FOIA Number: 2017-1093-F

FOIA MARKER

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

Collection/Record Group: Clinton Presidential Records

Subgroup/Office of Origin: Office of Environmental Initiatives

Series/Staff Member: Roger Ballentine

Subseries:

OA/ID Number: 19511

FolderID:

Folder Title:
Climate Change Other General Background

Stack:	Row:	Section:	Shelf:	Position:
S	62	1	1	2

David Gardiner
09/07/99 02:47:08 PM

Record Type: Record

To: Roger S. Ballentine/WHO/EOP@EOP

cc:
Subject: Comparative stats on GHG emissions

To help further your thinking about COP5, I have attached a set of charts that compares US emissions in a variety of ways with other OECD countries. I had this prepared to see if we could tell a good emissions story about the US relative to other developed countries. The bottom line is : NO. We look badly in virtually every way that you can look at it.

Attached is are files containing greenhouse gas emission statistics as we discussed over the phone yesterday (8/31/99). You had asked for various statistics showing how U.S. emission trends compared with other developed countries (primarily OECD). I have included an MS Excel spreadsheet and the identical material in a PDF format. The latter file may be easier to review.

The attached files includes several tables addressing a list of countries that was limited by data availability from national GHG inventory submissions to the UNFCCC. Only those countries which have provided updated GHG estimates to the Secretariat have been included. These data provide a time series of GHG emissions from all source categories from 1990 to 1996. Where available, 1997 data was also included. Also included with each table is a simple index to the year 1992 to show the trend during the 1990s. A brief description of each table is given below:

* Emissions per capita: Of the countries examined, the U.S. ranks at the bottom and exhibits and upward trend. The U.S. rate of growth is somewhat faster than the average across countries.

* Emissions per Dollar of GDP: The U.S. also ranks near the bottom, but exhibits a downward trend, though not as rapidly declining as the average across countries.

* Emissions per Unit of Primary Energy Consumption: The U.S. ranks roughly in the middle of countries examined, and is slightly lower than the average across countries. No specific trend for the U.S. or across countries is exhibited.

* Emissions per Unit of Land Area: The U.S. ranks better than the average across countries. Because the area of each country is static, an examination of the trend is not especially useful.

* Ratio of Energy-related CO2 Emissions to Aggregate GHG Emissions: This statistic is essentially the percentage of total national GHG emissions that is accounted for by carbon emissions from the combustion of fossil fuels. The U.S. ranks as having slightly more emissions associated with energy consumption than

the average across countries and shows no significant trend.

* Carbon Intensity of Primary Energy Consumption: This statistic is essentially a measure of how much carbon each country puts into the atmosphere for each unit of energy they consume. The U.S. ranks slightly worse than the average across countries. Neither the U.S. or the average across countries shows a significant trend.

* Carbon Intensity of Economy: This statistic is a measure of the amount of carbon each country puts into the atmosphere, related to energy consumption only, for each dollar of GDP generated. The U.S. ranks near the bottom for this statistic also (a function of the energy intensity of the U.S. economy and the carbon intensity of our energy use). The U.S., however, exhibits a significant downward trend, which is consistent with the average across countries. These downward trends are primarily a function of the declining energy intensity of many economies.

I hope this information proves useful. Please let me know if you have any problems accessing the files, or if you would like more or less detail provided. All of these tables could also be presented in a graphical form, if it is preferred.

Additionally, we can give you some more comparative information on the underlying sectoral efficiency/productivity statistics and trends (e.g., transportation-related emissions per unit of land area). Unfortunately, I do not have any technically credible measure of aggregate U.S. GHG emissions to put "a better light on things." Hopefully, the attached data, though, at least puts perspective on the relative position of the U.S. and the measurable trends.

Again, let me know if you have any questions.

Michael Gillenwater
U.S. EPA
Tel: 202/260-8501
gillenwater@alum.mit.edu

(See attached file: Gardiner Summary.xls)(See attached file: Gardiner Summary.pdf)

 - Gardiner Summary.xls

 - Gardiner Summary.pdf

Comparative Statistics for Various Greenhouse Gas Emission-related Variables

1 September 1999

Emissions include CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6 except where noted.

Emissions exclude Land-Use Change and Forestry

(Countries ordered based on unindexed 1995 data)

Emissions per Capita

(MMTCE/million people)					Index 1992=100				
Country	**1990**	**1995**	**1996**	**1997**	**1993**	**1994**	**1995**	**1996**	**1997**
Switzerland	2.1	2.0	2.0	-	96	94	95	95	-
Sweden	2.1	2.1	2.2	-	99	102	100	108	-
Latvia	3.6	2.1	2.0	-	88	77	79	75	-
France	2.7	2.6	2.6	-	95	94	95	97	-
Austria	2.7	2.7	2.7	-	98	97	102	103	-
Slovakia	3.8	2.8	2.8	-	95	88	91	93	-
Greece	2.8	2.9	3.0	-	100	102	104	106	-
Japan	2.7	2.9	-	-	99	104	106	-	-
United Kingdom	3.6	3.2	3.3	-	97	95	94	96	-
Norway	3.5	3.5	3.7	-	104	107	108	113	-
Germany	4.2	3.6	3.6	-	98	97	95	97	-
Belgium	3.8	3.9	4.1	-	99	102	102	107	-
Czech Republic	5.1	4.0	4.1	-	96	92	92	94	-
Denmark	3.8	4.1	4.8	-	102	106	101	117	-
Netherlands	4.0	4.1	4.3	-	100	101	104	107	-
Ireland	4.4	4.5	4.5	-	100	102	103	104	-
New Zealand	6.0	5.7	5.7	-	99	97	96	97	-
Canada	5.9	6.0	6.1	-	101	102	104	106	-
Australia	6.7	6.6	6.7	-	99	99	100	102	-
United States	**6.5**	**6.6**	**6.7**	**6.8**	**101**	**102**	**102**	**104**	**105**
Mean	**4.0**	**3.8**	**3.9**		**98**	**98**	**99**	**101**	

- Data not available

Emissions per Dollar of GDP

(MMTCE/$B GDP)*					Index 1992=100				
Country	**1990**	**1995**	**1996**	**1997**	**1993**	**1994**	**1995**	**1996**	**1997**
Switzerland	0.06	0.06	0.06	-	97	96	96	98	-
Sweden	0.08	0.08	0.08	-	102	102	97	104	-
Norway	0.13	0.11	0.11	-	102	100	97	97	-
Japan	0.11	0.12	-	-	99	104	104	-	-
France	0.13	0.12	0.12	-	96	94	93	94	-
Austria	0.13	0.12	0.12	-	98	96	99	99	-
Denmark	0.15	0.15	0.16	-	101	102	94	107	-
Germany	0.22	0.16	0.16	-	100	96	93	93	-
United Kingdom	0.21	0.18	0.18	-	95	90	86	87	-
Belgium	0.20	0.19	0.20	-	101	102	100	104	-
Netherlands	0.21	0.21	0.21	-	101	99	100	101	-
United States	**0.30**	**0.27**	**0.28**	**0.27**	**100**	**98**	**97**	**98**	**95**
Ireland	0.34	0.27	0.26	-	97	93	85	80	-
Canada	0.28	0.29	0.29	-	100	99	99	101	-
Australia	0.39	0.35	0.35	-	96	92	91	90	-
New Zealand	0.45	0.40	0.40	-	94	89	86	86	-
Czech Republic	-	-	-	-	-	-	-	-	-
Greece	0.35	-	-	-	102	102	-	-	-
Latvia	-	-	-	-	-	-	-	-	-
Slovakia	-	-	-	-	-	-	-	-	-
Mean	**0.22**	**0.19**	**0.20**		**99**	**97**	**95**	**96**	

- Data not available

* 1990 real dollars, unadjusted for purchasing power parity

Emissions per Unit of Primary Energy Consumption

(MMTCE/EJ)					Index 1992=100				
Country	**1990**	**1995**	**1996**	**1997**	**1993**	**1994**	**1995**	**1996**	**1997**
Sweden	8.7	8.3	9.4	-	100	104	95	107	-
Norway	10.0	9.4	9.7	-	104	108	105	109	-
Switzerland	13.2	13.0	12.8	-	98	97	101	98	-
Canada	15.8	15.9	15.9	-	99	99	101	101	-
France	18.1	16.7	16.5	-	96	97	96	95	-
Belgium	18.5	17.8	17.2	-	99	100	99	96	-
Austria	19.2	18.1	18.1	-	95	96	99	99	-
Netherlands	18.6	18.4	18.5	-	99	101	101	102	-
Japan	19.4	18.7	-	-	98	99	98	-	-
Slovakia	-	19.4	19.1	-	-	-	-	-	-
United States	**20.5**	**20.1**	**20.1**	**20.3**	**100**	**100**	**99**	**99**	**100**
United Kingdom	23.1	21.0	20.8	-	94	93	92	92	-
Germany	23.6	21.7	22.3	-	98	98	95	98	-
New Zealand	28.4	23.9	26.9	-	97	92	84	95	-
Czech Republic	-	24.3	23.5	-	-	-	-	-	-
Denmark	25.3	26.1	34.7	-	98	103	96	127	-
Greece	28.9	28.9	27.9	-	96	96	98	95	-
Latvia	-	29.3	26.8	-	120	112	102	93	-
Australia	32.3	30.4	31.3	-	98	98	97	100	-
Ireland	44.1	38.0	37.0	-	98	97	92	90	-
Mean	**21.6**	**21.0**	**21.5**		**99**	**100**	**97**	**100**	

- Data not available

Emissions per Unit of Land Area

(MMTCE/km^2)					Index 1992=100				
Country	**1990**	**1995**	**1996**	**1997**	**1993**	**1994**	**1995**	**1996**	**1997**
Australia	15	15	16	-	100	101	104	106	-
Canada	18	19	20	-	102	105	108	111	-
Sweden	43	44	48	-	100	103	102	111	-
Norway	49	50	52	-	104	109	109	115	-
New Zealand	74	74	76	-	100	99	99	102	-
Latvia	157	84	79	-	86	75	75	70	-
United States	**179**	**189**	**195**	**198**	**102**	**104**	**105**	**108**	**110**
Ireland	225	234	236	-	100	103	104	105	-
Greece	222	237	243	-	101	103	106	108	-
Austria	254	259	263	-	99	99	104	106	-
France	276	272	279	-	95	95	96	99	-
Slovakia	412	308	313	-	95	89	92	94	-
Switzerland	366	360	364	-	97	96	97	98	-
Denmark	465	512	602	-	102	106	102	120	-
Czech Republic	681	535	544	-	96	92	92	94	-
United Kingdom	854	784	808	-	97	96	95	98	-
Germany	945	839	853	-	99	98	97	98	-
Japan	884	978	-	-	99	105	106	-	-
Belgium	1,148	1,199	1,255	-	99	103	103	108	-
Netherlands	1,742	1,880	1,950	-	101	102	106	110	-
Mean	**450**	**444**	**431**		**99**	**99**	**100**	**103**	

- Data not available

Ratio of Energy-related CO_2 Emissions to Aggregate GHG Emissions

(Percent)					Index 1992=100				
Country	**1990**	**1995**	**1996**	**1997**	**1993**	**1994**	**1995**	**1996**	**1997**
Latvia	-	48%	54%	-	79	86	95	107	-
New Zealand	40%	49%	42%	-	100	100	114	98	-
Ireland	46%	53%	54%	-	101	101	108	110	-
France	68%	65%	67%	-	99	95	97	99	-
Norway	63%	67%	68%	-	94	93	97	98	-
Australia	66%	68%	66%	-	100	100	100	98	-
Austria	77%	74%	75%	-	99	98	95	97	-
Greece	78%	75%	76%	-	104	103	100	101	-
Slovakia	-	77%	76%	-	-	-	-	-	-
Canada	78%	77%	77%	-	99	100	98	97	-
Japan	82%	79%	-	-	98	98	96	-	-
Switzerland	82%	80%	85%	-	100	103	94	100	-
United Kingdom	81%	80%	79%	-	104	103	102	101	-
Germany	81%	80%	79%	-	101	100	101	99	-
United States	**83%**	**82%**	**82%**	**82%**	**100**	**100**	**100**	**100**	**100**
Czech Republic	-	86%	86%	-	-	-	-	-	-
Denmark	78%	86%	76%	-	95	99	109	97	-
Belgium	90%	88%	89%	-	99	98	99	99	-
Sweden	83%	92%	88%	-	102	100	113	107	-
Netherlands	101%	94%	94%	-	97	96	93	93	-
Mean	**75%**	**75%**	**74%**		**98**	**98**	**101**	**100**	

- Data not available

Carbon Intensity of Primary Energy Consumption
(Energy-related CO_2 Emissions Only)

(MMTCE/EJ)					Index 1992=100				
Country	**1990**	**1995**	**1996**	**1997**	**1993**	**1994**	**1995**	**1996**	**1997**
Norway	6.3	6.3	6.6	6.7	98	101	101	107	108
Sweden	7.2	7.7	8.2	7.4	102	104	107	114	102
Switzerland	10.9	10.4	10.8	10.9	98	99	95	98	100
France	12.3	10.9	11.1	11.0	95	93	93	94	94
New Zealand	11.4	11.7	11.3	12.0	97	92	97	93	99
Canada	12.4	12.2	12.2	12.4	98	99	99	99	100
Austria	14.7	13.4	13.7	13.7	95	94	93	95	96
Latvia	-	14.1	14.6	15.3	95	97	96	99	105
Japan	15.9	14.8	14.9	14.7	96	98	94	-	-
Slovakia	-	14.9	14.5	14.4	-	-	-	-	-
Belgium	16.7	15.7	15.3	15.1	98	98	98	95	94
United States	**17.0**	**16.5**	**16.5**	**16.7**	**100**	**99**	**98**	**99**	**100**
United Kingdom	18.7	16.8	16.4	16.4	97	96	95	93	93
Netherlands	18.8	17.3	17.4	17.5	96	96	94	95	96
Germany	19.1	17.4	17.5	17.4	99	97	96	96	96
Ireland	20.1	20.0	19.8	19.8	99	99	100	99	99
Australia	21.2	20.7	20.7	21.0	98	98	97	97	99
Czech Republic	-	20.8	20.3	20.5	-	-	-	-	-
Greece	22.5	21.7	21.3	21.3	100	100	98	96	96
Denmark	19.8	22.5	26.5	21.2	93	103	105	124	99
Mean	**15.6**	**15.3**	**15.5**	**15.3**	**97**	**98**	**97**	**100**	**98**

- Data not available

Carbon Intensity of Economy
(Energy-related CO_2 Emissions Only)

(MMTCE/$B GDP)*					Index 1992=100				
Country	**1990**	**1995**	**1996**	**1997**	**1993**	**1994**	**1995**	**1996**	**1997**
Switzerland	0.05	0.05	0.05	0.05	97	99	91	98	99
Sweden	0.06	0.07	0.07	0.06	104	102	110	111	95
Norway	0.08	0.07	0.08	0.08	96	94	94	96	96
France	0.09	0.08	0.08	0.08	96	89	90	93	91
Austria	0.10	0.09	0.09	0.09	98	94	94	96	95
Japan	0.09	0.09	0.09	0.09	97	102	99	99	96
Denmark	0.12	0.12	0.13	0.12	95	101	103	104	101
Germany	0.18	0.13	0.13	0.13	101	96	94	92	90
Ireland	0.16	0.14	0.14	0.13	98	94	92	87	83
United Kingdom	0.17	0.14	0.14	0.14	98	93	89	88	86
Belgium	0.18	0.17	0.17	0.17	99	100	99	103	100
Netherlands	0.21	0.19	0.19	0.19	97	95	94	94	93
New Zealand	0.18	0.20	0.17	0.17	94	89	99	85	86
Canada	0.22	0.22	0.22	0.22	99	99	97	98	97
United States	**0.245**	**0.225**	**0.227**	**0.221**	**100**	**98**	**97**	**97**	**95**
Australia	0.26	0.24	0.23	0.25	96	92	91	88	94
Czech Republic	-	-	-	-	-	-	-	-	-
Greece	0.27	-	-	-	106	106	-	-	-
Latvia	-	-	-	-	-	-	-	-	-
Slovakia	-	-	-	-	-	-	-	-	-
Mean	**0.16**	**0.14**	**0.14**	**0.14**	**98**	**96**	**96**	**96**	**94**

- Data not available

* 1990 real dollars, unadjusted for purchasing power parity

Notes:

Emissions data from Japan was only available through the year 1995.

