holes drilled near oil or gas fields to stimulate recovery.

- A variety of other exotic methods such as stimulating growth in ocean organisms.

THE WHITE HOUSE

WASHINGTON

October 1, 1997

MEMORANDUM FOR THE PRESIDENT

FROM: GENE SPERLING
DANIEL TARULLO
KATHLEEN McGINTY

SUBJECT: **Climate change**

As promised in our climate change workplan, this memorandum provides more detail on some of the issues that were raised during our meeting on September 18. We have held three principals meeting in the past week, and plan to hold one Friday, to pin down specific recommendations from the NEC/CEQ principals. We will then put together an NEC/CEQ recommendations memorandum and a briefing book that contains the underlying memoranda from the principals and other background materials. The recommendations memo and briefing book will be submitted to you by the end of this week, to inform your thinking before the October 6 White House conference.

Specifically, this memorandum:

- Outlines the sources of current emissions in the United States;
- Discusses several aspects of a tradeable permits system, including:
  - →The benefits of a permit trading system relative to traditional regulation;
  - →The lessons offered by the SO_2 trading program; and
  - →Direct allocation versus auctioning with revenue recycling; and
- Explores some of the costs and benefits of a slower approach.

I. SOURCES OF EMISSIONS IN THE UNITED STATES

Carbon dioxide (CO_2) accounts for more than 85 percent of U.S. greenhouse gas emissions. Roughly one-third of CO_2 emissions are from transportation, one-third from buildings and one-third from industry.[1] U.S. CO_2 emissions are now approximately 10 percent above 1990 levels, and are projected to be 28 percent over 1990 levels by 2010 absent policy interventions. Other greenhouse gases include methane (from landfills and livestock), nitrous oxide, and some engineered chemicals such as CFCs and HFCs.

In addition to the discussion below, the appendix -- prepared by OSTP -- presents more detailed data and figures on the sources of emissions. (Some of the potential emissions reductions mentioned in the appendix are not accepted by all agencies.)

TRANSPORTATION

Transportation contributes 31 percent of of U.S. CO_2 emissions. Its emissions are growing by about 2 percent (10 million tons) per year -- roughly twice as fast as industry and buildings -- because of increases in vehicle miles traveled and the increasing popularity of fuel-inefficient sport utility vehicles, minivans and pick-up trucks (which together now account for almost half of all new passenger vehicle sales).

Transportation: Sources of CO_2 emissions

Source	Emissions in millions of tons	As % of transportation emissions
Automobiles	152	34.9%
Light trucks	101	23.2%
Heavy trucks	67	15.4%
Aircraft	57	13.1%
Other	59	13.4%
TOTAL	437	100.0%

[1] In this accounting, the CO_2 produced to generate electricity is charged to the sector using the electricity. Taken together, emissions from all electricity production amount to 36 percent of CO_2 emissions.

BUILDINGS

Residential buildings produce 19 percent of U.S. CO_2 emissions, and commercial buildings account for another 15 percent -- implying that buildings account for over a third of total emissions. Emissions from both residential and commercial buildings are growing by 1 percent annually (2.6 and 2.1 million tons respectively). Energy demand in residential buildings is greatest for heating, electrical appliances, and air conditioning. In commercial buildings, demand is greatest for lighting, electric equipment, and air conditioning.

Buildings: Sources of CO_2 emissions

Source	Emissions in millions of tons	As % of building emissions
Space heat	211	43.0%
Appliances	98	20.0%
Cooling	69	14.0%
Lights	69	14.0%
Water heat	44	9.0%
TOTAL	490	100.0%

INDUSTRY

Industries produce about a third of all CO_2 emissions. Emissions from this source are expected to grow at 0.8 percent per year (4 million tons). About 80 percent of all industrial CO_2 emissions come from petroleum refining, chemicals, paper, lumber, and metals.

Industry: Sources of CO_2 emissions

Source	Emissions in millions of tons	% of industry emissions
Machine drive/electrolytic	149	32.0%
Steam	126	27.0%
Process heat	89	19.0%
Off-road equipment	33	7.0%
Heat/air conditioning/light	28	6.0%
Feedstocks/other	42	9.0%
TOTAL	466	100.0%

ELECTRICITY GENERATION

As noted, the CO_2 produced to generate electricity is charged to the sector using the electricity in the accounting above. Emissions from all electricity production amount to 36 percent of CO_2 emissions.

