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Stack:	Row:	Section:	Shelf:	Position:
S	21	2	3	1

3/17/98

Jay Makes

M

Sci. Comm. in House

cuts of Kyoto Protocol

Disc. with staff bipartisan
couldn't model (only in)
p on different amounts

7 1/2 cut from 1990
if up 20%

Talking with Edwards e. raly.

How high carbon 20% above 1990

Pres. to look over 2010

staff level skepticism

Sched. Labor Day

E Day in Nov.

In 5 weeks due 3 wks.
early when it goes to

A lot of optimism in .9

Re testimony

Sperling's office

2/13/98

Set. Comm asked EIT to do a study.

GAO study too.

~~SECRET~~ COM



Joseph E. Aldy
09/30/97 04:35:50 PM

Record Type: Record

To: Janet L. Yellen/CEA/EOP, Jeffrey A. Frankel/CEA/EOP, Adele C. Morris/CEA/EOP, Randall W. Lutter/CEA/EOP

cc:

Subject: 1996 vs 1990 carbon emissions -- 12% is not correct

I spoke with Arthur Rypinski at EIA today about our confusion regarding the many different estimates of 1990 carbon emissions. Here is the bottom line:

1990 carbon emissions (energy related CO₂): 1344 MMTCE
1990 carbon emissions (total CO₂): 1372 MMTCE

1996 carbon emissions (energy related CO₂): 1463 MMTCE
1996 carbon emissions (total CO₂): 1496 MMTCE

1996 vs 1990 (energy related CO₂): 8.8% higher
1996 vs 1990 (total CO₂): 9.0% higher

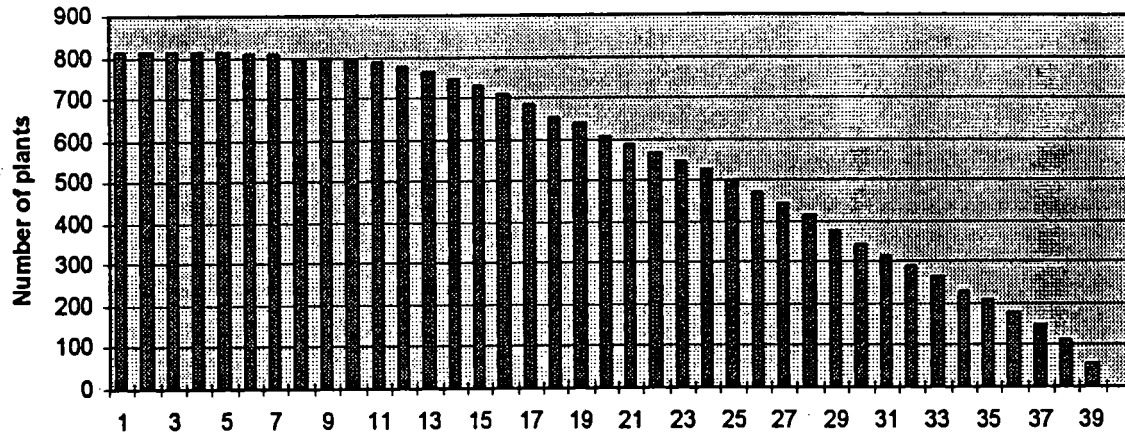
My estimate of 1996 emissions being 12% above 1990 emissions is based on a comparison of total CO₂ carbon emissions with energy related CO₂ carbon emissions. I was wrong.

The 1990 estimate changes basically every year because EIA is constantly refining its methodology and because it finds doublecounting errors -- it then goes back and revises the historical estimates based on these modifications. Note that the non-energy related CO₂ emissions result primarily from cement manufacturing (~10 MMTCE), accounting for all (energy and non-energy) emissions in the U.S. territories (~10 MMTCE), and odds and ends (~10 MMTCE), such as flare gas.

Rypinski said that EIA's numbers are really only precise to about 0.5% (~7-8 MMTCE).