The following counries were missing complete HFC, PFC, and SF_6 emission estimates from their inventory: Austria, Belgium, Czech Republic, Denmark, Ireland, Latvia, Monaco, Slovakia, Sweden, and Switzerland.

REFERENCES

Emissions Data

Source: UN Framework Convention on Climate Change, FCCC/CP/1998/INF.9, 31 October 1998
http://www.unfccc.de/resource/docs/cop4/inf09.pdf
Table 1, page 11

Population Data

Source: U.S. Bureau of the Census, International Data Base, Accessed 8/31/99
http://www.census.gov/cgi-bin/ipc/idbsprd

Land Area Data

World Development Indicators 1998, CD-ROM, World Bank
http://www.worldbank.org/data/databytopic/databytopic.html

GDP Data

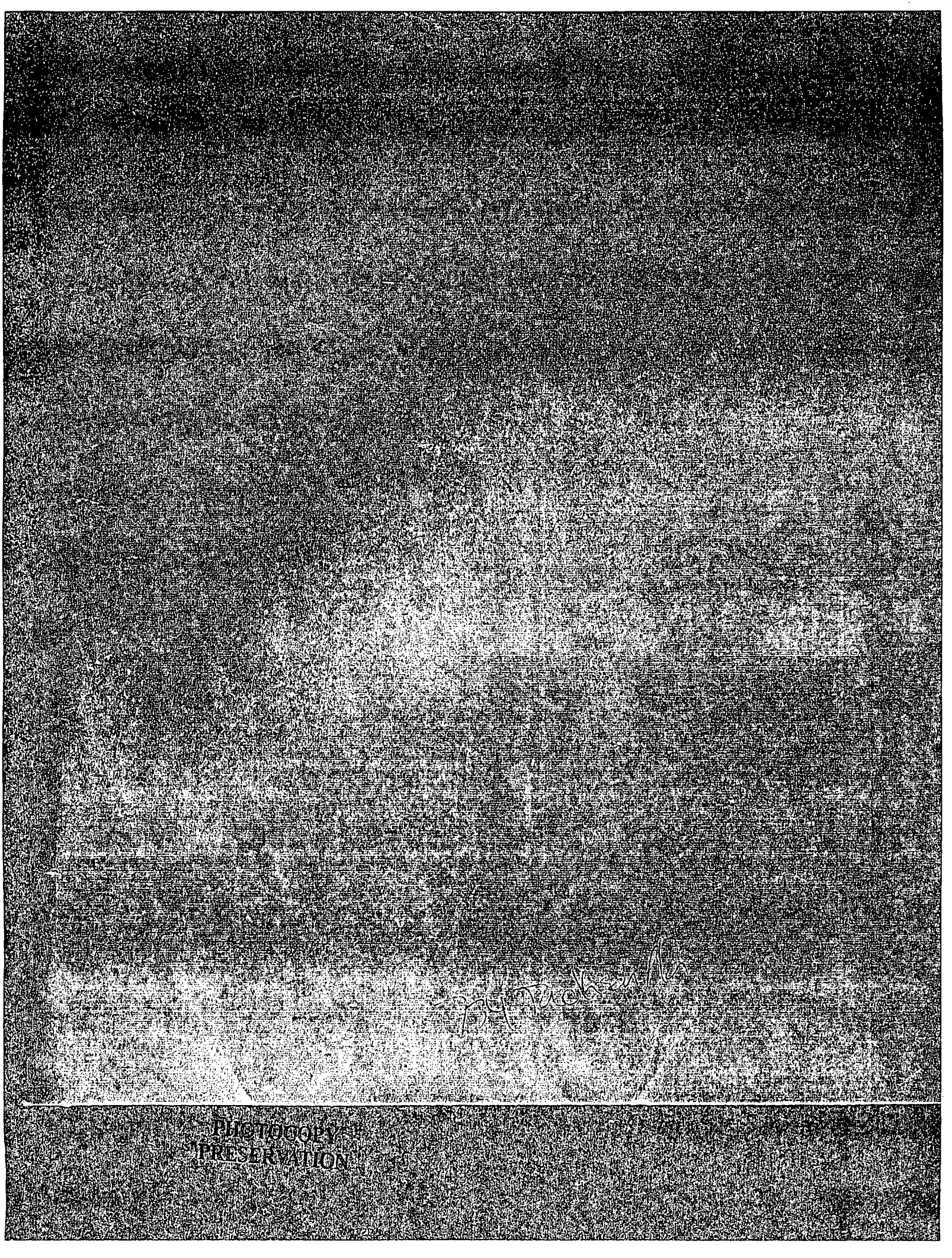
Source: DOE Energy Information Agency, International Energy Annual, accessed 8/31/99
http://www.eia.doe.gov/emeu/international/other.html

Primary Energy Consumption Data

Source: DOE Energy Information Agency, International Energy Annual, accessed 8/31/99
http://www.eia.doe.gov/pub/international/iealf/tablef1.xls

CO_2 Emissions from Energy Sector Data

Source: DOE Energy Information Agency, International Energy Annual, accessed 8/31/99
http://www.eia.doe.gov/emeu/international/carbon.html



White House Climate Change Task Force

734 Jackson Place, N.W. • Washington, DC 20503

March 31, 1998

Indian Treaty Room

I. Global Climate Change: Basic Talking Points (February 1998)

II. Testimony of Janet Yellen Before the House Commerce Committee (March 4, 1998)

III. Remarks by Vice President Al Gore in Kyoto, Japan (December 8, 1997)

IV. Remarks by the President on Global Climate Change at the National Geographic Society (October 22, 1997)

V. President Clinton Announces the United States Climate Change Policy (October 22, 1997)

VI. Climate Change Technology Initiative: 1999 Budget Briefing Materials (February 2, 1998)

202 343-1060 • Fax 202 343-1162

Global Climate Change: Basic Talking Points
February 1998

Core Message

Global climate change is a key environmental challenge for the 21st century. The world's best scientists tell us that this problem is real and that the threats it poses -- like increasingly frequent and severe storms and droughts and rising sea levels -- are too serious to ignore. It is our responsibility to take vigorous, sensible steps to solve this problem. If we fail to do so, our children and grandchildren will pay the price.

Over the course of the next year, the Clinton Administration will be working hard at home and with our partners abroad to address climate change. Domestically, we will begin implementing the President's plan for reducing greenhouse gas emissions. Internationally, we will build on the historic agreement reached in Kyoto, Japan last December.

President Clinton's Domestic Plan for Reducing Emissions

In October 1997, President Clinton outlined a comprehensive and economically sound plan for reducing U.S. greenhouse gas emissions. This plan emphasizes win-win initiatives designed to cut emissions by increasing energy efficiency; developing new, cleaner energy technologies; working with industry and others to promote sensible solutions; and relying on market-based mechanisms to ensure cost-effective reductions. The plan includes:

- **Tax cuts & research R&D**. The President's plan includes a vigorous program of tax cuts and R&D aimed at cutting greenhouse gas emissions. The package amounts to $6.3 billion over 5 years -- $3.6 billion in tax cuts and $2.7 billion in new investment.

  -- The **tax cut package** includes tax credits for fuel efficient cars of up to $4,000 to consumers who purchase highly efficient vehicles. Also included are credits for rooftop solar electricity and hot water systems, for energy efficient homes and appliances, and for several forms of advanced power generation.

  -- The **investment package** includes research and development spending in the three major carbon-emitting sectors of the economy -- buildings, transportation, and industry. Among projects to be expanded is the Partnership for a New Generation of Vehicles, a government-industry effort to develop super-efficient cars that are attractive, affordable, and meet all applicable safety and environmental standards. Substantial funds will also be invested in research partnerships for key renewable energy technologies.

- **Industry-by-industry partnerships**. A second component of the President's plan includes building partnerships with key energy producing and emitting industries to develop sector-by-sector initiatives to cut emissions. These partnerships will identify opportunities for working together to remove barriers to the development and widespread use of energy efficient technologies and practices.

- **Federal energy use and procurement**. A third element of the President's plan is to substantially reduce the Federal share of U.S. greenhouse gas emissions by improving the energy efficiency of Federal facilities and activities and by overhauling procurement practices. While achieving important reductions and cost savings in their own right, these actions can also set a powerful example for the private sector.

- **Electricity restructuring.** Another core element of the President's plan involves restructuring the electricity industry in such a way as to reduce greenhouse gas emissions while saving consumers millions on their energy bills.

- **Domestic emissions trading**. After a decade of experience in reducing emissions, the President has proposed a domestic emissions trading system beginning in 2008. The goal of such a regime is to ensure that further cuts are achieved as cost-effectively as possible. The U.S. has used emissions trading successfully to reduce the pollution that causes acid rain -- exceeding environmental objectives at costs far lower than anticipated.

The Kyoto Protocol on Climate Change

The Kyoto Protocol is an historic step toward building an effective international response to the problem of climate change. In key respects, the Protocol embraces U.S. proposals -- most notably bringing the power of the free market to bear in protecting the global environment. The essential elements of the Kyoto Protocol include binding emissions targets for industrialized nations and flexible market mechanisms for achieving those targets. Our work over the coming year will focus on achieving meaningful participation from developing countries and on establishing rules and guidelines for putting agreed market mechanisms into practice.

- **Emissions Targets.** The U.S. proposal entering Kyoto was for realistic and achievable emissions targets that were credible in reducing the dangerous buildup of greenhouse gases yet measured enough to safeguard U.S. prosperity at home and competitiveness abroad. We succeeded in achieving this goal by reaching agreement on:

  -- The President's concept of a **multi-year time frame** for emissions reductions rather than a fixed, single-year target. The multi-year time frame will allow nations greater flexibility in meeting their targets.

  -- The President's **specific time frame of 2008-2012**, rather than earlier periods favored by the European Union and others, giving us time to gradually phase in change and deploy new technologies cost-effectively.

  -- **Differentiated targets** for the key industrial powers ranging from 6% to 8% below baseline levels of greenhouse gas emissions, with the U.S. agreeing to a 7% reduction. When changes in accounting rules for certain gases and offsets for activities that absorb carbon dioxide are factored in, the level of effort required by the U.S. is actually quite close to the President's original proposal to return emissions to 1990 levels by 2008-2012. The Kyoto target is at most a 3% real reduction below that proposal.

-- **Coverage of all six greenhouse gases** (the EU and Japan favored counting only three) **and of activities that absorb carbon dioxide.** Including the additional three gases and so called carbon "sinks" provides for more comprehensive environmental protection while also allowing for cost-effective measures to combat climate change.

- **Flexible Market Mechanisms.** Central to making the Kyoto Protocol a comprehensive, global, and cost-effective agreement are several market mechanisms that will provide U.S. companies with real flexibility in how they achieve emissions reductions. These include:

  -- **The U.S. proposal on international emissions trading.** Through our domestic program to reduce acid rain, we have proven that emissions trading is an effective way of achieving environmental objectives at low cost.

  -- **A Clean Development Mechanism** (CDM) establishing the right for U.S. companies to participate with developing countries in specific projects to cut emissions. The CDM encompasses the U.S. proposal on joint implementation and will provide companies with relatively low-cost emissions reduction opportunities overseas while offering developing countries the double benefit of foreign investment and clean technology.

- **Meaningful Participation from Developing Countries.** President Clinton and Vice President Gore have called for the meaningful participation of key developing countries in reducing emissions and will not submit the Kyoto Protocol to the Senate until such participation is achieved. The Kyoto Protocol makes a down payment on meaningful participation (principally through the CDM), and the Administration plans to focus extensive diplomatic efforts over the coming year on securing additional commitments.

- **Economic Implications.** Through our success in achieving realistic and achievable emissions targets (rather than the more extreme proposals of other nations) and in establishing cost-effective market mechanisms (rather than the mandatory, standardized policies and measures favored by others), the U.S. helped craft an agreement that is both environmentally strong and economically sound. Those who claim that addressing global warming will send energy prices soaring and damage the economy ignore key provisions that will dramatically reduce costs, such as international emissions trading, and also ignore the important effects of the President's plan for reducing emissions at home.

Remember: the naysayers have told us for the past 25 years that taking action to protect our environment would hurt the economy and they have been wrong over and over again. Today we have the cleanest environment in a generation and the strongest economy in a generation. Environmental protection and economic growth *have* gone hand in hand and they will in the case of global climate change as well.

TESTIMONY OF DR. JANET YELLEN
CHAIR, COUNCIL OF ECONOMIC ADVISERS
BEFORE THE HOUSE COMMERCE COMMITTEE
ON THE ECONOMICS OF THE KYOTO PROTOCOL
MARCH 4, 1998

Thank you, Mr. Chairman. The President has said that we can work to avert the grave dangers of climate change, while at the same time maintaining the strength of our economy. I agree and am pleased to have this opportunity to appear before the Committee to elaborate on the Administration's views on these issues.

The international agreement that was reached in Kyoto this past December is a crucial step forward in addressing global climate change. But it is only one step in a journey. Since the international effort to reduce greenhouse gas emissions is still in some respects a work-in-progress, it is not yet possible to provide a full authoritative analysis of it. Many of the specifics in several crucial areas are not completely resolved in the diplomatic arena, forcing analysts to make a variety of assumptions about the ultimate form of the international regime. In my testimony today, I will attempt to identify key elements of the agreement and the Administration's policy, such as international emissions trading, meaningful developing country participation, inclusion of land-use activities that absorb carbon ("sinks") and six categories of gases, as well as domestic initiatives, that together can ensure that reductions in global greenhouse gas emissions are consistent with continued strong economic growth. I will explain the reasoning underlying our conclusion that, under these conditions, economic impacts are likely to be modest.