The table below shows that coal accounts for 50 percent of electricity generated in the U.S., but 77 percent of CO_2 emissions from electricity generation. Coal produces 72 percent more greenhouse gases than natural gas per unit of energy delivered -- which is why a carbon emissions reduction program would have a much larger impact on coal prices than on natural gas or other energy prices.

On average, the electric energy produced by an electric generator is only about a third of the energy input -- the other two-thirds is released as waste into the air or nearby waters. As more generation occurs closer to industrial and commercial sites, it should be easier to capture more of the heat from electric generation that would otherwise be wasted.

Electricity

Source	Share of electricity CO_2 emissions	Share of electricity generation
Oil	1.9%	1.5%
Natural gas	20.7%	23.0%
Coal	77.4%	50.1%
Nuclear	--	15.8%
Hydro & renewables	--	9.6%
TOTAL	100.0%	100.0%

II. Tradeable Permits

During our meeting with you last week, we discussed a tradeable permits system for reducing carbon emissions. This section examines several questions related to tradeable permits.

Tradeable Permits Versus Mandated Standards

A natural question about tradeable permits is why they reduce the costs associated with meeting a given emissions reduction objective. Wouldn't it be easier and more straightforward to mandate standards on items such as automobile fuel efficiency?

Mandated standards are more costly than market-based systems to reduce pollution for two reasons: First, standards usually only affect the market for new equipment; they do not

increase the incentive for owners of existing equipment to scrap their old, inefficient capital more rapidly. Second, standards do not affect the incentive to conserve energy once the new equipment is purchased. For products where additional usage is discretionary (such as cars, but unlike refrigerators), this can be significant. A standard for automobile efficiency does not increase incentives to cut out wasteful driving. A tradeable permits system, on the other hand, focuses directly on the activity in question, allowing reductions to take place wherever they are cheapest and imposing no arbitrary constraint on incentives for further improvement. And in most cases, a tradeable permits system is less administratively costly.

An illustrative example

An example may be helpful. Assume that there are two types of coal-fired plants, both of which emit 100,000 tons of carbon per year. The first type can easily switch to less carbon-intensive fuels (such as natural gas), and thereby reduce carbon emissions even for a given level of energy output (since natural gas has less carbon per BTU than coal). To be more specific, this first type of power plant can achieve carbon emissions reductions at a cost of $25 for every carbon ton reduction. The second type, however, was designed in a manner that makes it extremely difficult to switch fuel to reduce emissions: it can achieve emissions reductions only at a cost of $150 per ton.

The average cost of mandating that carbon emissions at all plants fall by 30 percent is therefore $2.6 million per plant ($0.75 million at the first type, and $4.5 million at the second). Under a permit system, however, the total cost would be dramatically reduced by allowing the second type of plant to buy permits from the first type. This way, a 30 percent reduction in total emissions would cost only $1.5 million per plant (all of the 60,000 ton reduction would occur at the first type of plant, at a cost of $25 per ton). In this example, the permit system produces a cost saving of over 70 percent *to achieve the same environmental goal.* This level of cost saving is not unrealistic: studies by environmental economists often find that market-based systems reduce the cost of environmental regulations by as much as 90 percent.

CAFE standards

You mentioned the specific case of fuel efficiency standards. The CAFE standard for automobiles was introduced in 1978 at a level of 18 mpg, and tightened until it reached 27.5 mpg in 1985. Fuel efficiency rose significantly during the same period, with average miles per gallon increasing by roughly 50 percent between 1975 and 1985. But it is difficult to separate the combined impacts of the CAFE standards and higher fuel prices: The two oil shocks in the 1970's clearly increased consumer demand for more efficient vehicles.

Since 1985, fuel efficiency has remained stagnant and CAFE standards have remained unchanged. Since real gasoline prices have fallen steadily in the 1980's and 1990's, fuel economy would likely have fallen -- rather than remained stagnant -- over this period if not for the CAFE standards. Technology relevant to fuel economy has continued to improve at a rate that would

allow fuel efficiency to climb about 2 percent per year, but auto makers are using this improved technology to add features such as increased vehicle horsepower and size, not fuel economy. Indeed, the past decade has seen a dramatic rise in sales of fuel-inefficient light trucks -- first minivans and pick-ups, then sport utility vehicles -- which now account for nearly half of all passenger vehicle sales and are subject to much lower CAFE standards (21.5 mpg) than cars.