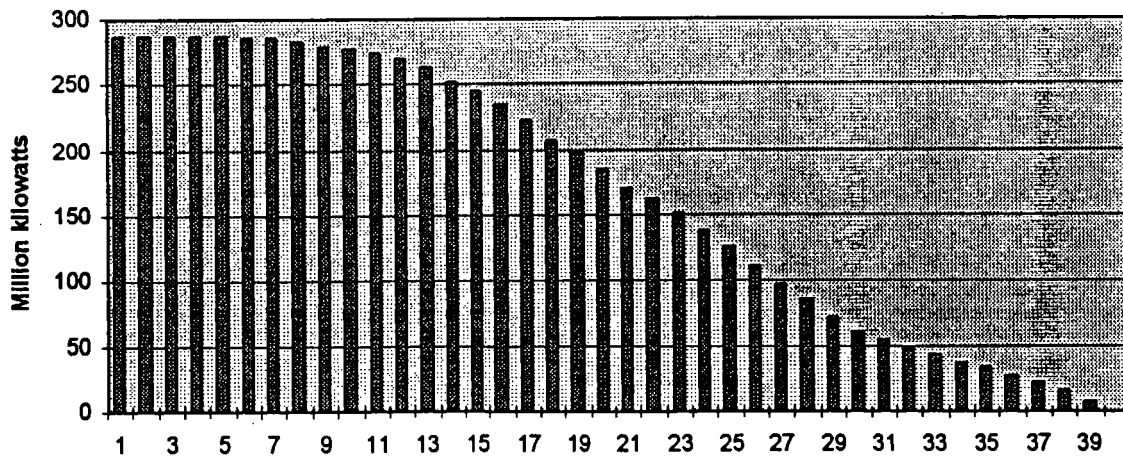
Joe

Figure 2a: Accelerated Replacement of Coal Plants



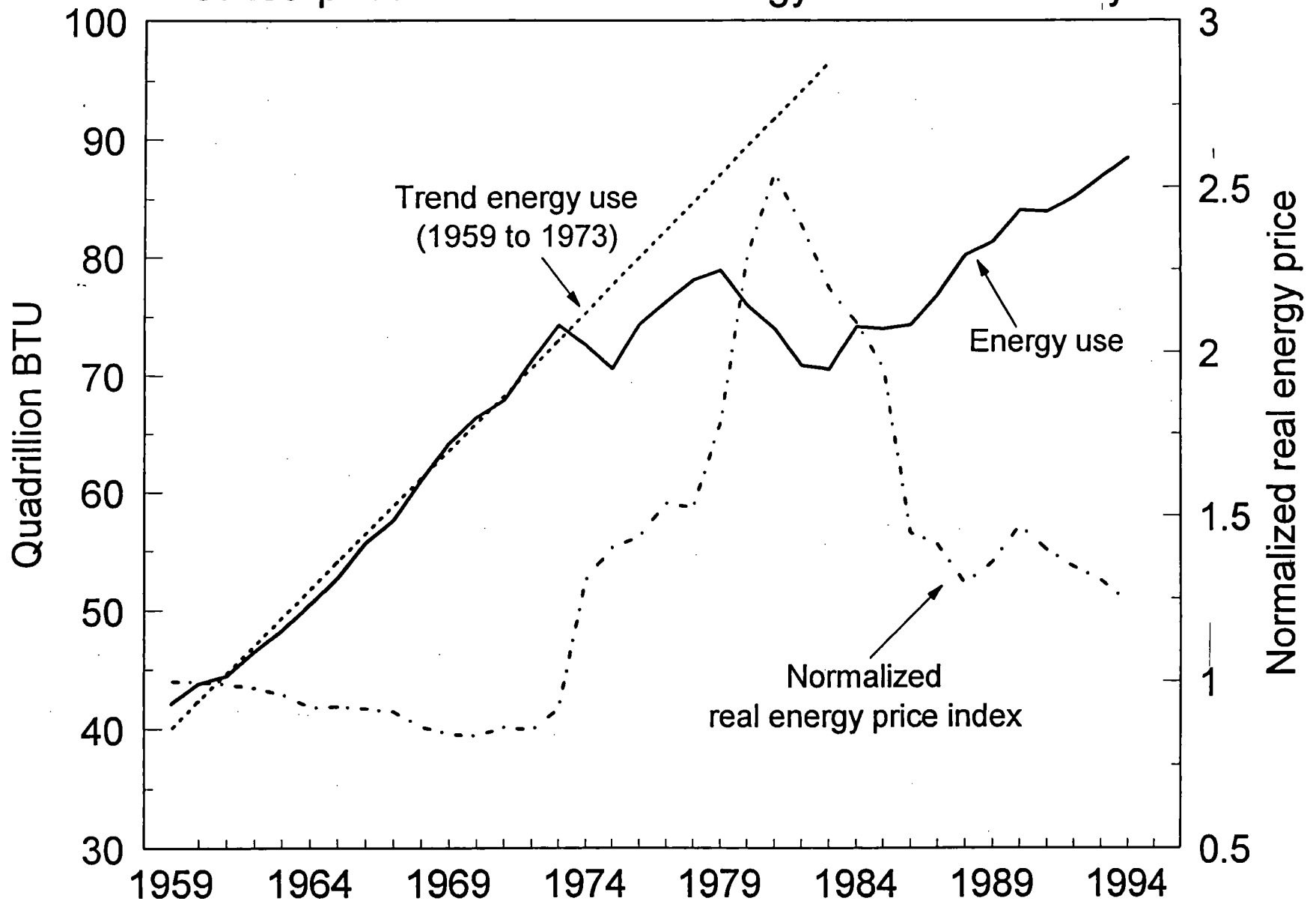
Bar height shows number of plants to replace (beyond normal replacement schedule) If complete change-over occurs within number of years shown on axis