The Administration is strongly committed to ensuring that these key elements are reflected in our domestic and international climate change policies. We are firmly committed to

meaningful developing country participation, the use of sinks to offset emissions requirements, and emissions trading both domestically and internationally. And as you know, the President's FY 1999 budget includes a $6.3 billion package of tax cuts and R&D investments over the next 5 years; this package makes good sense in terms of energy policy and will jumpstart our efforts. A final component of the President's climate change policy is his support for electricity restructuring in a manner that will offer approximately $20 billion in cost savings to electricity consumers, while reducing greenhouse gas emissions.

I. Basic Economic Rationale of the Kyoto Treaty

To begin our analysis, it may be worth stepping back and examining the larger question of the basic rationale, from an economist's perspective, for the Kyoto Protocol.

The earth's surface appears to be warming from the accumulation of greenhouse gases from myriad sources worldwide. None of these emitters presently pays the cost to others of warming's adverse effects -- a classic externality in the language of economists. As a result of these distorted incentives, disruption of the Earth's climate is likely to proceed at an excessive pace and if left uncontrolled may pose substantial costs in terms of harm to commerce and the environment alike. The fundamental economic logic of the Kyoto Protocol is thus that without such an international agreement, individual nations will not have the proper incentives to address the threats from global climate change.

II. Costs of Climate Change

In evaluating efforts to mitigate global warming, the first step is to consider the costs

of inaction. These costs --and they are significant-- provide the primary motivation for actions to reduce greenhouse gas emissions.

The Intergovernmental Panel on Climate Change (IPCC) jointly established by the World Meteorological Organization and the United Nations Environment Programme, concluded in 1995 that "the balance of evidence suggests that there is a discernible human influence on global climate." Current concentrations of carbon dioxide, methane, nitrous oxide, and the other so-called greenhouse gases have reached levels well above those of preindustrial times. Of these, carbon dioxide (CO_2) is the most important: net cumulative CO_2 emissions resulting from the burning of fossil fuels and deforestation account for about two-thirds of potential warming from changes in greenhouse gas concentrations related to human activity.

Climatic Impact

If growth in global emissions continues unabated, the atmospheric concentration of CO_2 will likely double relative to its preindustrial level by midway through the next century and continue to rise thereafter. As a result of the increased concentration of CO_2, the IPCC estimates that global temperatures will increase by between 2 to 6 degrees Fahrenheit in the next 100 years, with a best guess of about 3.5 degrees Fahrenheit. While scientists believe that human activities are leading to a gradual warming of the *average* temperature of the earth, the change in temperature in a given region at a given time may differ substantially from this average. Indeed, models predict warming will be greater in high latitudes than in the tropics, and greater over land than ocean.

Potential consequences associated with this shift in climate include a rise in sea levels, greater frequency of severe weather events, shifts in agricultural growing conditions from

changing weather patterns, threats to human health from increased range and incidence of diseases, changes in availability of freshwater supplies, and damage to ecosystems and biodiversity.

Economic and Monetary Damages

The derivation of quantitative or monetary estimates of the damages from such a change in the climate is extremely difficult given the capacity of today's models. Estimates of the economic damages from climate change fall into the following broad areas: agriculture, sea-level rise, air conditioning and heating, water supply, human life and health, air pollution, and other costs (hurricanes, relocation costs, human amenity, construction, leisure activities, urban infrastructure, and ecological damages such as forest loss and species loss). Although the quantification of these effects is quite demanding, researchers have developed estimates that prompt substantial concern. The IPCC reports that a doubling of carbon dioxide levels would lead to approximately 10,000 estimated additional deaths per year for the current U.S. population from higher summer temperatures, even after netting out the effects of warmer winters and assuming acclimatization. Other researchers have predicted sea level increases of about 20 inches by 2100, with greater increases in subsequent years.

Despite the difficulties, respected researchers have developed estimates of the monetary damages expected from an average worldwide temperature increase. For example, William Cline, then of the Institute for International Economics, estimated that a temperature change of 4.5 degrees Fahrenheit would impose annual damages of about 1.1 percent of GDP per year on the U.S. economy. That amounts to $89 billion in today's terms. (Cline's original estimate is quoted in 1990 dollars. The figure given above translates this number into 1997

terms by scaling it to current GDP.) William Nordhaus of Yale University has likewise computed estimates of the dollar loss attributable to a doubling of greenhouse gas concentrations. Although he uses methods that differ from Cline's in several respects, Nordhuas estimates that a slightly larger temperature change of 5.4 degrees Fahrenheit would impose losses equal to about 1 percent of GDP. A third independent estimate reported by Nordhaus is close to Cline's. It must be noted, however, that this similarity among aggregated estimates masks the true uncertainty associated with forecasts of the damages from given increases in global warming -- the estimates are all fundamentally based on extrapolations from current and past experience, and may not fully incorporate effects that will unfortunately become apparent only with future experience.

One key difficulty in interpreting and monetizing these estimates of damages is uncertainty over the extent that they should be discounted because they occur in the distant future. Since the benefits of stemming future climate change accrue over not only decades but centuries, small changes in the discount rate can produce substantial changes in the results. But the precise discount rate that should be used to evaluate questions as important as the future climate of the planet remains a subject of intense debate. It is safe to say that there is, as yet, no professional consensus on the issue. Indeed there can be no technical answer to the ethical question how we should value the welfare of future generations.

A similar difficulty with such estimates is that they do not include potential non-linearities in the relationships between greenhouse gas concentrations and temperature, between temperature and economic damages, or in the various other complicated relationships governing interactions between greenhouse gas emissions, the climate, and the economy. Current estimates

of damages do not, and cannot, accurately reflect the value of reducing the unknown risk of large-scale and potentially irreversible discrete events with potentially catastrophic consequences.

Two such possibilities serve as illustrations. Warming of Northern tundra may release huge amounts of methane from the permafrost, thereby leading to accelerated warming. We do not know at what point, if any, such potentially unstable activity would be triggered. Second, evidence from climate models suggests that some types of climate change may lead to changes in ocean currents, including weakening of the Gulf Stream that warms Western Europe. Scientific evidence suggests that abrupt seawater temperature shifts have occurred over periods as short as decades.

To what extent are we willing to take such chances with our planet? There is a strong argument for the Kyoto Protocol as a form of planet insurance. But what numerical weight should one assign to these catastrophic risks? In other words, what is the value of the insurance policy? Although it is difficult for an economist, or anyone, to know, reductions in the risk of such catastrophic outcomes must be considered in addition to the costs and benefits that can be reasonably quantified. Since human beings are typically averse to risk, such catastrophic risks are especially important in evaluating whether the benefits of a particular climate control policy justify the costs. One must have at least some sympathy with those who criticize economists on the grounds that the effects of climate change are extremely difficult to quantify in a single monetary number.

III. Addressing Global Climate Change in an Efficient Manner

The costs of unabated climate change may thus be difficult to quantify, but they are nonetheless real and provide the motivation for reducing greenhouse gas emissions. In taking action to reduce those emissions, economic analysis suggests that two elements are absolutely essential:

- The effort must be global, to address the global externality inherent in the nature of the problem.
- The effort must be flexible and market-based, to ensure that we achieve our objectives in the most efficient manner possible.

Need for Global Action

Climate change is a global problem requiring a global solution. As I mentioned earlier, no single country has an incentive to reduce emissions sufficiently to protect the global environment against climate change. Each has an economic incentive to "free ride" on the efforts of others. Even if the United States sharply reduced its emissions unilaterally without an international agreement limiting emissions abroad, greenhouse gas emissions from all other countries would continue to grow, and the risks posed by climate change would not be significantly reduced. It is important to emphasize that emissions of different gases anyplace in the world have very similar effects on global climate.

The threat of disruptive climate change has led to coordinated international efforts to reduce the risks of global warming by reducing emissions of greenhouse gases. A landmark international agreement to address global warming was the Framework Convention on Climate

Change signed during the Earth Summit in Rio de Janeiro in 1992. This convention established an objective of limiting greenhouse gas concentrations and called upon industrial countries to return their emissions to 1990 levels by 2000. Since then, it has become clear that the United States and many other participating countries will not meet this voluntary goal; quite the contrary, emission levels have continued to rise not fall among both developed and developing countries.

To address the lack of progress among many industrialized countries toward meeting the Rio objective, the United States and approximately 160 other nations agreed in negotiations held in Kyoto, Japan, last December, to reduce emissions of greenhouse gases. The Kyoto Protocol, which requires the advice and consent of the Senate, would place binding limits on each industrial country's combined emissions of the six principal categories of greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. These limits apply to the 38 so-called Annex I countries, which are the industrialized countries, defined to include Russia, Ukraine, and most Eastern European countries.

Under the Kyoto Protocol, each industrial country's baseline is its 1990 emissions of CO_2, methane, and N_2O and its choice of 1990 or 1995 levels of the other three categories of gases. The United States agreed to a target of 7 percent below this baseline by the period between 2008 and 2012. Given the changes in the definition of the baseline for the three long-lived chemical compounds (HFCs, PFCs and SF6) from 1990 to 1995 combined with a change in the way sinks are accounted for in the baseline, the actual reduction required in the U.S. is no more than 2-3% more than the President originally proposed as the U.S. negotiating

position. The targets for the European Union and Japan are 8 percent and 6 percent below 1990 levels, respectively. Australia, New Zealand, Norway, Russia, and Ukraine all have limits somewhat less ambitious when phrased as cuts relative to their 1990 levels. In sum, over the period from 2008 to 2012, the industrial countries are expected to reduce their average emissions of greenhouse gases to about 5 percent below their 1990 levels.

The President has made clear that he will not submit the Kyoto Protocol to the Senate without meaningful participation from key developing countries (who are not included in Annex I).

There are several reasons why meaningful participation from developing countries is essential. First, developing countries are projected to contribute a majority of world emissions around 2030 under a continuation of business-as-usual. Without the participation of developing economies, efforts by the industrialized countries to limit emissions will therefore not provide adequate protection from climate change.

Second, developing country participation is crucial because it would permit relatively low-cost emissions reductions to be internationally recognized as a substitute for more expensive emissions reductions that might otherwise be achieved domestically by U.S. companies and those in other industrialized countries. Since greenhouse gas emissions have the same basic impact on the climate regardless of where they occur, emission reductions in developing countries have the same environmental benefit as reductions in the U.S. But these reductions are much less costly than reductions in the U.S. or in other developed nations, because of the very inefficient and carbon-intensive uses of energy in these countries today. It thus makes sense, from both an environmental and an economic perspective, to incorporate emissions reductions in

developing countries into the international system.

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

Some have expressed fears that the Kyoto Protocol might adversely affect the competitive position of American industry. Evaluating how the Kyoto Protocol could affect competitiveness of a few specific manufacturing industries -- especially those that are especially energy-intensive, such as aluminum and chemicals -- is complex. The answer depends, in part, on the impact of the agreement on energy prices, which we will shortly address. In general it is difficult to undergo a structural change in the economy without having the effect of expanding some sectors and contracting others. But to provide some perspective on this issue, consider the following facts. First, on average, energy constitutes only 2.2 percent of total costs to U.S. industry. Second, energy prices already vary significantly across countries. According to the *1997 Statistical Abstract,* for example, in 1996 premium gasoline cost $1.28 per gallon in the United States -- but only 8 cents per gallon in Venezuela. Similarly, gas prices were $3.71 per gallon in Switzerland and $4.41 per gallon in France. Electricity prices also vary significantly: in the U.S. they were 5 cents per kilowatt hour in 1995, a fraction of prices in Switzerland of 13 cents per kilowatt hour. Yet U.S. industry is not moving en masse to Venezuela, nor is Swiss industry moving to the United States. Third, roughly two-thirds of all emissions are not in manufacturing at all, but in transportation and buildings, sectors which, by their very nature, are severely limited in their ability to relocate to other countries. We therefore believe we need

developing country participation because the problem is global and cost-effective solutions are essential, than to avoid adverse effects on competitiveness.

Flexibility and Market Mechanisms

A global solution is thus critical to the global problem of climate change. Globalizing the solution is not, however, enough by itself. We must also ensure that our efforts to reduce global greenhouse gas emissions reductions in the most efficient manner possible. The nature of the climate change problem suggests three basic methods to lower costs of achieving given levels of environmental protection. They can be characterized in terms of three categories of flexibility: (1) "when" flexibility; (2) "what" flexibility; and (3) "where" flexibility, which may be the most important of all. Such methods have long been championed by economists interested in increasing the efficiency of protection. Indeed, over 2,500 economists from academia, industry, and government alike urged such approaches in a letter they signed last year advocating action on climate change:

> "Economic studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs...The most efficient approach to slowing climate change is through market-based policies."

1. "When flexibility" (timing)

First is "when flexibility" or timing. Since climate change is a long-term problem, the exact timing of emissions reductions is, within some range, not of primary importance. Thus the freedom to delay or accelerate reductions within an agreed upon time frame -- while ensuring credibility of emissions reductions -- lowers costs.

As a result of U.S. leadership, the Kyoto Protocol incorporates this principle of "when

flexibility" in four ways:

- First, the initial emissions reductions are less severe, and the period over which they occur ends much later than what had been proposed by many other countries. By adopting a gradual and credible path of reductions in the early years, we can greatly reduce costs such as those from prematurely scrapping coal-fired electricity plants, while attaining the same ultimate environmental goals.
- Second, under the Kyoto Protocol, the emissions target is not specified in terms of a specific year, but rather in terms of an average over a five-year period (2008-2012). Averaging over five years, instead of requiring countries to meet a specific target each year, can lower costs, especially given an uncertain future. The averaging can smooth out the effects of short-term events such as fluctuations in the business cycle and energy demand, or hard winters and hot summers that would increase energy use and emissions.
- Third, there is allowance for "banking" emission reductions within the 2008-2012 commitment period, for use in a subsequent commitment period [although the emission targets of the subsequent periods have not yet been specified].
- Fourth, CDM credits achieved between 2000 and 2008 may be banked until 2008 to 2012.

2. "What flexibility" (gases and sinks)

The second type of flexibility is "what flexibility", along two dimensions. The first is the inclusion in the agreement of all six greenhouse gases. Emissions of different kinds of gases, not just carbon dioxide, contribute to the greenhouse effect. Since the IPCC has developed

conversion factors for all greenhouse gases by estimating their global warming potentials, reductions in emissions of one gas can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects. Again at U.S. urging, all six gases are included, while Japan and the EU had insisted until the end on covering only three. Thus the U.S. succeeded in having the Kyoto Protocol stipulate that countries with binding targets are to reduce their *total* greenhouse gas emissions by certain percentages, but does not require specific reductions for specific gases. Since a molecule of sulfur hexafluoride is 23,900 times more potent over 100 years than a molecule of CO_2, it may be cheaper to achieve the same environmental benefit by eliminating one molecular unit of SF_6 than nearly 24,000 units of CO_2.