Proponents of fuel efficiency standards argue that increases in CAFE standards could re-route this trend of technical improvement to greater mileage. Some have proposed modifications to CAFE to make it more flexible and cost-efficient, such as allowing trading between companies, or (as part of a broader emissions trading program) with other sectors. Fuel-efficiency standards could also be used to promote commercial introduction of PNGV vehicles with double or triple current fuel economy. (At present, our PNGV partners have pledged only to develop prototypes, but have not committed to sell them.)

Raising CAFE standards, however, can entail substantial -- albeit hidden -- costs. First, consumers prefer to use technology for improved features rather than fuel efficiency -- and forcing them to reverse this preference would be both unpopular and costly. For example, several studies have estimated the cost of reducing carbon emissions with CAFE standards. One estimated the implied cost of carbon reductions from increasing the CAFE standard to 37.5 miles per gallon at $106 per ton of carbon reduced; another estimated that raising CAFE standards to 40 miles per gallon would be equivalent to a carbon price of $104 per ton. Second, to the extent that higher CAFE standards raise the cost of new cars, they tend to discourage new purchases -- thus limiting the overall efficiency benefit by keeping older cars on the road longer than they would have otherwise remained. Finally, increasing CAFE standards would be politically difficult. Auto-makers will resist efforts to increase standards, especially for sport-utility vehicles -- where the Big 3 make much of their profits (up to $10,000 per vehicle).

Since CAFE standards apply only to new cars and vehicles, an increase takes a decade or more to work its way fully through the vehicle fleet. This means that if a significant effect is to be felt by 2010, any CAFE increases would need to begin early.

The SO_2 Example: How Much Can We Learn From It?

The Clean Air Amendments of 1990 required a 50 percent reduction in SO_2 emissions from electric-utility boilers. To accomplish this goal, an emissions trading program was constructed, under which a fixed number of emission allowances were allocated to electric utilities based on historical fuel use. (In addition, a small number of allowances are auctioned every year.) A natural question is whether the experience under the SO_2 programs provides insight into a carbon emissions trading system. Two notable aspects of the SO_2 experience include:

- First, a tradeable permit system can reduce the cost of meeting environmental problems involving a limited number of polluters (e.g., electric utilities). Relative to the previous

command-and-control approach to reducing SO_2 emissions, the tradeable permits program is widely hailed as a success in producing cost-effective environmental protection. Utilities found new and less costly ways to reduce SO2 emissions than had been anticipated at the time the legislation was enacted.

- Second, the cost estimates before the trading system began operations were too high. Around the time that the 1990 Amendments were enacted, a commonly held view was that achieving the targeted reduction in SO_2 would require the price of emissions to rise above $400 per ton, and possibly as high as $1,000 per ton. Today, the price of SO_2 allowances ranges between $90 and $120 per ton -- despite the fact that SO_2 emissions from utilities in 1995 and 1996 were 3 million tons lower than required.

There are several important caveats, however, that limit the applicability of the lessons from the SO_2 program to a carbon emissions program. In particular:

- A carbon emissions program would be *substantially* larger than the SO_2 program: The annual stock of permits under the SO_2 program is worth less than $1 billion; the annual stock of permits under a carbon trading program might be worth between $30 billion and $150 billion. And a significant reduction in carbon emissions will require much more fundamental changes in the structure of the American economy than the SO_2 program. Treasury and CEA argue that any emissions trading system for carbon will be substantially more difficult -- and perhaps even impossible -- to administer than is the case for SO_2. EPA -- which administers the SO2 program -- does not believe that this difference in scale would significantly complicate administering a C02 trading program.

- Simple price comparisons -- showing that the actual permit prices are much lower than predicted -- may be somewhat misleading. Some of the early price estimates conflated the two phases of the program (we're still in the first phase), and were based on inaccurate guesses as to the provisions of the final bill. The last pre-enactment estimate -- the one with the best information about the legislation that would actually be passed -- projected that the permit price would be between $170 and $200 per ton. The degree of true prediction error may be less than some have suggested.