Figure 2b: Accelerated Replacement of Coal Plant Capacity



Bar height shows coal capacity to replace (beyond normal replacement schedule) If complete change-over occurs within number of years shown on axis

Figure 1: Energy Prices and Changes in Energy Use
OPEC price hikes lowered energy use substantially



Total Carbon Emissions

(Million metric tons)

	1990 historical levels	1995 historical levels	% change from 1990	1990 levels at 1995 Share of Emissions	% change from 1990	Maximum of 85-95 Emissions	% change from 1990	year	1990 levels at Maximum of 85-95 Share of Emissions	% change from 1990
Australia	75.2	80.5	7.1%	86.7	15.4%	80.5	7.1%	1995	75.7	0.7%
Austria	15.4	15.1	-1.9%	16.3	5.7%	16.2	5.0%	1991	15.2	-1.4%
Belarus	28.5	16.7	-41.5%	18.0	-37.0%	31.0	8.6%	1988	29.1	2.0%
Belgium & Luxembourg	36.2	37.5	3.7%	40.4	11.6%	37.7	4.1%	1991	35.4	-2.1%
Bulgaria	18.9	15.2	-19.5%	16.4	-13.3%	22.0	16.4%	1986	20.7	9.4%
Canada	119.9	124.3	3.7%	133.8	11.6%	126.2	5.3%	1989	118.6	-1.1%
Czech Republic	43.5	30.6	-29.8%	32.9	-24.4%	49.4	13.4%	1985	46.4	6.6%
Denmark	14.4	16.9	17.1%	18.2	26.0%	17.5	21.6%	1994	16.5	14.3%
Finland	13.6	12.9	-5.5%	13.8	1.7%	14.2	4.5%	1994	13.4	-1.8%
France	107.2	104.0	-3.0%	112.0	4.4%	113.1	5.5%	1991	106.3	-0.9%
Germany	265.7	240.1	-9.6%	258.6	-2.7%	281.7	6.0%	1986	264.7	-0.4%
Greece	20.9	22.7	8.4%	24.4	16.7%	22.7	8.4%	1995	21.3	1.8%
Hungary	18.2	19.7	7.9%	21.2	16.2%	21.0	15.2%	1985	19.7	8.3%
Iceland	0.6	0.8	27.6%	0.8	37.4%	0.8	27.6%	1995	0.7	19.9%
Italy	114.6	105.0	-8.4%	113.0	-1.4%	114.6	0.0%	1990	107.7	-6.0%
Japan	304.9	337.4	10.6%	363.3	19.1%	337.4	10.6%	1995	317.0	4.0%
Netherlands	55.9	60.4	8.0%	65.0	16.3%	60.4	8.0%	1995	56.7	1.5%
New Zealand	7.4	8.0	9.2%	8.7	17.5%	8.0	9.2%	1995	7.6	2.6%
Norway	8.0	8.5	6.6%	9.2	14.8%	8.5	6.6%	1995	8.0	0.2%
Other Europe	38.6	25.8	-33.1%	27.8	-28.0%	57.5	49.2%	1985	54.0	40.2%
Other Former Soviet Union	47.7	14.8	-69.0%	15.9	-66.7%	49.5	3.8%	1985	46.5	-2.5%