Some initial analysis indicates that a strategy of reducing non-CO_2 greenhouse gas emissions by a greater percent than CO_2 emissions could lower prices by as much as 10 percent. Thus allowing countries flexibility in what gases they reduce -- essentially trading emissions reductions across gases -- can help lower significantly the costs of meeting their targets.

The second source of "what flexibility" is the treatment of sinks, i.e., land use activities that promote the removal of carbon from the atmosphere through the growth of plants. At the urging of the U.S. delegation, sinks can be used to offset emissions targets. Promoting such sinks through afforestation and reforestation may reduce atmospheric concentrations of CO_2 at much lower costs than reducing emissions of greenhouse gases.

3. "Where flexibility" (international)

The third type of flexibility, and perhaps the most important, is "where flexibility" (international). As I have already emphasized, emissions have the same environmental consequences regardless of where in the world they occur. Therefore, the least-cost approach to

controlling climate change is to reduce emissions wherever such reductions are cheapest. The Kyoto Protocol, because of U.S. insistence and persistence, includes three important cost-saving provisions of this nature.

- First, it provides the opportunity for countries that take on binding targets to trade rights to emit greenhouse gases with each other. This market in emissions permits could ensure that emissions reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emissions reductions in other participating countries when doing so would reduce their costs -- thus lowering costs without affecting the level of environmental protection. While currently only industrialized countries have emissions caps, this mechanism also offers an incentive for developing countries to take on emissions targets.
- Second, the agreement provides for Joint Implementation by Annex I countries. Thus if some countries do not develop programs to trade permits internationally, U.S. firms could nonetheless implement projects in those countries for which they could receive emissions reductions credits in the U.S.
- Third, the agreement allows industrial countries to invest in "clean development" projects in the developing world and use these projects' certified emissions reductions toward meeting their targets. Many such clean development projects may be quite cheap in terms of the cost per ton of emissions avoided, as has been illustrated by the Joint Implementation pilot program that is already in place in the U.S.

Details of how these provisions will operate will be discussed in future negotiations such as the one in Buenos Aires later this year. Nonetheless, effective international trading of

emission credits, Joint Implementation, and the Clean Development Mechanism can lead to substantial reductions in costs relative to alternative policies that do not exploit the power of market incentives. To illustrate briefly the ability of U.S. industry to perform beyond expectations when given appropriate economic incentives, consider further EPA's highly acclaimed sulfur dioxide (SO_2) program, which relies, among other things, on a system of tradeable permits to reduce emissions of SO_2 from electric utilities. The SO_2 program has been successful in several ways: a large number of utilities participate, SO_2 emissions and ambient concentrations have fallen and the costs of reducing emissions are considerably lower than originally forecast.

As has been frequently noted, the average cost of SO_2 emissions reductions has recently been significantly lower than was originally forecast, in part due to the role of incentives in fostering innovation. Emission permit prices, currently at approximately $100 per ton of SO_2, are well below earlier estimates of around $250 to $400 per ton.

Trading programs may not always bring cost savings as large as those achieved by the SO_2 program; trading programs will not always be accompanied by the discovery of much cheaper control strategies. However, the SO_2 experience demonstrates clearly how programs like international permit trading, Joint Implementation, and the Clean Development Mechanism will lead firms to find cheaper ways of reducing emissions that can lead to unexpectedly low costs.

IV. Difficulties of Economic Analysis of the Kyoto Protocol

Now that we have a Protocol -- even if it is not yet fully complete nor ready for the President's submission to the Senate -- it is possible to examine it in somewhat more detail from

an economic perspective. But, once again the inherent limitations of any such estimates deserve emphasis. Such limitations should not be surprising to you: economists have a difficult enough time projecting the behavior of the economy over the next quarter or year, let alone over the next two decades. The scale of the forecasting exercise is therefore daunting, and any specific results should be treated with substantial caution.

The difficulties associated with economic analysis of climate change fall into three broad categories. First are the uncertainties that still remain over the terms of the ultimate treaty, necessitating assumptions on which the analysis is predicated. Second are the inherent limitations of available models to analyze even short-term costs and benefits. And finally is a topic discussed earlier: the impossibility of putting a single monetary number on the long-term benefits of climate change mitigation, although there will clearly be economic benefits of emission reductions.

Uncertainties in the International Effort to Combat Climate Change

The Kyoto Protocol was an historic accomplishment, delineating the broad terms of the international effort to address climate change. But although we know a lot more than we did before Kyoto about how that international system can work, and that informs our analysis, there is still much that we do not know.

First, some provisions raise complex implementation issues. At issue here is the treatment of so-called sinks -- activities that affect the rate at which carbon is removed from the atmosphere and "sequestered," e.g., by the planting of trees.

Second, the details of a number of items -- primarily concerning international trading, the Clean Development Mechanism, and developing countries -- are the subject of further

discussions including future negotiations in Buenos Aires next fall, because they had not been definitively settled by the end of the Kyoto talks.

Finally, and most importantly, we have not yet negotiated international agreements to limit emissions beyond the 2012 window. The emission cuts agreed upon at Kyoto are only a first step on a long journey. The first step that we propose to take over the next 15 years is critical. But the reason it is critical is *not* that, by itself, it will solve the climate change problem -- emissions during any given decade are small compared to the cumulative concentrations in the atmosphere. Rather, the first step is critical because we can not take the second and third steps until we have taken the first. At the same time, any analysis is complicated by the lack of knowledge over what the subsequent steps will be.

Inherent Limitations of Models

In addition to these uncertainties about the details of the international effort to address climate change, are the inherent limitations of the models used to evaluate that effort. Even within a given model, answers depend critically on the precise nature of the question asked. For example, the costs of emissions reductions depend critically on the extent of global participation and international trading that a treaty is assumed to feature. But in addition to the dependence of the results from a given model on the precise assumptions, different models can give different answers even when all the assumptions are specified to be the same -- a concrete illustration of the range of uncertainty to which we must assign the predictions of any one individual model.

One area in which the uncertainty is particularly large is the pace of technological progress --especially the diffusion of existing energy-efficient technologies, but also the development of new technologies -- and the extent to which the pace will accelerate in response

to government programs. Models and experts on climate change policy tend to have a wider range of disagreement on the scope for speeding the diffusion of existing energy-efficient technologies than on any other single issue.

Furthermore, each model has strengths and weaknesses; each has questions to which it is better or worse suited to answer. Some, for example, model the energy sector in detail. Some allow for the fact that a coal-fired power plant cannot costlessly be converted to one that runs on natural gas. Some show the effects of hypothetical tax cuts made possible by the new revenues earned through the auction of emissions permits. Some are capable of showing recessions and booms. Others include a long-term "carbon cycle" model that can keep track of the accumulation of greenhouse gas concentrations in the atmosphere and their climatological effects. Some break down the rest of the world into regions and so can model international trade. No one model does everything, and therefore we must not rely blindly on the results of any one model or set of models. Professional judgement and economic intuition, along with diplomatic assessments, are also crucial.

Benefits of Averting Climate Change

As discussed above, it is evident that the benefits of averting climate change are potentially immense. But we have chosen not to try to quantify them in monetary terms, in light of the difficulties we have enumerated. These include the uncertainty of these benefits, their timing and therefore the extreme sensitivity of the results to the chosen discount rate, and the dependence of benefits on emissions paths after the 2008 to 2012 budget period specified in Kyoto.

V. Assessing the Kyoto Protocol

In order to evaluate the likely net economic impact of the Kyoto Protocol, *excluding the benefits of mitigating climate change itself*, we have drawn upon a variety of tools to assess the various possible costs and non-climate benefits of the Administration's emissions reduction policy. To give away the punch line, our conclusion is as follows: the net costs of our policies to reduce emissions are likely to be small, assuming those reductions are undertaken in an efficient manner and we are successful in securing meaningful developing country participation as well as effective international trading, and the Clean Development Mechanism in future negotiations. That potential small net premium, even excluding the benefits of mitigating climate change, in effect, purchases a partial insurance policy against a serious environmental threat.

Because the results from any model must be treated with caution, the Administration has employed a broad set of economic tools to assess the Kyoto Protocol. We have drawn on the insights of a wide range of models of the energy sector and economy over the next 25 years, including but not limited to the results of the Stanford Energy Modeling Forum exercises, the IPCC's review of the economic and social dimensions of climate change, the work of the OECD on Economic Dimensions and Policy Responses to Global Warming, and the staff-level Interagency Analytical Team analysis produced last year. Other tools include simple relevant statistics, "meta-analyses" such as work by the World Resources Institute, models, and basic economic reasoning. Drawing on this broad array of analytical tools is crucial to an intelligent evaluation of the policy alternatives.

To our knowledge, no model -- whether used inside the government or not -- has yet been set up to analyze the implications of the Kyoto Protocol, since this agreement is only a few

months old and remains unfinished. In particular, no model is currently designed to assess Kyoto's treatment of sinks, or all six greenhouse gases. Some model-builders outside the government tend to take as long as several years to incorporate changes in policy parameters into their models.

Our thinking has been informed, however, by simulations conducted with the Second Generation Model of Battelle Laboratories, one of the leading models in the field. The SGM is one of the models best positioned to analyze the role of international trade in emission permits, which we consider to be a critical element of the Kyoto Treaty. However, the SGM does not cover all six gases included in the Kyoto Protocol or include a role for sinks. We have used the SGM model as one input into our overall assessment of the Kyoto treaty, but have attempted to supplement its results with additional analysis to account for such special features of the agreement as the inclusion of six gases, a possible trading arrangement that could include a subset of the Annex I countries and the Clean Development Mechanism. We will share with you today some preliminary results of this analysis. To the extent possible, we have compared results obtained with the SGM model with those of other modelling efforts.

Mindful of the limitations of any single model, we are eager to see features of the Kyoto Protocol assessed by other models to obtain a better feel for the range of possible effects. This work is just beginning and much of it will continue to go on outside the government. For example, the Energy Modeling Forum, based at Stanford University, is a long-running model comparison exercise involving many of the leading climate models. EMF is currently studying

how features of the Kyoto legal language can be translated into terms recognizable to economic modelers. We expect that the group will conduct a full scale analysis of the Kyoto Protocol. The Energy Modeling Forum believes that its members will need at least until mid-year to update their results.

VI. Assessing the Potential Costs of Emissions Reductions

I said in Congressional testimony last July that we can do this smart or we can do this dumb. I was referring to the point that the costs of cutting emissions can be much reduced if flexible, market-based mechanisms are used. Our economic analysis highlighted the importance of such flexible, market-based mechanisms -- which are therefore reflected, at the President's insistence, in the Kyoto Protocol and our ongoing diplomatic strategy.

Within the Kyoto Protocol, this means an insistence on international trading, Joint Implementation, the Clean Development Mechanism, and, ultimately, on meaningful developing country participation. Domestically, this means that we implement any emissions reductions through a market-based system of *tradeable* emissions permits, which ensures that we achieve reductions wherever they are least expensive. But this also means taking serious and responsible steps in the short run to prepare us to meet our obligations in the longer term.

The first such step is the inclusion in this year's budget of an aggressive, $6.3 billion program of tax cuts and R&D investments -- $1.3 billion more than the $5 billion package the President promised in his October 22 speech on this issue. The goal is both to stimulate the development of new energy-saving and carbon-saving technologies and to encourage the dissemination of those that exist already. The proposed package contains $3.6 billion over the

next 5 years in tax cuts for energy efficient purchases and renewable energy, including tax credits of $3,000 to $4,000 for consumers who purchase highly fuel efficient vehicles, a 15 percent credit (up to $2,000) for purchases of rooftop solar equipment, a 20 percent credit (subject to a cap) for purchasing energy-efficient building equipment, a credit up to $2,000 for purchasing energy-efficient new homes, an extension of the wind and biomass tax credit, and a 10 percent investment credit for the purchase of combined heat and power systems. The package also contains $2.7 billion over the next 5 years in additional research and development investments -- covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and cross-cutting analyses and research. One example of the R&D effort is the Partnership for a New Generation of Vehicles (PNGV). PNGV is a government-industry effort to develop attractive, affordable cars that meet all applicable safety and environmental standards and get up to three times the fuel efficiency of today's cars. In FY99, the combined proposal for PNGV is $277 million, up from $227 million appropriated in FY98. Similar government-industry efforts are proposed to develop more efficient diesel engines for both light trucks and heavy trucks.

A second responsible step entails industry-by-industry consultations to prepare emission reduction plans in key industrial sectors. The Administration will work in partnership with industry to identify ways in which the Federal government might remove regulatory hurdles that discourage energy efficiency. In addition, DOE will spearhead a comprehensive effort to improve the energy efficiency of the Federal government's own operations and purchases.

The third step is the promotion of an environmentally-responsible electricity restructuring bill, which the President identified as part of his domestic climate change package

in his address to the National Geographic Society on October 22. An electricity sector freed from government regulation would be a more efficient energy sector. Costs to consumers would fall. In addition, stronger incentives for improved generation efficiency in conjunction with appropriate market based provisions could achieve modest reductions in emissions. A reasonable overall estimate of the contribution of federal electricity restructuring to the rest of the President's program to address climate change is that it would make further progress to the same emission reduction goals at a cost saving of roughly $20 billion per year. These steps should be taken regardless of Kyoto, because they make sense in terms of energy efficiency. But they have the added benefit of preparing us for Kyoto.

Estimated Reduction in Costs from Annex I Trading

In the language of the treaty, "Annex I," is the set of countries that have agreed to take on binding limitations in emissions of greenhouse gases. Even without meaningful developing country participation -- which, again, the President has emphasized is essential before the treaty would be submitted for ratification -- costs could be reduced substantially by emission trading among the Annex I countries. To provide some indication of the possible efficiency improvements, Russia and Ukraine consume six times as much energy per dollar of output as does the United States. Such large international differences in energy efficiency suggest that adoption of existing U.S. technology would yield very large emissions reductions in these countries.

Estimates derived from the SGM model confirm that emissions trading among Annex I countries can reduce the cost to the United States of achieving its targets for 2008-2012 emissions by about half relative to a situation in which such trading was not available. This

concept of costs is meant to capture aggregate resource costs to the US economy, including the cost to domestic firms of purchasing emission permits from other countries where emission reductions may be cheaper than in the United States. Although these estimates reflect idealized international trading in efficient markets, the overall conclusion is clear. The dramatic reduction in costs potentially available from Annex I trading within the SGM model -- cutting the costs involved by half -- highlights why the President insisted that international trading be part of the Kyoto Protocol; and why its achievement by our negotiators in Kyoto was such an important accomplishment.