- The remaining discrepancy between predicted and actual permit prices under the SO_2 program partially reflects the deregulation of the freight-carrying railroads -- a development that had nothing to do with the SO_2 program -- which facilitated increased use of low-sulphur coal. Although there are many policy areas that could affect the cost of a carbon trading program -- such as electricity deregulation -- it is, by definition, impossible to know how unexpected future policy actions will affect such costs.

Direct Allocation Versus Auctioning-With-Revenue Recycling

Another issue related to a permit system, and one we touched upon in our meeting, is whether the permits should be auctioned or allocated (that is distributed by the government to designated recipients). One approach to allocating permits would be to "grandfather" them to existing emitters. It is essential to recognize that regardless of whether the permits are auctioned or allocated, consumers are likely to bear most of the costs involved in reducing emissions (through higher energy prices). Thus the choice between auctioning and allocating does not in any way avoid the role of higher energy prices in reducing carbon emissions.

To summarize the pros and cons:

DIRECT ALLOCATION

PROS

- More difficult to characterize as a tax: An allocation program does not involve directly raising revenue. Previous allocation programs -- such as the SO_2 program -- have not been viewed as a tax.

- Corporate support: Our outreach effort suggests that an allocation system could be crucial to generating corporate support -- or at least minimizing opposition -- for the effort to reduce greenhouse gas emissions. But it is not possible to avoid imposing costs on at least some current polluters, so that opposition will remain in the corporate sector.

CONS

- Regressivity: Even with allocated permits, companies are likely to pass most of the higher energy costs on to consumers. Any program that involves direct allocation to businesses thus protects corporations even though they do not need protection, and gives away the funds that could protect consumers, who will bear most of the costs from adjusting to the emissions reduction scheme.

- Corporate welfare: One way to think about the difference between direct allocation and auctioning is to recognize that allocation is functionally equivalent to auctioning the permits, and then giving the proceeds of the auctions back to the recipients of the permits. If permits are "grandfathered," this wealth would go directly to existing emitters. The optics of "giving away" to companies as much as $50 to $100 billion per year, which represents about *10 to 20 percent of total after-tax corporate profits*, may be difficult.

- Inefficiency: Treasury, Commerce, and CEA have grave reservations about the efficiency

-- and indeed even the feasibility -- of an allocation system, especially if the permit requirement is imposed downstream (e.g., on electric utilities). First, any downstream option must settle for only partial coverage of emissions to limit administrative burden. Second, the typical downstream system creates obvious incentives for evasion (e.g., cheating or building units that fall just short of the cutoff level).

AUCTIONS

PROS

- Auctioning would raise revenue -- potentially more than $100 billion a year -- that could be used to reduce other taxes, fund the adjustment programs favored by the labor unions, offset the regressivity of the emissions reduction scheme, or raise national saving. As some rough examples of what could be done under a revenue-neutral auction approach, $50 billion raised from auctioning permits could be used for one of the following:

  →Exclude over $3,000 of payroll from both parts of the 12.4 percent OASDI tax;

  →Cut the employees' OASDI payroll tax (currently 6.2 percent) by 25 percent; or

  →Reduce the 15 percent income tax rate in the lowest bracket to 12.7 percent.

CONS

- Business groups are likely to recognize this as a tax. The theoretical benefits of auctions as a means of distributing the permits will be much less salient to the CEO of a large corporation than the necessity of having to purchase permits to continue operations. Businesses will view an auction as an obligation to pay for something they currently do for free -- even if they are able to pass the higher costs on to consumers.

- An auction would be more easily characterized as a tax than an allocation program. Although we could emphasize the differences between an auction and a tax, the auction would be scored by budget experts as a revenue flow to the Treasury.

III. THE COSTS AND BENEFITS OF A SLOWER APPROACH

The case for an approach with earlier reductions

Absent policy interventions, atmospheric greenhouse gas concentrations will increase during the next century to levels unknown on this planet for 50 million years. To avoid such extraordinary increases, *global* greenhouse gas emissions must at least begin to decline from projected levels early in the next century. For *global* emissions to begin to decline in this time frame, developed countries must move quickly to reduce their emissions, followed rapidly by

action by developing countries.