Poland	99.1	90.1	-9.1%	97.0	-2.1%	126.9	28.0%	1987	119.2	20.3%
Portugal	11.9	14.7	24.3%	15.9	33.8%	14.7	24.3%	1995	13.9	16.8%
Romania	43.0	33.2	-22.7%	35.8	-16.8%	53.3	24.0%	1989	50.1	16.5%
Russian Federation	603.4	422.6	-30.0%	455.0	-24.6%	616.7	2.2%	1989	579.4	-4.0%
Slovakia	12.9	12.3	-4.0%	13.3	3.4%	14.5	12.4%	1985	13.6	5.6%
Spain	61.7	68.8	11.5%	74.1	20.1%	68.8	11.5%	1995	64.7	4.8%
Sweden	15.9	15.6	-1.8%	16.8	5.7%	18.3	14.8%	1986	17.2	7.8%
Switzerland	11.6	11.1	-4.3%	11.9	3.0%	12.0	3.3%	1992	11.2	-2.9%
Turkey	42.3	48.1	13.8%	51.8	22.6%	49.1	16.3%	1993	46.2	9.2%
Ukraine	193.1	97.4	-49.5%	104.9	-45.7%	193.1	0.0%	1990	181.4	-6.0%
United Kingdom	160.9	153.0	-4.9%	164.7	2.4%	162.9	1.3%	1991	153.1	-4.8%
USA	1,344.2	1,409.4	4.9%	1,517.7	12.9%	1,409.4	4.9%	1995	1,324.2	-1.5%
Total	3,955.3	3,673.1	-7.1%	3,955.3	0.0%	4,209.7	6.4%		3,955.3	0.0%

Sources: U.S. carbon emissions are from EIA. The rest are from BP.

Conversion Table

Tons of carbon/unit fuel

Coal	Oil	Gasoline	Natural Gas
0.649	0.130	0.0027	0.016

Addition to price (dollars)

Carbon Tax	Coal per ton	Oil per barrel	Gasoline per gallon	Natural Gas per 1000 cubic feet
10	6.49	1.30	0.03	0.16
25	16.23	3.25	0.07	0.40
50	32.45	6.50	0.14	0.80
75	48.68	9.75	0.20	1.20
100	64.90	13.00	0.27	1.60
125	81.13	16.25	0.34	2.00
150	97.35	19.50	0.41	2.40
175	113.58	22.75	0.47	2.80
200	129.80	26.00	0.54	3.20
225	146.03	29.25	0.61	3.60
250	162.25	32.50	0.68	4.00

1994 base prices (DoE Annual Energy Review)

Coal per ton	Oil per barrel	Gasoline per gallon	Natural Gas per 1000 cubic feet
19.43	15.59	1.17	1.83

Percentage increase in price

Carbon Tax	Coal per ton	Oil per barrel	Gasoline per gallon	Natural Gas per 1000 cubic feet
10	33%	8%	2%	9%
25	84%	21%	6%	22%
50	167%	42%	12%	44%
75	251%	63%	17%	66%
100	334%	83%	23%	87%
125	418%	104%	29%	109%
150	501%	125%	35%	131%
175	585%	146%	40%	153%
200	668%	167%	46%	175%
225	752%	188%	52%	197%
250	835%	208%	58%	219%