Estimated reduction in costs from umbrella trading

One possibility that emerged in Kyoto, which none of us foresaw, was the idea developed there by the U.S. delegation, that the United States might undertake trading with a subset of Annex I countries, dubbed the "umbrella". Countries that have expressed interest in the umbrella include the United States, Australia, Canada, New Zealand and Russia, with strong indications of interest from some others. This subset of Annex I countries shares a common interest in promoting market-based mechanisms, most specifically, fully flexible rules for international trading of emissions permits.

It is too early to state the precise form the umbrella will take. But we can envision a number of potential benefits. The umbrella could, for example greatly reduce costs to the U.S. Results that we have derived from various SGM simulations of efficient international trading suggest that, relative to the situation in which there is no trading at all, the umbrella can reduce costs by an estimated 60-75 percent, depending on whether the former Warsaw Pact countries fall within the umbrella. The Kyoto Protocol classifies these countries outside of the EU bubble

for the first budget period 2008-2012.

Estimated reduction in costs from developing country participation

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

The substantial potential gains from meaningful developing country participation are highlighted by the significant benefits that will likely accrue from the limited role that the developing countries have already agreed to: the Clean Development Mechanism (CDM), modeled after the U.S. joint implementation concept. The CDM cannot realistically be expected to yield all the gains of binding targets for developing countries, but it might shave costs by roughly another 20 to 25 percent from the reduced costs that result from trading among Annex I countries.

Another possibility is that we persuade some of the key developing countries that are the largest emitters to commit to targets, and allow us to buy emission reductions from those paths. Simulations with the SGM model suggest that full participation by non Annex I countries could cut roughly 55 percent off the reduced costs that result from Annex I trading. The actual cost reduction would depend on the extent of developing country participation that is ultimately obtained, as well as the effectiveness of international trading arrangements. The more developing countries that take on modest binding targets and trade in international permit markets, the lower will be costs.

These cost-saving opportunities are fundamental tenets of the U.S. position. The promise of Kyoto cannot be achieved without effective emissions trading. Moreover, if we do

not get meaningful participation by key developing countries, we won't submit the treaty for ratification to the Senate. So, while our analysis may be predicated on some ambitious conditions concerning trading and developing country participation, it is exactly those conditions that form the foundation of the U.S. position in international negotiations including those at Buenos Aires.

Accounting for Carbon Sinks

The preceding discussion has emphasized the importance of trading arrangements and the CDM. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. Again, the U.S. delegation obtained a novel concept, that carbon absorbing activities called sinks could be used to offset emissions. The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. The Kyoto Protocol specifies that removals of CO_2 by sinks count toward meeting the target. The Kyoto Protocol counts the net emissions effects of three sink activities --afforestation, reforestation, and deforestation. Very preliminary estimates of the implications for the United States of the Kyoto provision on sinks indicate that carbon sinks could comprise a significant portion of the total required emissions reductions. Moreover, decreasing the required emissions reduction by, for example, 10% would likely result in cost-savings greater than 10%.

Even this estimate of the effect of sinks is conservative in one respect: it is based on an assumption for sink activity in the U.S. over the 2008-2012 period, and no assumed benefits from sinks elsewhere in the world. Very preliminary estimates suggest that incorporating the gains from sinks *throughout the world* can substantially reduce the costs of meeting the Kyoto target, on top of the gains from trading among Annex I countries. (Furthermore, no model has yet

even tried to take into account that government policies can help increase the activities qualifying as allowable sinks, like some tree-planting.) Because the quantitative uncertainty is so large, we do not yet have an estimate with which we are comfortable. But we expect that complete modelling of the Kyoto provision pertaining to sinks will likely have favorable and potentially large effects on projected costs.

Accounting for the role of improvements in energy efficiency

Another issue in analyzing the Kyoto protocol concerns future improvements in energy efficiency due to innovation and diffusion of existing technology. The parameter that figures most prominently in analysis of energy efficiency is the rate of improvement in the so-called Autonomous Energy Efficiency Index (AEEI), that is the rate at which the total use of energy falls relative to GDP. A plausible assumption on the AEEI is an improvement of 1.0 percent per year. Reflecting a conservative interpretation of the 15-year impact of various climate change initiatives, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is not the most optimistic outcome that might occur. Some authorities in the field of energy policy forecast more rapid technological progress. Experts at five national laboratories managed by the Department of Energy, using an engineering approach rather than an economic paradigm, found that a third of the emissions reductions necessary to return to 1990 levels by 2010 could be achieved through the adoption of existing energy-efficient technologies at no net resource cost, or even some savings. The National Academy of Sciences reached qualitatively similar conclusions in a 1992 report.

The President's FY 1999 budget, as I have noted, includes a $6.3 billion package of

tax cuts and R&D investments intended to spur the discovery and adoption of new technologies. If the Administration is successful in this effort, the rate of improvement in energy efficiency could rise and such improvements would lower the cost of meeting our Kyoto target. For example, published results based on SGM model simulations with different assumed rates of AEEI suggest that an increase in the AEEI of 25 percent could lead to declines in the permit price of approximately 40 percent.

Our justification for incorporating into our assessment a small assumed impact of Administration technology policies is somewhat analogous to the Administration's rationale for employing mainstream economic assumptions in our budget forecasts: in the presence of uncertainty, we are conservative in our estimates of the speed with which the economy will grow, tax receipts will rise, and the budget will improve. That way, any revisions or surprises that occur are likely to be in the pleasant direction. In this instance, we prudently and conservatively assume that there will be substantial delays between investments in new technology or the diffusion of existing technology, and the returns to such investments.

Moreover, at the recent automobile show in Detroit, General Motors announced that it has developed a hybrid-based vehicle that can achieve fuel efficiency of 80 miles per gallon, and that this car could be in commercial production within a few years. Ford also exhibited a prototype of a light-weight highly fuel efficient sedan that could be in commercial production by the middle of the next decade. These announcements followed an earlier breakthrough announced by DOE and its partners of a fuel cell that could run on gasoline and double current fuel economy while reducing conventional air pollution emissions by 90 percent. These technological advances have been made possible through the efforts of the Partnership for a New

Generation of Vehicles between the Administration and the U.S. auto companies and their suppliers.

Such progress may be replicated in other sectors. VCRs and TVs, while switched off, consume about $1 billion worth of electricity annually. EPA has established a partnership with major manufacturers that has a goal of achieving up to a 70 percent reduction in energy use by VCRs and TVs while they are switched off, without sacrificing product quality, usefulness, or increasing costs. This partnership offers promise of substantial improvements in energy efficiency.

Non-Climate Benefits

A final factor that should be included in any comprehensive assessment of the economic implications of the Kyoto protocol are the benefits of the agreement. The literature has emphasized that any relative price shifts that prove necessary to reduce emissions should produce non-climate benefits in three areas: traffic congestion, highway accidents, and air pollution unrelated to climate change. These benefits are hard to quantify precisely but are potentially significant: our rough estimates suggest that these three benefits could offset approximately a quarter of the resource cost of the climate change policy.

Synthesis

A comprehensive evaluation of the economic impact of the Kyoto Protocol must integrate all of the factors described above: reliance on flexible market-based mechanisms domestically; international trading and Joint Implementation among Annex I countries; the Clean Development Mechanism; meaningful developing country participation; the potential cost-mitigating role of including six gases and carbon sinks; the benefits of electricity restructuring;

and emissions reductions achieved as a consequence of other proposed Administration climate change initiatives. Assuming that effective mechanisms for international trading, Joint Implementation and the Clean Development Mechanism are established, and assuming also that the U.S. achieves meaningful developing country participation, our overall assessment is that the economic cost to the United States in aggregate and to typical households of attaining the targets and timetables specified in the Kyoto Protocol, will be modest.

This conclusion that the impact will be modest is not entirely dependent upon, but is fully consistent with, formal model results. I have previously emphasized the limitations of relying on any single model in assessing the economic impact of the Kyoto Protocol, and continue to view any such results as just one input into an overall analysis. But it is worth emphasizing that model results reflecting the details of the Kyoto Protocol are consistent with our conclusion. For example, under the assumptions of either trading under the umbrella or within Annex I, the CDM and permit trading with developing countries, estimates derived using the SGM model, which adjust for the inclusion of six gases and assume little banking of credits beyond 2012, suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to $7 to $12 billion per year in 2008 to 2012. This implies that overall costs, excluding not only climate and non-climate benefits, but also such cost mitigating factors as sinks and payoffs from the President's electricity restructuring and climate change initiatives, would reach roughly one tenth of one percent of projected GDP in 2010.

A more tangible measure of costs is the estimated effects on energy prices. Excluding the impact of electricity restructuring and the ancillary benefits of mitigation and better forest management, the SGM-based estimate, corresponding to the gross resource cost estimate cited

above, is an emissions price in the range of $14 to $23 per ton of carbon equivalent. This translates into an increase in energy prices between 2008 and 2012 at the household level of between 3 and 5 percent, an increase in fuel oil prices of about 5 to 9 percent, natural gas prices of 3 to 5 percent, gasoline prices of 3 to 4 percent (or around 4 to 6 cents per gallon), and electricity prices of 3 to 4 percent. This increase in energy prices at the household level would raise the average household's energy bill in ten years by between $70 and $110 per year, although such predictions may not be observable because they would be small relative to typical energy price changes, and nearly fully offset by electricity price declines from Federal electricity restructuring. In particular, this increase in energy prices is small relative to the average of *year to year* real energy price changes experienced by U.S. consumers since 1960: such *annual* changes have averaged 3.8 percent. In addition, by 2008-2012, the anticipated 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda is projected to lead to expenditure reductions of about $90 per year for the average household.

As highlighted earlier, there are substantial but unavoidable uncertainties surrounding estimates like these. For example, the estimate just discussed is predicated, among other things, on the developing country participation that we are insisting upon as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol, and on effective international trading. Moreover, other models will yield other answers and much work remains to be done by the modeling community to test the robustness of these results. Preliminary comparisons of the SGM model to the few other models that have attempted to evaluate the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto Protocol on carbon permit prices are neither the most conservative nor the most optimistic of the models that have been developed.

The predictions of the SGM model are robust in the sense that virtually all energy models reveal the potency of effective, flexible, domestic and international trading mechanisms to reduce substantially the cost and energy price impact of meeting the Kyoto targets.

Of course, the most important factor that has been left out of the above assessment is the benefit of mitigating climate change itself. A full cost-benefit analysis would include mitigation in the benefits column. The only reason we have not done so, explained repeatedly above, is the difficulty in coming up with a number to capture the monetary benefits. But nobody should lose sight of our ultimate objective -- keeping our planet the hospitable home that we enjoy today.

Effects on employment and aggregate output

So far we have said nothing about job losses resulting from climate change policy. Although there may be job gains in some sectors and job losses in others, we do not anticipate any significant aggregate employment effect if we achieve the conditions we have discussed. The effects on energy prices described above will occur only 10 to 14 years in the future. Not only are these effects small relative to historical variations in energy prices, and offset by other policies like electricity restructuring, they would occur sufficiently far in the future to enable monetary policy to keep the economy operating at its potential. In energy-intensive sectors some employment reduction could occur, although given the very small predicted change in energy prices, impacts in most such sectors are apt to be minimal. Furthermore, a large number of jobs will be created in other sectors -- many of them high-tech jobs paying high wages. The President is firmly committed to assisting any workers who are adversely affected during the transition to a climate-friendly economy.

VII. Conclusion

In conclusion, the Kyoto Protocol and the President's general approach to climate change reflect the insight of economic analysis. The Kyoto Protocol includes key provisions on international trading and Clean Development projects. The President's approach relies on market incentives -- first, with a system of tax cuts and R&D investments, and then later with a market-based system of tradeable permits -- to ensure that our objectives are achieved as efficiently as possible.

Our overall conclusion is that the economic impact of the Protocol will be modest under the conditions we have identified. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which draws insights from not only the forecasts of individual models, any one of which has its own strengths and limitations, but also a broad variety of additional analyses.

I look forward to continuing to work with members of this Committee, as well as other interested parties, in further analyzing the Kyoto Protocol and evaluating the net effects of reducing greenhouse gas emissions. It is my hope that economic analysis will continue to play a key role in designing policies in this area.

I welcome your questions.

USIS Transcription
12/8/97 11:10am

Remarks by Vice President Al Gore
The United Nations Committee on Climate Change Conference of the Parties
December 8, 1997
Kyoto, Japan

Thank you. Prime Minister Hashimoto and President Figueres, President Kinza Clodumar, other distinguished heads of state, distinguished delegates, ladies and gentlemen.

It is an honor to be here at this historic gathering, in this ancient capital of such beauty and grace. On behalf of President Clinton and the American people, and our U.S. negotiator, Ambassador Stu Eizenstat, I salute our Japanese hosts for their gracious hospitality, and offer a special thank you to Prime Minister Hashimoto, and to our chairs, Minister Ohki, and Ambassador Estrada, for their hard work and leadership.

Since we gathered at the Rio Conference in 1992, both scientific consensus and political will have come a long way. If we pause for a moment and look around us, we can see how extraordinary this gathering really is.

We have reached a fundamentally new stage in the development of human civilization, in which it is necessary to take responsibility for a recent but profound alteration in the relationship between our species and our planet. Because of new technological power and our growing numbers, we now must pay careful attention to the consequences of what we are doing to the Earth - especially to the atmosphere.

There are other parts of the Earth's ecological system that are also threatened by the increasingly harsh impact of thoughtless behavior:

The poisoning of too many places where people -- especially poor people -- live, and the deaths of too many children -- especially poor children -- from polluted water and dirty air.

The dangerous and unsustainable depletion of ocean fisheries. And

The rapid destruction of critical habitats -- rain forests, temperate forests, boreal forests, wetlands, coral reefs, and other precious wellsprings of genetic variety upon which the future of humankind depends.

But the most vulnerable part of the Earth"s environment is the very thin layer of air clinging near to the surface of the planet, that we are now so carelessly filling with gaseous wastes that we are actually altering the relationship between the Earth and the Sun -- by trapping more solar radiation under this growing blanket of pollution that envelops the entire world.

The extra heat which cannot escape is beginning to change the global patterns of climate to which we are accustomed, and to which we have adapted over the last 10,000 years.

Last week we learned from scientists that this year, 1997, with only three weeks remaining, will be the hottest year since records have been kept. Indeed, nine of the ten hottest years since the measurements began have come in the last ten years. The trend is clear. The human consequences -- and the economic costs -- of failing to act are unthinkable. More record floods and droughts. Diseases and pests spreading to new areas. Crop failures and famines. Melting glaciers, stronger storms, and rising seas.

Our fundamental challenge now is to find out whether and how we can change the behaviors that are causing the problem.

To do so requires humility, because the spiritual roots of our crisis are pridefulness and a failure to understand and respect our connections to God's Earth and to each other.

Each of the 160 nations here has brought unique perspectives to the table, but we all understand that our work in Kyoto is only a beginning. Non of the proposals being debated here will solve the problem completely by itself. But if we get off to the right start here, we can quickly build momentum as we learn together how to meet this challenge. Our first step should be to set realistic and achievable, binding emissions limits, which will create new markets for new technologies and new ideas that will, in turn, expand the boundaries of the possible and create new hope. Other steps will then follow. And then, ultimately, we will achieve a safe overall concentration level for greenhouse gases in the Earth's atmosphere.