Those in favor of an approach with earlier reductions -- such as implied by reaching 1990 levels by 2010 -- argue that if the United States delays emissions reductions, it makes it more likely that other developed countries will do so too. It will be much longer, as well, before developing countries take any steps to reduce emissions. In such an event, businesses and consumers will make another generation of investment in relatively inefficient plant and equipment, and the world will become more and more committed to greenhouse gas concentrations far outside the range of historic experience.

- **Effect of delay on later emissions reductions.** For example, if our goal were to stay below 550 ppm of CO_2 in the atmosphere, a ten-year delay in starting emissions reductions would require emissions reductions to proceed much faster in later decades. Even assuming steep reductions in greenhouse gas emissions in distant decades (which our children and grandchildren may or may not be able to achieve), reductions must begin soon to avoid serious environmental damage.

The case for an approach with small reductions earlier and steep reductions later

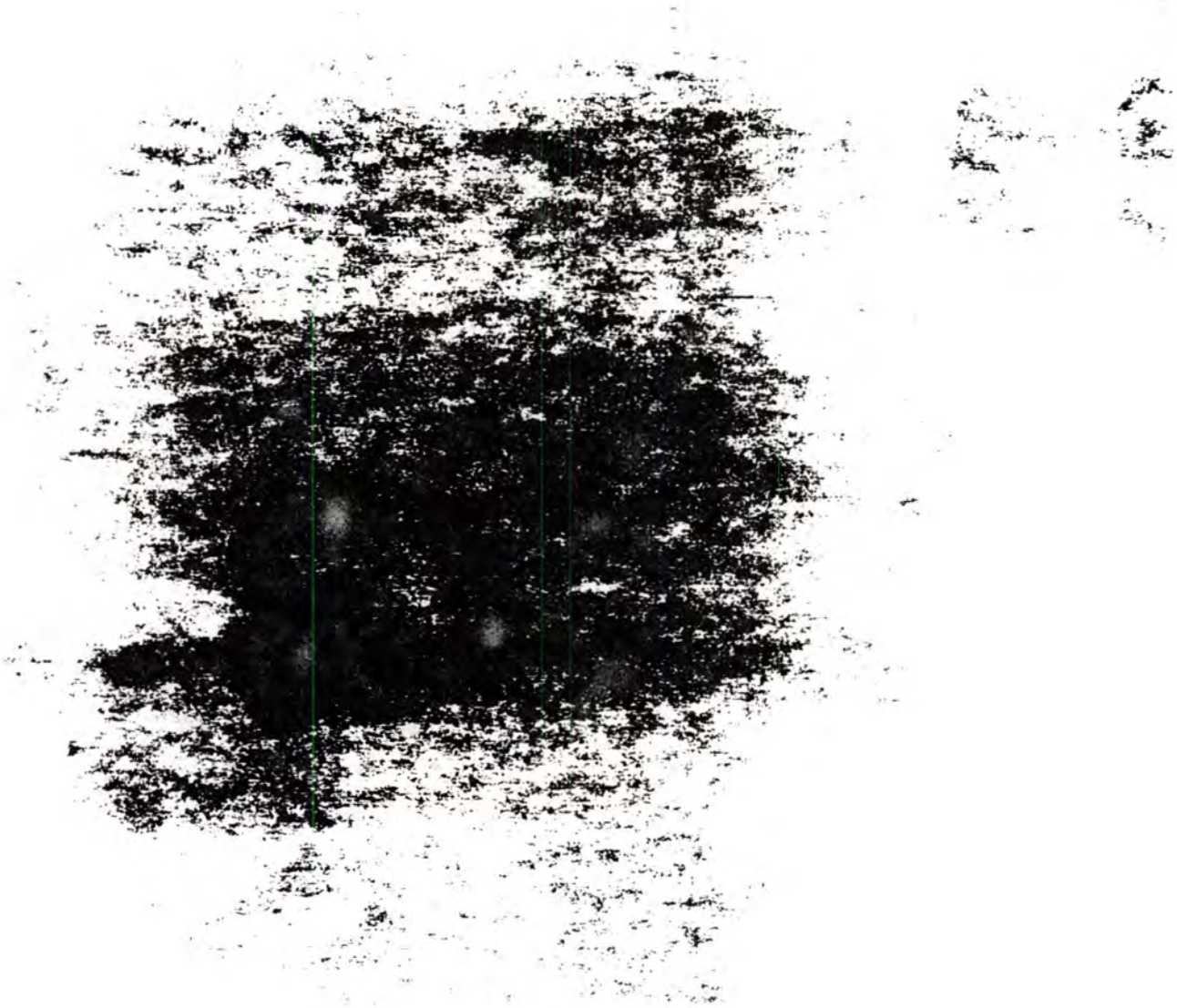
Other advisers are extremely concerned that a target anywhere close to 1990 emissions levels by 2010 would be excessively costly, like the oil price increases of the 1970s and imposing a reduction in the living standards of the average family of about $1,000 -- equivalent to a tax on consumers at least five times as large as the Administration's 1993 BTU tax proposal. These advisers argue that the same environmental goals can be achieved at substantially lower economic cost by adopting a more gradual approach -- one that allows the economy to adjust slowly over time to the new constraints being imposed. There are three major reasons that a more rapid approach raises overall costs:

- ***Capital stock.*** It is very expensive to scrap capital stock while it is still in the prime of its useful life, and replace it with new plant and equipment that is more energy-efficient. Making efficiency improvements when the plants would have been replaced in any case significantly reduces the costs of such improvements because there are no additional costs of scrapping otherwise productive plant.

- ***Lead time for technologies.*** A second motivation for a slow takeoff in curbing greenhouse gases emissions is that it takes considerable time before emerging carbon-free or carbon-lean technologies are developed. Waiting until these new technologies are available before making expensive emissions-saving investments offers the potential of both lower economic costs and higher environmental payoffs.

- ***Macroeconomic impact.*** Your economic advisers believe that a plan to attain 1990 emissions levels by 2010 would produce "stagflation" -- higher unemployment and higher inflation. In contrast to the two oil shocks, the increases in energy prices associated with

a treaty to reduce greenhouse gases would be anticipated, rather than a surprise. Nevertheless, your economics team expects that the efforts of the Federal Reserve to contain inflation, coupled with likely efforts on the part of workers to recoup real wage losses -- even if those losses are anticipated -- will lead to a period of higher unemployment.



Something for Everyone: A Climate Policy That Both Environmentalists and Industry Can Live With

By Raymond Kopp, Richard Morgenstern and William Pizer

SUMMARY: Researchers at Resources for the Future propose an alternate climate policy that has the potential to make both environmentalists and industry happy -- it establishes binding emissions targets as long as costs remain reasonable and allows the target to rise somewhat if costs are unexpectedly high.

SEPTEMBER 29, 1997 -- Over the next few months big business and environmental advocates will bombard the American public with high dollar, slick advertisements reflecting the deep disagreement that exists within the U.S. and across the world regarding global warming and what actions, if any, need to be taken.

The motivator for this media blitz is the upcoming December meeting of the United Nation's Conference of the Parties in Kyoto, Japan to consider climate change policy options. Environmental advocates hope the U.S. will agree to binding targets and timetables for reductions in the emissions of greenhouse gases (GHG) which may be linked to disastrous changes in the world's climate. Many in the business community would like nothing better than to see no agreement at all. We propose a policy approach that can make everyone at least somewhat satisfied.

About the only thing the protagonists in this debate can agree upon is that there exists great uncertainty about the two pieces of information that are crucial to the development of a reasonable climate policy: the gains from reducing GHG emissions and the costs of attaining those reductions. While acknowledging our lack of precise information, environmental advocates believe the risks to our planet posed by climate change are so great that aggressive action must be taken now. By the same token they see the cost of that action as relatively low. In contrast, many in the business community see the climate risks as too uncertain and the costs too high to warrant drastic action. They would prefer a wait-and-see policy or, at most, a limited expenditure on GHG emission reductions.

As a compromise, we propose an alternate policy. Recent research* using a climate policy model developed at Resources for the Future by Pizer suggests that a hybrid system coupling an emissions target with a relief mechanism for unexpectedly high costs goes a long way towards addressing each groups' concerns. In particular, the policy (1) fixes emissions targets that are binding as long as costs remain reasonable and (2) allows the target to rise somewhat if costs are unexpectedly high.

Consider the position of those concerned about the environment. Their policy of choice is a tradable permit system where each permit gives the holder the right to emit a specified amount of GHG into the atmosphere. By limiting the number of permits, one can precisely control GHG emissions and guarantee they remain below the threshold for disastrous climate change. In contrast, while GHG emissions can be set with certainty using a permit system -- and by implication the benefits of GHG control obtained with certainty-- the cost of control is highly uncertain. That is, the cost to society, in terms of higher prices for fuel and reduced productivity, varies greatly under a permit system.