Sources:

Poterba (1991) Global Warming Policy: A Public Finance Perspective, JEP, Fall, 1993, p. 52;
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DoE 1994 Annual Energy Review;

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Table 1 -- Base Case with Annex I Emissions Permit Trading*

Variable of Interest	Option 1 -- 10% below 1990 levels	Option 2 -- 1990 levels by 2010	Option 3 -- 10% above 1990 levels
GDP in 2005	-1.0% to -0.1%	-0.5% to 0.0%	-0.2% to 0.0%
GDP in 2010	about -0.3%	-0.4% to -0.1%	-0.2% to -0.1%
GDP in 2020	-0.3% to +0.2%	about -0.1%	-0.1% to 0.0%
Implied price increase per ton of carbon in 2010	about \$85	about \$50	about \$20
Implied price increase per gallon of gasoline in 2010	about 20-25 cents	about 10-15 cents	about 5 cents
Implied price increase per ton of coal in 2010	about \$50	about \$30	about \$10-15
Implied average price increase for residential electricity in 2010	about 1.5 cents per kwh	about 1 cent per kwh	about 0.5 cents per kwh
Decline in total employment in 2010 (national)	about 200,000	about 50,000- 250,000	about 50,000- 150,000
Decline in overall energy use in 2010			
Increase in renewables (2010)			
Annual value of domestic emission permits (2010)	about \$110 billion	about \$60-70 billion	about \$25-30 billion

* Analysis of Joint Implementation (worldwide emissions trading) would show lower implied price increases, smaller reductions in economic activity, and greater purchases by the U.S. of emissions reductions abroad.

AT

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Table 2 -- Base Case without Emissions Permit Annex I Trading

Variable of Interest	Option 1 -- 10% below 1990 levels	Option 2 -- 1990 levels by 2010	Option 3 -- 10% above 1990 levels
GDP in 2005	-2.0% to -0.1%	-1.0% to -0.1%	-0.5% to 0.0%
GDP in 2010	-0.7% to -0.3%	-0.6% to -0.2%	-0.4% to -0.1%
GDP in 2020	-0.3% to +1.0%	-0.6% to +0.2%	about -0.1%
Implied price increase per ton of carbon in 2010	\$130-200	\$80-140	\$35-50
Implied price increase per gallon of gasoline in 2010	35-50 cents	20-40 cents	10-15 cents
Implied price increase per ton of coal in 2010	\$80-120	\$50-85	\$20-30
Implied average price increase for residential electricity in 2010	about 4 cents per kwh	about 1.5-3.0 cents per kwh	about 1 cent per kwh
Decline in total employment in 2010 (national)	about 200,000- 500,000	about 150,000- 400,000	about 50,000- 250,000
Decline in overall energy use relative to 2010 baseline		10% to 17%	
Increase in renewables (2010)		about 15%	
Annual value of domestic emission permits (2010)	about \$270 billion	about \$110- 190 billion	about \$60-70 billion

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Estimated Implications for Carbon Emissions Abatement by 2020: A Literature Review

Forcing a large number of disparate models into such a simple table as this necessarily does violence to some of them; many issues of comparability and choice of assumptions have been swept under the rug, and modelers might not all agree with how their results are presented. The table is a work in progress. Nevertheless, the range of variation in the results reported here gives an idea of the range of variation in the literature.