This is the step-by-step approach we took in Montreal ten years ago to address the problem of ozone depletion. And it is working.

This time, success will require first and foremost that we heal the divisions among us.

The first and most important task for developed countries is to hear the immediate needs of the developing world. And let me say, the United States has listened and we have learned.

We understand that your first priority is to lift your citizens from the poverty so many endure and build strong economies that will assure a better future. This is your right: it will not be denied.

And let me be clear in our answer to you: we do not want to founder on a false divide. Reducing poverty and protecting the Earth's environment are both crucial components of truly sustainable development. We want to forge a lasting partnership to achieve a better future. One key is mobilizing new investment in your countries to ensure that you have higher standards of living, with modern, clean and efficient technologies.

That is what our proposals for emissions trading and joint implementation strive to do.

To our partners in the developed world, let me say we have listened and learned from you as well. We understand that while we share a common goal, each of us faces unique challenges.

You have shown leadership here, and for that we are grateful. We came to Kyoto to find new ways to bridge our differences. In doing so, however, we must not waiver in our resolve. For our part, the United States remains firmly committed to a strong, binding target that will reduce our own emissions by nearly 30 percent from what they would otherwise be -- a commitment as strong, or stronger, than any we have heard here from any country. The imperative here is to do what we promise, rather than to promise what we cannot do.

All of us, must reject the advice of those who ask us to believe there really is no problem at all. We know their arguments: we have heard others like them throughout history. For example, in my country, we remember the tobacco company spokesman who insisted for so long that smoking did no harm. To those who seek to obfuscate and obstruct, we say: we will not allow you to put narrow special interests above the interests of all humankind.

So what does the United States propose we do?

The first measure of any proposal must be its environmental merit, and ours is environmentally solid and sound.

It is strong and comprehensive, covering all six significant greenhouse gases. It recognizes the link between the air and the land, including both sources and sinks. It provides the tools to ensure that targets can be met -- offering emissions trading, joint implementation and research as powerful engines of technology development and transfer. It further reduces

emissions -- below 1990 levels -- in the years 2012 and beyond. It provides the means to ensure that all nations can join us on their own terms in meeting this common challenge.

It is also economically sound. And, with strict monitoring and accountability, it ensures that we will keep our bond with one another.

Whether or not agreement is reached here, we will take concrete steps to help meet this challenge. President Clinton and I understand that out first obligations is to address this issue at home. I commit to you today that the United States is prepared to act -- and will act.

For my part, I have come here to Kyoto because I am both determined and optimistic that we can succeed. I believe that by our coming together in Kyoto we have already achieved a major victory, one both of substance and of spirit. I have no doubt that the process we have started here inevitably will lead to a solution in the days or years ahead.

Some of you have, perhaps, heard from your home capitals that President Clinton and I have been burning up the phone lines, consulting and sharing new ideas. Today let me add this. After talking with our negotiators this morning and after speaking on the telephone from here a short time ago with President Clinton, I am instructing our delegation right now to show increased negotiating flexibility if a comprehensive plan can be put in place, one with realistic targets and timetables, market mechanisms, and the meaningful participation of key developing countries.

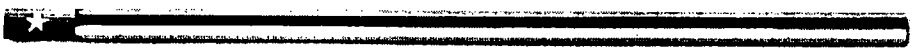
Earlier this century, the Scottish mountain climber, W.H. Murray, wrote:

"Until one is committed there is hesitancy, the chance to draw back, always ineffectiveness. Concerning all acts of initiative. . .there is one elementary truth, the ignorance of which kills countless ideas and splendid plans: that the moment one definitely commits oneself, providence moves, too."

So let us press forward. Let us resolve to conduct ourselves in such a way that our children's children will read about the "Spirit of Kyoto," and remember well the place and the time where humankind first chose to embark together on a long-term sustainable relationship between our civilization and the Earth's environment.

In that spirit, let us transcend our differences and commit to secure our common destiny: a planet whole and healthy, whose nations are at peace, prosperous and free; and whose people everywhere are able to reach for their God-given potential.

Thank you.



To comment on this service,
send feedback to the Web Development Team.

Clinton Presidential Records
Digital Records Marker

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

This marker identifies the place of a publication.

Publications have not been scanned in their entirety for the purpose of digitization. To see the full publication please search online or visit the Clinton Presidential Library's Research Room.

CLIMATE CHANGE

State of Knowledge

Clinton Presidential Records
Digital Records Marker

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

This marker identifies the place of a publication.

Publications have not been scanned in their entirety for the purpose of digitization. To see the full publication please search online or visit the Clinton Presidential Library's Research Room.

GLOBAL CLIMATE CHANGE

AN EAST ROOM ROUNDTABLE

The White House

July 24, 1997

THE WHITE HOUSE
Office of the Press Secretary

For Immediate Release

October 22, 1997

REMARKS BY THE PRESIDENT
ON GLOBAL CLIMATE CHANGE

National Geographic Society
Washington, D.C.

2:57 P.M. EDT

THE PRESIDENT: Thank you very much. Mr. Murphy, Mr. Vice President, to all of you who are here. I thank especially the members of Congress who are here, the leaders of labor and business who are here, all the members of the administration, and especially the White House staff members that the Vice President mentioned and the Secretary of Energy, the Administrator of the EPA, and the others who have helped us to come to this moment.

On the way in here we were met by the leaders of the National Geographic, and I complimented them on their recent two-part series on the Roman Empire. It's a fascinating story of how the Empire rose, how it sustained itself for hundreds of years, why it fell, and speculations on what, if any, relevance it might have to the United States and, indeed, the West.

And one of the gentlemen said, well, you know, we got a lot of interesting comments on that, including a letter referencing a statue we had of the bust of Emperor Vespasian. And one of our readers said, why in the world did you put a statue of Gene Hackman in a piece on the Roman Empire? (Laughter.) And I say that basically to say, in some senses, the more things change, the more they remain the same. (Laughter.)

For what sustains any civilization, and now what will sustain all of our civilizations, is the constant effort at renewal, the ability to avoid denial and to proceed into the future in a way that is realistic and humane, but resolute. Six years ago tomorrow, not long after I started running for President, I went back to my alma mater at Georgetown and began a series of three speeches outlining my vision for America in the 21st century -- how we could keep the American Dream alive for all of our people, how we could maintain America's leadership for peace and freedom and prosperity, and how we could come together across the lines that divide us as one America.

And together, we've made a lot of progress in the last nearly five years now that the Vice President and I have been privileged to work at this task. At the threshold of a new century, our economy is thriving, our social fabric is mending, we've helped to lead the world toward greater peace and cooperation.

I think this has happened, in no small measure, in part because we had a different philosophy about the role of government. Today, it is smaller and more focused and more oriented toward giving people the tools and the conditions they need to solve their own problems and toward working in partnership with our citizens. More important, I believe it's happened because we made tough choices but not false choices.

On the economy, we made the choice to balance the budget and to invest in our people and our future. On crime, we made the choice to be tough and smart about prevention and changing the conditions in which crime occurs. On welfare, we made the choice to require work, but also to support the children of people who have been on welfare. On families, we made the choice to help parents find more and better jobs and to have the necessary time and resources for their children. And on the environment, we made the choice to clean our air, water, and land, to improve our food supply, and to grow the economy.

This kind of commonsense approach, rooted in our most basic values and our enduring optimism about the capacity of free people to meet the challenges of every age must be brought to bear on the work that remains to pave the way for our people and for the world toward a new century and a new millenium.

Today we have a clear responsibility and a golden opportunity to conquer one of the most important challenges of the 21st century -- the challenge of climate change -- with an environmentally sound and economically strong strategy, to achieve meaningful reductions in greenhouse gases in the United States and throughout the industrialized and the developing world. It is a strategy that, if properly implemented, will create a wealth of new opportunities for entrepreneurs at home, uphold our leadership abroad, and harness the power of free markets to free our planet from an unacceptable risk; a strategy as consistent with our commitment to reject false choices.

America can stand up for our national interest and stand up for the common interest of the international community. America can build on prosperity today and ensure a healthy planet for our children tomorrow.

In so many ways the problem of climate change reflects the new realities of the new century. Many previous threats could be met within our own borders, but global warming requires an international solution. Many previous threats came from single enemies, but global warming derives from millions of sources. Many previous threats posed clear and present danger; global warming is far more subtle, warning us not with roaring tanks or burning rivers but with invisible gases, slow changes in our surroundings, increasingly severe climatic disruptions that, thank God, have not yet hit home for most Americans. But make no mistake, the problem is real. And if we do not change our course now, the consequences sooner or later will be destructive for America and for the world.

The vast majority of the world's climate scientists have concluded that if the countries of the world do not work together to cut the emission of greenhouse gases, then temperatures will rise and will disrupt the climate. In fact, most scientists say the process has already begun. Disruptive weather events are increasing. Disease-bearing insects are moving to areas that used to be too cold for them. Average temperatures are rising. Glacial formations are receding.

Scientists don't yet know what the precise consequences will be. But we do know enough now to know that the Industrial Age has dramatically increased greenhouse gases in the

atmosphere, where they take a century or more to dissipate; and that the process must be slowed, then stopped, then reduced if we want to continue our economic progress and preserve the quality of life in the United States and throughout our planet. We know what we have to do.

Greenhouse gas emissions are caused mostly by the inefficient burning of coal or oil for energy. Roughly a third of these emissions come from industry, a third from transportation, a third from residential and commercial buildings. In each case, the conversion of fuel to energy use is extremely inefficient and could be made much cleaner with existing technologies or those already on the horizon, in ways that will not weaken the economy but in fact will add to our strength in new businesses and new jobs. If we do this properly, we will not jeopardize our prosperity -- we will increase it.

With that principle in mind, I'm announcing the instruction I'm giving to our negotiators as they pursue a realistic and effective international climate change treaty. And I'm announcing a far-reaching proposal that provides flexible market-based and cost-effective ways to achieve meaningful reductions here in America. I want to emphasize that we cannot wait until the treaty is negotiated and ratified to act. The United States has less than 5 percent of the world's people, enjoys 22 percent of the world's wealth, but emits more than 25 percent of the world's greenhouse gases. We must begin now to take out our insurance policy on the future.

In the international climate negotiations, the United States will pursue a comprehensive framework that includes three elements, which, taken together, will enable us to build a strong and robust global agreement. First, the United States proposes at Kyoto that we commit to the binding and realistic target of returning to emissions of 1990 levels between 2008 and 2012. And we should not stop there. We should commit to reduce emissions below 1990 levels in the five-year period thereafter, and we must work toward further reductions in the years ahead.

The industrialized nations tried to reduce emissions to 1990 levels once before with a voluntary approach, but regrettably, most of us -- including especially the United States -- fell short. We must find new resolve to achieve these reductions, and to do that we simply must commit to binding limits.

Second, we will embrace flexible mechanisms for meeting these limits. We propose an innovative, joint implementation system that allows a firm in one country to invest in a project that reduces emissions in another country and receive credit for those reductions at home. And we propose an international system of emissions trading. These innovations will cut worldwide pollution, keep costs low, and help developing countries protect their environment, too, without sacrificing their economic growth.

Third, both industrialized and developing countries must participate in meeting the challenge of climate change. The industrialized world must lead, but developing countries also must be engaged. The United States will not assume binding obligations unless key developing nations meaningfully participate in this effort.

As President Carlos Menem stated forcefully last week when I visited him in Argentina, a global problem such as climate change requires a global answer. If the entire industrialized world reduces emissions over the next several decades, but emissions from the developing world continue to grow at their current pace, concentrations of greenhouse gasses in the atmosphere will continue to climb. Developing countries have an opportunity to chart a different energy future consistent with their growth potential and their legitimate economic

aspirations.

What Argentina, with dramatic projected economic growth, recognizes is true for other countries as well: We can and we must work together on this problem in a way that benefits us all. Here at home, we must move forward by unleashing the full power of free markets and technological innovations to meet the challenge of climate change. I propose a sweeping plan to provide incentives and lift road blocks to help our companies and our citizens find new and creative ways of reducing greenhouse gas emissions.

First, we must enact tax cuts and make research and development investments worth up to $5 billion over the next five years -- targeted incentives to encourage energy efficiency and the use of cleaner energy sources.

Second, we must urge companies to take early actions to reduce emissions by ensuring that they receive appropriate credit for showing the way.

Third, we must create a market system for reducing emissions wherever they can be achieved most inexpensively, here or abroad; a system that will draw on our successful experience with acid rain permit trading.

Fourth, we must reinvent how the federal government, the nation's largest energy consumer, buys and uses energy. Through new technology, renewable energy resources, innovative partnerships with private firms and assessments of greenhouse gas emissions from major federal projects, the federal government will play an important role in helping our nation to meet its goal. Today, as a down payment on our million solar roof initiative, I commit the federal government to have 20,000 systems on federal buildings by 2010.

Fifth, we must unleash competition in the electricity industry, to remove outdated regulations and save Americans billions of dollars. We must do it in a way that leads to even greater progress in cleaning our air and delivers a significant down payment in reducing greenhouse gas emissions. Today, two-thirds of the energy used to provide electricity is squandered in waste heat. We can do much, much better.

Sixth, we must continue to encourage key industry sectors to prepare their own greenhouse gas reduction plans. And we must, along with state and local government, remove the barriers to the most energy efficient usage possible. There are ways the federal government can help industry to achieve meaningful reductions voluntarily, and we will redouble our efforts to do so.

This plan is sensible and sound. Since it's a long-term problem requiring a long-term solution, it will be phased in over time. But we want to get moving now. We will start with our package of strong market incentives, tax cuts, and cooperative efforts with industry. We want to stimulate early action and encourage leadership. And as we reduce our emissions over the next decade with these efforts, we will perform regular reviews to see what works best for the environment, the economy, and our national security.

After we have accumulated a decade of experience, a decade of data, a decade of technological innovation, we will launch a broad emissions trading initiative to ensure that we hit our binding targets. At that time, if there are dislocations caused by the changing patterns of energy use in America, we have a moral obligation to respond to those to help the workers and the enterprises affected -- no less than we do today by any change in our economy which affects people through no fault of their own.

This plan plays to our strengths -- innovation, creativity, entrepreneurship. Our companies already are showing the way by developing tremendous environmental technologies and implementing commonsense conservation solutions.

Just yesterday, Secretary Pena announced a dramatic breakthrough in fuel cell technology, funded by the Department of Energy research -- a breakthrough that will clear the way toward developing cars that are twice as efficient as today's models and reduce pollution by 90 percent. The breakthrough was made possible by our path-breaking partnership with the auto industry to create a new generation of vehicles. A different design, producing similar results, has been developed by a project funded by the Defense Advanced Research Products Agency and the Commerce Department's National Institute of Science and Technology.