Within the business community, as well as among consumers in general, the ideal climate policy is one that sets an upper limit on climate related expenditures. Businesses are interested in maintaining a stable environment for planning and investment. The risk of unexpectedly high compliance costs under a strict permit system thwarts that stability. For that reason, most businesses would prefer some sort of contingent policy that would keep costs low and predictable.

The hybrid system we propose would establish a fixed number of tradable permits based on an emission target. It would then provide additional permits at a pre-specified trigger price. As long as the cost of controlling a ton of GHG emissions remains below the trigger level, the emission target would be attained.

For environmental advocates, the hybrid approach guarantees that emissions will not exceed the tradable permit limit as long as the price of the tradable permits (i.e., the marginal cost of GHG control) does not rise above the trigger price. Based on their belief that the cost of reducing GHG emissions is low – and assuming these beliefs turn out to be correct -- the permit price will never reach the trigger level and emissions will remain capped.

The current choice of policies facing both environmental advocates and the business community are too tightly drawn. What we propose is a more flexible policy with the potential to address the substantive concerns of both groups, i.e., uncertainties about both benefits and costs. The hybrid policy does just that. By implementing a tradable permit system where the pool of available permits remains fixed as long as the price remains below a reasonable threshold, the risk of catastrophic climate damages is greatly diminished. By capping the potential expenditure on GHG abatement and allowing additional permits to be purchased if costs turn out to be particularly high, the policy protects against runaway costs for business and consumers, enabling sound business planning.

This may not be fully satisfactory from the perspective of an environmental advocate, but if the cost of GHG control is as low as suggested by both the environmental community and our experience with the sulfur trading program, these concerns are unwarranted. Similarly, the business community may be unhappy with the level of required expenditures -- but at least those expenditures remain capped. While a hybrid policy does not address all the thorny issues of GHG control, we believe it provides a valuable degree of freedom to bring the sides together and it may, indeed, be a valuable approach for the Clinton Administration in Kyoto.

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** The recent research by William Pizer mentioned in this article is detailed in the RFF discussion paper, Prices vs. Quantities Revisited: The Case of Climate Change. It is the second of two papers by Pizer that deals with uncertainty in climate policy. Click* ***here*** *to download this paper in PDF format (which can be read with Adobe Acrobat Reader; if your computer is not equipped with Acrobat Reader, click* ***here*** *to download the software FREE). Click* ***here*** *for a summary of Pizer's first paper, Optimal Choice of Policy Instrument and Stringency Under Uncertainty: The Case of Climate Change.*

Click ***here*** *to read the New York Times article by Peter Passell that mentions this Weathervane article and discusses related policy options for combatting climate change.*

Please rate the quality of the information contained in this article:

Right on target Useful Somewhat useful You lost me

For businesses, the policy guarantees that the cost of control per unit of GHG emitted can never exceed the specified trigger price that would be charged for additional permits (and could always be less). Thus, while business leaders may still feel the benefits of GHG control are not commensurate with costs, they can at least make business plans based on the knowledge of a well-specified cost structure.

The hybrid approach proposed here is not entirely new. Aficionados of U.S. air pollution policy will remember that the 1990 Amendments to the Clean Air Act, which established the sulfur permit trading system, also had a provision that enabled industry to buy additional permits at a pre-specified fee. This option was never exercised because the price of the permits (the cost of sulfur control) began low and has fallen over time. Similar mechanisms have been employed to regulate imports and domestic agricultural production. More recently, economists McKibbin and Wilcoxen went on record as favoring a hybrid policy for GHG controls based on their concern about enforcement, monitoring and international trade – important issues, but distinct from our focus on benefit and cost uncertainties.

A final advantage of the hybrid policy is its enhanced credibility relative to a straight permit alternative. The idea that binding targets and timetables will remain inflexible in the face of unexpectedly high costs is unrealistic. By providing an automatic mechanism to relieve cost pressure, the hybrid policy stands a much greater chance of remaining in force and consequently convincing businesses to take action immediately (instead of waiting to see if the policy is eventually abandoned).