	<u>Less Ambitious Goal</u>			<u>Moderate Goal</u>			<u>More Ambitious Goal</u>		
	10% Increase over 1990			1990 Levels			10% Reduction from 1990		
	Lower	Median	Upper	Lower	Median	Upper	Lower	Median	Upper
Base Case: No Internationally Tradable Permits (12 models)									
Change in "Price"									
Carbon (per ton)	\$10	\$50	\$133	\$25	\$82	\$215	\$35	\$139	\$280
Gasoline (per gallon)	\$0.03	\$0.11	\$0.35	\$0.07	\$0.22	\$0.57	\$0.09	\$0.37	\$0.75
Coal (per ton, current price=\$28)	\$7	\$34	\$89	\$17	\$55	\$144	\$23	\$93	\$188
GDP Loss (% in 2020)	0.1%	0.2%	0.5%	0.3%	0.6%	1.3%	0.6%	0.9%	1.8%
Gains Relative to Base Case: Tradable Permits w/ OECD (1 Model)									
"Price" (% decrease)				na	6%	na			
GDP Change (percentage point)				na	na	na			
Gains Relative to Base Case: Tradable Permits w/ World (4 Models)									
"Price" (% decrease)				5%	20%	29%			
GDP Change (percentage point)				0.1%	0.1%	0.3%			
US Transfers** (% of GDP)				-0.2%	-0.7%	-1.7%			

Note: A large class of "bottom-up engineering" models emphasize the existence of energy-saving technologies that could save money if implemented (e.g., "green" light bulbs). An influential 1991 study from O.T.A. showed that emissions could be reduced in this way as much as 25%. Consumer irrationality, poor access to information, or very high discount rates are invoked to explain why these technologies are not currently used more widely. To the extent that specific policies can be implemented to overcome these market imperfections, bottom-up models suggest that some reduction in energy usage could be accomplished without raising the price of energy. The key here, however, is identifying specific policies. Empirical evidence suggests that countries that use energy-saving technology tend to be those with high energy prices (see table and graph on next page).

* Based on the change in the shadow price of carbon. The ultimate market clearing price change will depend on the elasticity of supply and demand.

** Assumes that permits are distributed according to 1990 population shares.

Table 4

Climate and Economic Variables under Alternative Emissions Paths *

		<u>Concentration Level (ppmv)</u>		<u>Year at Which Concentration Reaches 2x Pre-Industrial Level **</u>	<u>Change in Temperature from 1990 Level (Celsius)</u>	
	<u>Year</u>	<u>2050</u>	<u>2100</u>		<u>2050</u>	<u>2100</u>
Business As Usual (BAU)		502	711	2064	1.06	2.36
<i>Deviation from BAU:</i>						
Annex I Participation Only	1990 -10% beginning in 2010	-21	-58	+10	-0.09	-0.25
	1990 beginning in 2010	-17	-53	+8	-0.07	-0.20
	peak in 2015, 1990 in 2040	-13	-52	+7	-0.06	-0.19
	1990 +10% beginning in 2010	-14	-47	+7	-0.07	-0.18
		<u>Carbon Permit Price (\$ per ton)</u>		<u>Consumption *** (billions of \$)</u>		
		<u>Domestic Trading</u>		<u>Annex I Trading</u>		
		<u>2010</u>	<u>2050</u>	<u>2010</u>	<u>2050</u>	
Business As Usual (BAU)		0.00		0.00		121,650
<i>Deviation from BAU:</i>						
Annex I Participation Only	1990 -10% beginning in 2010	+175	+924	+91	+238	-980
	1990 beginning in 2010	+110	+582	+42	+149	-670
	peak in 2015, 1990 in 2040	+12	+563	+11	+153	-270
	1990 +10% beginning in 2010	+60	+310	+17	+113	-460

Summary description

A plan to return carbon emissions to their 1990 levels by 2010 postpones by 8 years the date at which CO₂ concentrations reach twice pre-industrial levels. Global warming would be reduced by 0.20 degrees by the year 2100 versus an estimated 2.36 degrees under BAU. Under this emissions path the value of the estimated foregone consumption is \$670 billion.

A less ambitious path -- "eliminate emissions growth by 2010-2020" -- would postpone the doubling date by 3 years less, and would lead to another 0.01 degrees of warming. But, the economics would become much easier: The value of foregone consumption would be only \$270 billion.

* Preliminary CEA projections. The origin of these preliminary numbers is described on the accompanying page.