The Energy Department discovery is amazing in what it does. Today, gasoline is used very inefficiently in internal combustion engines -- about 80 percent of its energy capacity is lost. The DOE project announced yesterday by A.D. Little and Company uses 84 percent of the gasoline directly going into the fuel cell. That's increased efficiency of more than four times traditional engine usage.

And I might add, from the point of view of all the people that are involved in the present system, continuing to use gasoline means that you don't have to change any of the distribution systems that are out there. It's a very important, but by no means the only, discovery that's been made that points the way toward the future we have to embrace.

I also want to emphasize, however, that most of the technologies available for meeting this goal through market mechanisms are already out there -- we simply have to take advantage of them. For example, in the town of West Branch, Iowa, a science teacher named Hector Ibarra challenged his 6th graders to apply their classroom experiments to making their school more energy efficient. The class got a $14,000 loan from a local bank and put in place easily available solutions. The students cut the energy use in their school by 70 percent. Their savings were so impressive that the bank decided to upgrade its own energy efficiency. (Laughter.)

Following the lead of these 6th graders -- (laughter) -- other major companies in America have shown similar results. You have only to look at the proven results achieved by companies like Southwire, Dow Chemical, Dupont, Kraft, Interface Carpetmakers, and any number of others in every sector of our economy to see what can be done.

Our industries have produced a large group of efficient new refrigerators, computers, washer/dryers, and other appliances that use far less energy, save money, and cut pollution. The revolution in lighting alone is truly amazing. One compact fluorescent lamp, used by one person over its lifetime, can save nearly a ton of carbon dioxide emissions from the atmosphere, and save the consumer money.

If over the next 15 years everyone were to buy only those energy-efficient products marked in stores with EPA's distinctive "Energy Star" label, we could shrink our energy bills by a total of about $100 billion over the next 15 years and dramatically cut greenhouse gas emissions.

Despite these win-win innovations and commitments that are emerging literally every day, I know full well that some will criticize our targets and timetables as too ambitious. And, of course, others will say we haven't gone far enough. But before the debate begins in earnest, let's remember that over the past generation, we've produced tremendous environmental

progress, including in the area of energy efficiency, at far less expense than anyone could have imagined. And in the process, whole new industries have been built.

In the past three decades, while our economy has grown, we have raised, not lowered, the standards for the water our children drink. While our factories have been expanding, we have required them to clean up their toxic waste. While we've had record numbers of new homes, our refrigerators save more energy and more money for our consumers.

In 1970, when smog was choking our cities, the federal government proposed new standards for tailpipe emissions. Many environmental leaders claim the standards would do little to head off catastrophe. Industry experts predicted the cost of compliance would

devastate the industry. It turned out both sides were wrong. Both underestimated the ingenuity of the American people. Auto makers comply with today's much stricter emissions standards for far less than half the cost predicted, and new cars emit on average only 5 percent of the pollutants of the cars built in 1970.

We've seen this pattern over and over and over again. We saw it when we joined together in the '70s to restrict the use of the carcinogen, vinyl chloride. Some in the plastics industry predicted massive bankruptcies, but chemists discovered more cost-effective substitutes and the industries thrived. We saw this when we phased out lead and gasoline. And we see it in our acid rain trading program -- now 40 percent ahead of schedule -- at costs less than 50 percent of even the most optimistic cost projections. We see it as the chlorofluorocarbons are being taken out of the atmosphere at virtually no cost in ways that apparently are beginning finally to show some thickening of the ozone layer again.

The lesson here is simple: Environmental initiatives, if sensibly designed, flexibly implemented, cost less than expected and provide unforseen economic opportunities. So while we recognize that the challenge we take on today is larger than any environmental mission we have accepted in the past, climate change can bring us together around what America does best -- we innovate, we compete, we find solutions to problems, and we do it in a way that promotes entrepreneurship and strengthens the American economy.

If we do it right, protecting the climate will yield not costs, but profits; not burdens, but benefits; not sacrifice, but a higher standard of living. There is a huge body of business evidence now showing that energy savings give better service at lower cost with higher profit. We have to tear down barriers to successful markets and we have to create incentives to enter them. I call on American business to lead the way, but I call upon government at every level -- federal, state, and local -- to give business the tools they need to get the job done, and also to set an example in all our operations.

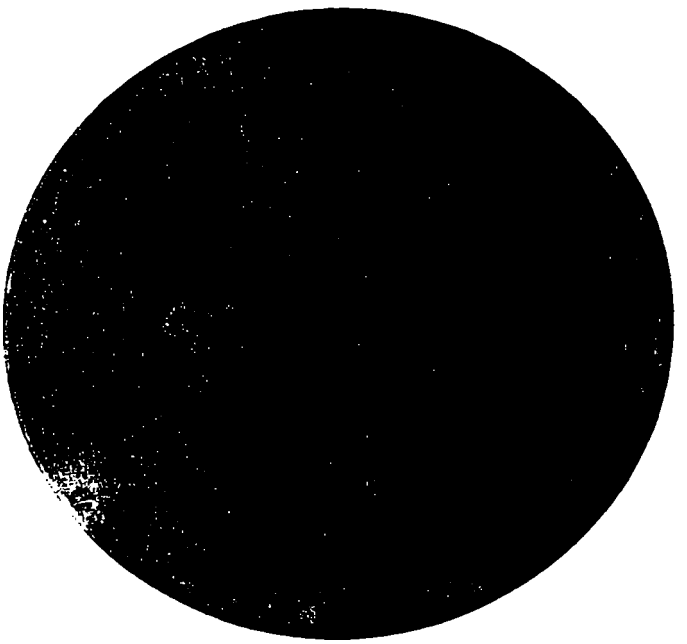
And let us remember that the challenge we face today is not simply about targets and timetables. It's about our most fundamental values and our deepest obligations.

Later today, I'm going to have the honor of meeting with Ecumenical Patriarch Bartholomew I, the spiritual leader of 300,000,000 Orthodox Christians -- a man who has always stressed the deep obligations inherent in God's gift to the natural world. He reminds us that the first part of the word "ecology" derives from the Greek word for house. In his words, in order to change the behavior toward the house we all share, we must rediscover spiritual linkages that may have been lost and reassert human values. Of course, he is right. It is our solemn obligation to move forward with courage and foresight to pass our home on to our children and future generations.

I hope you believe with me that this is just another challenge in America's long history, one that we can meet in the way we have met all past challenges. I hope that you believe with me that the evidence is clear that we can do it in a way that grows the economy, not with denial, but with a firm and glad embrace of yet another challenge of renewal. We should be glad that we are alive today to embrace this challenge, and we should do it secure in the knowledge that our children and grandchildren will thank us for the endeavor.

Thank you very much. (Applause.)

PRESIDENT CLINTON ANNOUNCES THE UNITED STATES CLIMATE CHANGE POLICY



NATIONAL GEOGRAPHIC SOCIETY

GILBERT H. GROSVENOR AUDITORIUM
Washington, D.C.

October 22, 1997

FACT SHEET ON INTERNATIONAL EMISSIONS TRADING

October 22, 1997

Description

The principle of emissions trading is to use the efficiency of the market place to achieve environmental objectives at the lowest possible cost. Under an international emissions trading regime, a country (or firm) would be able to meet its emissions reduction target by reducing pollution itself, purchasing reductions from another country (or firm) that was able to achieve excess gains, or some combination of both.

Given an effective international regime, emissions trading provides a powerful incentive for nations to reduce below the amount required and then sell excess reductions to others who in turn avoid more costly actions. The U.S. has proposed that emissions trading be permitted among all countries that agree to a binding emissions target.

How it would work

Consider a simplified example for how international emissions trading might work. Country A and Country B must reduce emissions by 100 tons each. It might cost each country $1,000 to reduce 100 tons individually for a total cost of $2,000. However, if Country A could reduce its emissions by 200 tons for a total cost of $1,500 and sell half of these reductions to Country B, the overall target would be achieved for $500 less, a savings of 25 percent.

U.S. experience

Emissions trading is being used successfully at the domestic level to reduce sulfur dioxide emissions (which cause acid rain) under the Clean Air Act. Achieving targeted reductions was originally estimated to cost $5 billion annually if traditional controls had been required and $4 billion with emissions trading. A GAO estimate after the initial stage of emissions trading now puts the cost at $2 billion per year, or 60 percent below the original estimate with pollution reductions significantly ahead of schedule. Emissions trading has also been successful in cutting the costs of phasing out leaded gasoline and in curbing the production of chlorofluorocarbons which deplete the ozone layer.

Cost savings

According to the 1997 Economic Report of the President, international emissions trading for carbon dioxide could lower the cost of reductions by 50 percent below the minimum achievable using purely domestic programs.

FACT SHEET ON JOINT IMPLEMENTATION

October 22, 1997

Description

Joint Implementation (JI) is an innovative, market-based approach for addressing global climate change that uses international partnerships to achieve low-cost reductions in greenhouse gas emissions. Under JI, a company in the United States invests in a project which reduces emissions in another country and uses those reductions as a less expensive means of meeting its own target. The U.S. has proposed that a formal regime that gives credit for JI projects be part of a new climate change agreement.

How it would work

Consider the example of a project announced today as part of a pilot program on joint implementation instituted by the United States. Two U.S. companies (Solar Electric Power and Light of Washington, D.C. and Trexler and Associates, Inc of Oak Grove, Illionois) will work with Renewable Energy Services Company of Asia, Ltd. to market and install 812,000 solar home systems in Sri Lanka. These systems will replace the use of kerosene lamps for lighting and the use of diesel-electric charging of lead-acid batteries for powering small home appliances. The result will be a 1.5 million metric ton reduction in greenhouse gas emissions and cleaner energy for tens of thousands of people.

U.S. experience

Under the U.S. pilot program on JI (formed under the existing climate change convention), 28 projects have been approved in 12 countries, including Costa Rica, Bolivia, the Czech Republic, and Russia. These projects span a range of technologies, including solar, geothermal, and wind power; fuel switching for district heating; biomass energy; and reforestation. U.S. companies and organizations already participating include Commonwealth Edison, Wisconsin Electric Power, Kenetech Windpower, Sealweld Corp., American Electric Power, PacificCorp, Detroit Edison, Clean Air Coalition, and many others.

Benefits

Lower costs: JI provides a strong incentive for companies and countries to search the globe for the lowest cost ways of reducing greenhouse gas emissions.

Expanded exports of U.S. technology: The enormous potential for JI projects around the world creates major opportunities for the increased sale of U.S. energy efficiency and alternative energy technologies.

Technology transfer: Increased reliance on more energy efficient technologies and less carbon-intensive energy alternatives will help developing countries meet their growing energy needs with more environmentally sustainable solutions.

FACT SHEET ON ELECTRICITY RESTRUCTURING
October 22, 1997

As part of his climate change initiative, President Clinton announced his support for appropriately crafted electricity restructuring legislation that will save consumers billions of dollars while reducing carbon emissions.

Description

The electricity sector is our nation's most capital intensive industry -- and has sales of over $200 billion. Under electricity restructuring, competition would be the primary mechanism to set electricity generation prices. Utilities would open up their distribution and transmission wires to all qualified sellers. The transmission and distribution of electricity would continue to be regulated because they will remain monopolies for the foreseeable future. The system would be restructured, not deregulated. Done correctly, this process can save consumers in their utility bills and reduce carbon emissions. A properly structured retail competition system can deliver electricity more efficiently, and just as reliably, as our present system of regulated monopolies.

Cost savings

Most experts are confident that restructuring will reduce the cost of electricity, although there is a diversity of views over the potential size of the savings. Because the industry is so large, even modest savings represent billions of dollars. DOE economists estimate potential savings of $20 billion a year, which would mean average direct savings of about $100 a year to a typical family of four and indirect savings to such a family through lower cost goods and services of about another $100 a year. Other studies predict far larger savings.

Carbon reductions

With appropriate market-based provisions, electricity restructuring legislation could reduce carbon emissions by creating incentives to produce and use electricity more efficiently and with less pollution. As emphasized at the White House Conference on Climate Change, two-thirds of the energy used to produce electricity is currently wasted. Restructuring should introduce incentives for reducing this waste heat. Restructuring legislation could also include other provisions -- such as various incentives and mandates to promote energy efficiency and renewable energy -- that offer potential carbon savings.

Next steps

The Administration looks forward to working with interested parties on crafting comprehensive electricity restructuring legislation.

FACT SHEET ON FEDERAL ENERGY MANAGEMENT
October 22, 1997

Aggressive energy management can substantially reduce carbon emissions from the activities of the Federal government, which has the nation's largest energy bill at almost $8 billion per year. Significant strides have already been made --energy consumption per square foot in Federal buildings is down 15 percent and energy use in civilian and military vehicles is down about 27 percent from 1985 levels. However, we can do much more.

The initiatives below will reduce Federal emissions of greenhouse gases through enhanced focus on energy efficiency and renewable energy. They address areas which can deliver the greatest energy savings, best leverage private sector funding and improve the Federal procurement system.

1. Expand Energy Savings Performance Contracting

- Expand use of Energy Savings Performance Contracts. ESPC uses private investment capital and expertise to accomplish energy and cost saving projects in Federal facilities. When a private sector firm which has invested in federal energy efficiency improvements is fully repaid from its share of the delivered savings, all additional savings accrue to the government. Streamlined ESPC contracts put in place by DOD and DOE are beginning to speed large investments in energy projects at Federal facilities. However, use of ESPC's is still limited in the Federal government. The Office of Management and Budget will lead an effort to increase their use. It will include new policy and budget guidance for agencies. ESPC authority can also be extended to other areas including:

- *Leased Federal buildings.* These include buildings where the Government either pays for the energy use directly or in other building where ESPC can provide a better lease for the Government.

- *Federal mobility.* There may be great potential for energy savings from more efficient energy use in aircraft, ships and vehicles.

- *Water conservation.* Water conservation projects save energy because each gallon contains energy from pumping, heating, chilling or treatment.

- *Non-federal facilities* where the Government makes indirect payment of energy expenses. These include, for example, National Guard facilities which the state owns but where the Federal Government covers utility expenses and public housing facilities which are Federally supported but owned by public housing authorities.

- *State and local government facilities.* Federal energy experts can help transfer ESPC techniques to state and local governments so they can access this important approach to energy efficiency.

2. Improve Federal Procurement of Energy Efficient Technology

- *Accelerate the development of Product Energy Efficiency Recommendations.* These cover products that are in the top 25 percent of their class for energy efficiency or have Energy Star ratings, for example electric motors and air conditioning chillers. They provide a guide to Federal purchasers

of the energy efficiency level to request in a specification or procurement.

- *Establish as standard practice, the purchase of energy efficient products for Government use.* Traditionally, federal purchases have been based on lowest price, ignoring the substantial savings many energy efficient products can achieve over their life. The Executive Office of the President will lead an interagency team to streamline and update Executive Orders and procurement practices to encourage the acquisition of these products. Use of alternative contracting vehicles to acquire energy-efficient products will be encouraged, and purchase of products in the top 25 percent of class for energy efficiency or conforming to Energy Star standards will become standard practice, subject to necessary exceptions. The initiative will be augmented by publication of a "best practices" buying guide and expanded training of purchasing decision-makers.

- *Use consolidated purchasing to stimulate markets and lower prices.* Consolidated Federal purchasing can stimulate commercial markets for new and emerging products which offer greater energy efficiency, lower operating costs, and sales opportunities for small businesses that produce these products.

- *Increase Federal procurement of renewable energy.* In states that have implemented retail competition in their electricity industry, Federal facilities will work with their suppliers to ensure that the facilities purchase competitively supplied non-hydro renewable energy at levels equivalent to the percentage specified in that state's retail competition legislation.

- *Report Federal Agencies' Contributions to Reduction of Carbon Emissions.* This initiative will develop an appropriate measurement methodology to convert currently available data on Federal energy use to carbon emissions to aid national carbon reduction efforts.

3. Building for the 21st Century

- *Establish a new level of excellence for Federal building construction and renovation that incorporates energy efficiency, quality, affordability, and sustainability.* By using the latest construction techniques and tapping the knowledge of the building community and local partners, agencies will work to ensure that new Federal buildings achieve energy efficiency increases of 30-50 percent by 2000 as compared to existing facilities. This will be accomplished through a "whole building" approach that treats buildings as integrated systems rather than a series of independent component selections.

- *Deploy solar technologies in Federal buildings.* Show Federal leadership by installing solar photovoltaic and solar thermal systems on 20,000 Federal roofs by 2010 in support of the President's 'Million Solar Roof Initiative'. Utilize alternative financing methods to provide the rapid infusion of investment necessary to support the cost-effective installation of these systems.

- *Expand the use of combined heat and power generation at Federal facilities.* Combined heat and power makes greater use of the waste heat produced in the generation of electricity.

- *Use biomass fuels in Federal boilers.* Biomass would come from agricultural and wood waste and methane from landfill and treatment plant operations.

- *Expand public awareness of energy efficient technologies.* By showcasing energy efficient and

renewable energy technologies at National Parks, Federal offices, embassies, military bases, and other facilities the public will be more aware of their potential to reduce pollution and lower costs.

- *Seek increased resources for civilian agency staffing to expand energy management activities and complete energy efficiency projects.* In recent years, budgets for energy management in several key agencies have been cut by more than 80 percent. These Federal appropriations often provide the most cost-effective funding for Federal energy efficiency projects.

4. Improve Aircraft, Ship, and Heavy Vehicle Fuel Efficiency

- *Public-Private partnerships to improve the energy efficiency of Federal aircraft, ships and vehicles.* Energy use in Federal aircraft, ships and vehicles, predominantly in the military services, is responsible for 43 percent of the $8 billion Federal energy bill. This initiative would improve the energy efficiency of main propulsion systems, with particular emphasis on medium and heavy diesel engines and high performance turbine technology. The initiative -- designed along the lines of the Partnership for a New Generation of Vehicles -- would involve a partnership between Federal agencies and the private sector. Advances under this initiative will have significant application in commercial markets. In addition, the initiative will focus on near-term energy efficiency opportunities such as lighting retrofits on ships.

- *Increase the use of alternative fueled vehicles (AFVs) in the Federal fleet.* Federal agencies are increasing the use of alternative fuel vehicles which, among other things, helps reduce emissions of greenhouse gases. This initiative would enhance the focus of the current program on AFVs such as electrics, hybrid-electrics, natural gas and renewable-fueled vehicles.

5. Greenhouse Gas Assessments

- Federal agencies will be required to assess their greenhouse gas emissions in major actions they undertake.

FACT SHEET ON U.S. GLOBAL CHANGE RESEARCH PROGRAM

October 22, 1997

Background: The U.S. Global Change Research Program (USGCRP) is a National Research Program conducted under the auspices of the National Science and Technology Council (NSTC) Committee on Environment and Natural Resources. The NSTC is a cabinet-level council established by President Clinton in November 1993 to coordinate Federal science and technology efforts. The program's fundamental purpose is to increase understanding of the Earth system, and of human and naturally induced changes in the Earth's environment, and thus provide a sound scientific basis for decision making on global change issues. The USGCRP began as a Presidential Initiative, and was codified by the Global Change Research Act of 1990. The overall FY 1997 USGCRP budget was $1.81 billion.

The core program of the USGCRP is focused on four key scientific areas:

• *Seasonal to Interannual Climate Variability:* The development and refinement of forecasts of seasonal and interannual climate variability, including study and prediction of the El Niño phenomena.

• *Climate Change Over Decades to Centuries:* Analysis and projection of the effects of long-term climate change on natural resources, public health, and socio-economic sectors.

• *Changes in Ozone, UV Radiation, and Atmospheric Chemistry:* Research on the causes, rate, magnitude, and human health and ecological consequences of changes in stratospheric ozone, UV radiation, and atmospheric chemistry.

• *Changes in Land Cover and Terrestrial and Aquatic Ecosystems:* Research on the causes and consequences of land-cover changes, and on basic processes governing the functions and structure of terrestrial, aquatic, and marine ecosystems.

New Research Directions: Global change research is providing the information about the changing Earth system, and in particular, about climate change, that is needed to achieve a sustainable future. New research efforts include:

• *A National Assessment of Climate Change Impacts* to aggregate information across regions and sectors, analyze national-scale consequences, and support development of mitigation and adaptation strategies.

• *Improved Regional-scale Analyses*, including regional estimates of the rate and magnitude of climate change, analyses of the environmental and socio-economic consequences of climate change in the context of other stresses, and integrated assessments of the implications for society and the environment of climate change.

• *Regional Workshops* to examine the vulnerabilities of various regions of the United States to climate change.

FACT SHEET ON PNGV

October 22, 1997

Announced at the White House on September 29, 1993 by President Clinton, Vice President Gore, and the CEOs of the domestic auto makers, the Partnership for a New Generation of Vehicles (PNGV) is a partnership between the U.S. Federal government (7 agencies and 20 federal laboratories) and Chrysler, Ford, and General Motors that aims to strengthen America's competitiveness by developing technologies for a new generation of vehicles. Its programs include research support for over 350 automotive suppliers, universities, and small businesses.

PNGV's long-term goal is to develop production prototypes of an attractive, affordable car that can meet all applicable environmental and safety times and achieve up to three times the fuel efficiency of a comparable automobile sold today. This would mean that a typical midsize car would be able to achieve 80 mpg. The partnership also aims to (i) improve automotive manufacturing, and (ii) introduce efficiency technologies into production vehicles as soon as they are economically justified.

There are numerous reasons for pursuing PNGV, including:

- **Environmental:** Automobiles are a major contributor to atmospheric carbon dioxide, a major greenhouse gas. Already, concentrations of carbon dioxide are 25 percent higher than pre-industrial levels and are expected to double within the next century. Since the number of registered vehicles in the United States is expected to climb from 194 million in 1993, to as many as 270 million in 2010, PNGV's success is critical to any program of controlling US and world greenhouse gas emissions. It will also result in low cost methods for controlling the emissions that contribute to urban air pollution.

- **Reducing U.S. Dependence on Foreign Oil**: The United States currently imports 50 percent of the oil we consume -- this share is expected to grow to more than 60 percent by 2010. Petroleum imports make up ten percent of our country's import inventory and account for a large chunk of the nation's trade deficit. This dependence on foreign oil makes the United States vulnerable.

PNGV Status Report: The industrial partners are now in the process of selecting technologies that will be included in concept vehicles that will be completed by the turn of the century. The federal agencies are working to revise their research priorities to support both technologies that can be incorporated in production prototypes for 2004 and that can be integrated into even more advanced vehicles that would be designed in later years.

The goal of the program, while extremely ambitious, still seems possible given the advances in key technology that have been achieved during the life of the program. These include advances in production of low-cost, light-weight materials for the vehicle body and frame; electrical control systems, batteries; and compact, inexpensive fuel cells -- including the new technology for using gasoline to power fuel cells announced yesterday; and, advanced internal combustion engines for use in hybrid vehicles.

FACT SHEET ON FUEL CELLS
October 22, 1997

THE BREAKTHROUGH: A gasoline-powered technology that would allow you to double the fuel efficiency of a car and emit half the greenhouse gases and virtually no other air pollution. For the first time, gasoline was used to produce electricity from a pollution-free fuel cell, allowing the use of the existing gasoline infrastructure. Previously, fuel cells have been powered by hydrogen or methanol, which are less convenient for use in cars.

The Department of Energy, together with Los Alamos National Laboratory, and A.D. Little, have developed a breakthrough fuel processor, which can extract hydrogen from gasoline and other fuels such as ethanol and natural gas. Last week, this fuel processor was combined with a fuel cell from Plug Power to demonstrate for the first time that a fuel cell electric car could be fueled by gasoline or ethanol. This eliminates the limited driving range and lengthy recharging times associated with electric cars that run on batteries.

WHAT IS A FUEL CELL: The fuel cell converts the chemical energy of a fuel directly into usable electricity and heat without combustion. Fuel cells are similar to batteries in that both produce a direct current by means of an electrochemical process, but fuel cells can operate indefinitely as long as fuel is supplied to them. Fuel cells can provide power for cars and other applications, such as electricity and hot water for buildings.

The Department of Energy working with its partners has brought down the cost of proton exchange membrane (PEM) fuel cells by a factor of twenty in the last ten years. Continued R&D, coupled with the economies of scale from mass production of fuel cells as they enter the marketplace, should allow us to maintain this pace of cost reduction for another decade.

PARTNERSHIP FOR A NEW GENERATION OF VEHICLES (PNGV): The fuel cell breakthrough was accomplished as part of President Clinton's PNGV initiative, an innovative partnership between the government, the national laboratories, the big three automakers, and their suppliers. PNGV's goal is to develop a family-sized vehicle with triple the fuel efficiency of today's cars, without compromising cost or convenience.

POTENTIAL GREENHOUSE GAS REDUCTIONS: One-third of the nation's carbon dioxide emissions comes from the transportation sector, primarily cars. Fuel cell technology alone can directly double fuel efficiency and cut carbon dioxide emissions in half. In combination with other PNGV advances, such as lightweight materials and regenerative breaking, fuel cells will allow a tripling of fuel efficiency and a further reduction in greenhouse gas emissions. Powering the fuel cell with renewable fuels, such as ethanol, could eliminate automotive greenhouse gas emissions entirely in the long run. The buildings sector also generates one-third of the nation's emissions of carbon dioxide. A building that uses the electricity and hot water from a fuel cell fueled by natural gas would have about half of the greenhouse gas emissions of the average building today. Plug Power expects to introduce fuel cells for homes and other buildings in 2000 that will provide electricity for less than the current residential rate. By 2010, fuel cells in buildings could be providing emissions savings of five million metric tons of carbon.

FACT SHEET ON POTENTIAL INDUSTRY SECTOR SAVINGS

October 22, 1997

The industrial sector produces approximately one-third of total U.S. emissions. We can cut emissions substantially in this sector through the right mix of tax incentives, accelerated research and development, electricity restructuring, and environmental regulatory reinvention. According to a recently released report from five of the nation's energy laboratories, programs such as the ones below can reduce emissions in the industrial sector in 2010 by 28 million metric tons even with no increase in energy prices.

Increasing Energy Efficiency: Energy audits encourage systematic approaches to energy efficiency that typically have high yields. Southwire Corporation, a large manufacturer of wire, rod, and cable, cut their use of natural gas by 60 percent and cut electricity use by 40 percent per pound of product produced. Motors consume 70 percent of industrial electricity used, and there is room for improving their efficiency. The Greenville Tube Company, for example, increased productivity by 15 percent, increased energy efficiency by 30 percent, reduced scrap by 15 percent, and achieved $77,000 per year savings -- a 6 month payback -- by improving the efficiency of their motors.

Cogeneration (Combined Heat and Power): New technologies available in the industrial sector will allow us to capture the waste heat the U.S. now throws away. With the right policies, industrial cogeneration of natural gas or biomass could cut annual carbon emission significantly by 2010. Advanced turbines developed by DOE with industry will be available in three years (orders are already being taken). They have an overall efficiency of 80 percent to 90 percent, produce steam together with low-cost electricity and significantly reduce NOx emissions. These turbines can run on natural gas or biomass. Some industries have their own low-cost biomass feedstocks (for example, black liquor gasification in the pulp and paper industry), which makes possible cogeneration with nearly zero carbon emissions.

Expanding Industries of the Future: The seven most energy-intensive industries—steel, aluminum, petroleum refining, chemicals, pulp and paper products, glass, and metal casting—account for about 80 percent of the carbon emissions in U.S. manufacturing and more than 90 percent of the hazardous waste. Industry, partnering with the Department of Energy, has developed long-term visions of energy-efficient, low-polluting, highly competitive "Industries of the Future" as well as technology roadmaps to identify an R&D and deployment pathway to achieving the vision. Visions typically foresee annual energy efficiency improvements of 1.0 percent to 1.5 percent for two decades.

FACT SHEET ON POTENTIAL BUILDINGS SECTOR SAVINGS

October 22, 1997

The buildings sector also produces approximately one-third of total U.S. emissions. There is substantial opportunity to improve the energy efficiency of our buildings and the appliances in them. Many of these technologies improve the quality of service delivered (i.e. higher quality lighting), and have also been documented in a number of cases to improve productivity. According to a recently released report from five of the nation's energy laboratories, programs such as the ones below can reduce emissions in the buildings sector in 2010 by 25 million metric tons even with no increase in energy prices.

Standards: Substantial carbon emissions reductions in 2010 can be achieved through existing authority of the Department of Energy to establish market-oriented efficiency standards for appliances, such as refrigerators and air conditioners. The Department of Energy uses a consensus-based approach in which manufacturers, environmentalists, consumer advocates, and the states work together to develop applicable standards.

Voluntary Programs: Significant carbon reductions in 2010 could also be achieved by expanding voluntary programs such as the joint EPA–DOE Energy Star program. Energy Star labeling has already transformed a number of markets. For example, it has cut the energy used by computers, monitors, and printers by 50 percent at virtually no incremental cost. It is now being extended to dozens of other products.

Adopting Best Electricity Engineering Practices: Electronic equipment consumes electricity in stand-by mode (even when not being used) generating 12 MMTs of carbon emission each year. Preliminary analysis suggests that 80 percent of that could be saved through adopting best engineering practices without reducing service.

Research and Development: Designing buildings with advanced technology can reduce energy consumption by 25 to 50 percent without increasing the building's initial cost. The extra cost of some of the energy-efficient equipment is offset by the smaller required heating and cooling system.

Combined Heat and Power: As in industry, we can reduce the carbon intensity of the buildings sector by accelerating the use of combined heat and power (CHP). Two CHP technologies—small turbines and proton-exchange membrane (PEM) fuel cells—can convert natural gas to useful energy with 80 to 90 percent efficiency, significantly cutting carbon emissions from a building.