** Pre-industrial concentrations of CO₂ were approximately 275 ppmv.

*** Assumes domestic trading only. Annex I or worldwide trading may substantially reduce these costs. Deviations are foregone consumption assuming a 5% discount rate for the time horizon 2000-2050.

September 4, 1997

Sources and Explanations

Sources

Business As Usual (BAU) emissions projections are based on the assumptions employed in the IAT process. These projections incorporate the Annual Energy Outlook and International Energy Outlook projections, and closely mirror the IPCC IS92a emissions profiles with modifications made for the economic decline in the Former Soviet Union and Eastern Europe. BAU concentration and temperature projections are from the MAGICC model. Carbon permit price estimates and foregone consumption figures are from the SGM model. All these results were provided by Jae Edmonds, Marshall Wise, and Chris MacCracken at Battelle, Washington, DC.

Participation Cases

Annex I Participation Only: Assumes full compliance of stated targets and timetables by countries in Annex I; rest of the world behaves as in BAU.

Targets and Timetables

1990 (+/-10%) in 2010: Emissions follow BAU through 2000, reduce to 1990 (+/-10%) levels by 2010, and remain at 1990 levels thereafter.

Peak in 2015, 1990 in 2040: Emissions follow BAU through 2005, peak at 2010 BAU levels in 2015, and stabilize at 1990 levels in 2040 and into the future. Because of linear interpolation in emissions profile between 2015 and 2040, this scenario may slightly overestimate the deviation of concentration from BAU.

Trading Scenarios

Domestic Trading: Trading only within each country.

Annex I Trading: Permits are grandfathered to Annex I nations based on 1990 emissions levels. All Annex I countries participate in the trading of permits.

Price Assumptions

Carbon: U.S. permit prices for the four policy options are from SGM, which assumes that all revenues are returned to the economy through a lump-sum redistribution.

Consumption: Deviations are present discounted value of foregone consumption differences for United States in billions of dollars between BAU and scenarios. The present discounted value assumes a discount rate of 5% and a time horizon of 2000-2050.

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25	16.23	3.25	0.07	0.40
50	32.45	6.50	0.14	0.80
75	48.68	9.75	0.20	1.20
100	64.90	13.00	0.27	1.60
125	81.13	16.25	0.34	2.00
150	97.35	19.50	0.41	2.40
175	113.58	22.75	0.47	2.80
200	129.80	26.00	0.54	3.20
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**The Effects of Emissions Pathway on Consumption Losses by OECD Countries,
550 ppmv Stabilization Goal, EMF-14**

Model	Trading	WRE	WG1	WRE/WG1
CETA	no	1.83	5.94	0.31
CPBRIVM	no	0.64	3.25	0.20
FUND	no	9.82	11.71	0.84
MERGE	no	0.85	6.12	0.14
MiniCAM	no	1.58	6.51	0.24
SGM	no	1.84	6.17	0.30
CETA	yes	1.86	4.03	0.46
CPBRIVM	yes	0.17	0.99	0.17
FUND	yes	1.47	4.97	0.30
MERGE	yes	0.60	3.24	0.19
MiniCAM	yes	0.54	3.44	0.16
SGM	yes	0.13	1.48	0.086
			Average:	0.28

source: Weyant, 1997

**The Effects of Trading on Consumption Losses by OECD Countries,
550 ppmv Stabilization Goal, EMF-14**

Model	Pathway	Trading	No Trading	Trading/No Trading
CETA	WRE	1.86	1.83	1.02
CPBRIVM	WRE	0.17	0.64	0.27
FUND	WRE	1.47	9.82	0.15
MERGE	WRE	0.60	0.85	0.71
MiniCAM	WRE	0.54	1.58	0.34
SGM	WRE	0.13	1.84	0.07

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x511111111

CETA	WGI	4.03	5.94	0.68
CPBRIVM	WGI	0.99	3.25	0.30
FUND	WGI	4.97	11.71	0.42
MERGE	WGI	3.24	6.12	0.53
MiniCAM	WGI	3.44	6.51	0.53
SGM	WGI	1.48	6.17	0.24
			Average:	0.44

source: Weyant, 1997

The modelers in the EMF-14 exercise did not attempt to calculate the least-cost path for achieving concentration stabilization goals.

The least-cost mitigation path, compared to 2010 constraints

Manne and Richels (1997a, 1997b) are believed to be the first researchers to have computed the path that minimizes costs (using the MERGE model), subject to the constraint of stabilizing concentrations at a level such as 550 ppmv.⁷ As the EMF-14 results illustrate, the MERGE model generates results on the costs of concentration stabilization that fall among the middle of the economic models. In their papers, they employ the same international burden-sharing rule as EMF-14.

Their model implies that the least cost mitigation path has emissions from Annex I countries peaking in the decade 2020-2030, a bit behind the WRE path. The peak of Annex I emissions is 29 percent above 1990 levels. [Source: personal communication from Richels, 8/21 and 8/28/97.] Emissions do not return to their 1990 levels until after 2050. Emissions from developing countries peak in 2050. The sum of the two, total worldwide emissions, also peaks in 2050. (By mid-century, developing countries are such an important source of emissions that they dominate the global peaking date and the date of return to 1990 levels.) Worldwide emissions return to their 1990 levels shortly before the end of the 21st century.

This least cost mitigation path generates quite low values for carbon emissions rights after implementation in 2000. The permit price is only \$2/ton in 2010, and rises slowly to \$3/ton in 2020. Only in the latter part of the century does it rise significantly, to \$156/ton in 2100.

⁷ Also Manne and Richels (1995). Kosobud, et al (1994) examine alternative paths to achieve a given temperature target in 2100. All three papers find that a return to 1990 emission levels early in the 21st century is a needlessly costly way to attain the 2100 goals for concentration and climate.

Meanwhile, the non-participation of the developing countries means a clear failure to meet the goal of capping global emissions at 550 ppmv. Even if the Annex I countries choose an aggressive path of reducing emissions 10% below 1990 levels by 2010 (and stay at that level thereafter), the effect is to reduce global concentrations only 7 % below BAU levels in the year 2100. This is less than a third of the reductions achieved when the developing countries participate [22%; conversation 8/28] This result illustrates the problem of free riding. Moreover, the estimate does not include an allowance for "leakage" of carbon savings from participating to non-participating countries (e.g., reduced oil demand in the former, via a lower world price of oil, raises oil consumption in the latter). Once leakage effects are added to the free-riding problem, the difficulty of accomplishing meaningful reductions without the help of developing countries are even greater. The savings is only 5 percent in this case. In other words, of the 22 percent reductions achieved when the developing countries participate, 15 percentage points are lost to free-riding, and another 2 points to carbon leakage. [conversation 8/29.] This estimate captures only one of the possible leakage channels, via the world oil and gas market. It omits, for example, the relocation of production in polluting industries to non-participating countries. Indeed, models do not even attempt to measure this effect, because it is so difficult to do.

**

What if there is no international trading?

It is important to keep in mind that the permit price estimates cited earlier assume perfect global trading. Under this assumption, emission reductions occur where it is cheapest to do so regardless of geographic location. What if there is no opportunity to buy emission reductions from lower-cost countries? The following table shows permit prices in 2010 when Annex I emissions are constrained to 1990 levels under alternative assumptions about where flexibility. If the U.S. must attain its target entirely by domestic emission cuts, because developing countries do not participate and there is not trading even among Annex I countries, then the cost rises steeply. These conditions triple the price of the "1990 by 2010" target, in terms of the marginal cost of abatement, from \$67/ton to \$204.

U.S. Permit Prices in 2010, 1990 Level in 2010 Scenario

MERGE

Where Flexibility	Global Trading	Annex I Only Trading	Domestic Only Trading
Permit Price in 2010 (\$/ton)	67	132	204



Joseph E. Aldy
09/05/97 03:20:03 PM

Record Type: Record

To: Jeffrey A. Frankel/CEA/EOP

cc:

Subject: summary table of some of MERGE outputs

These outputs are from the faxes and phone conversations with Richels.

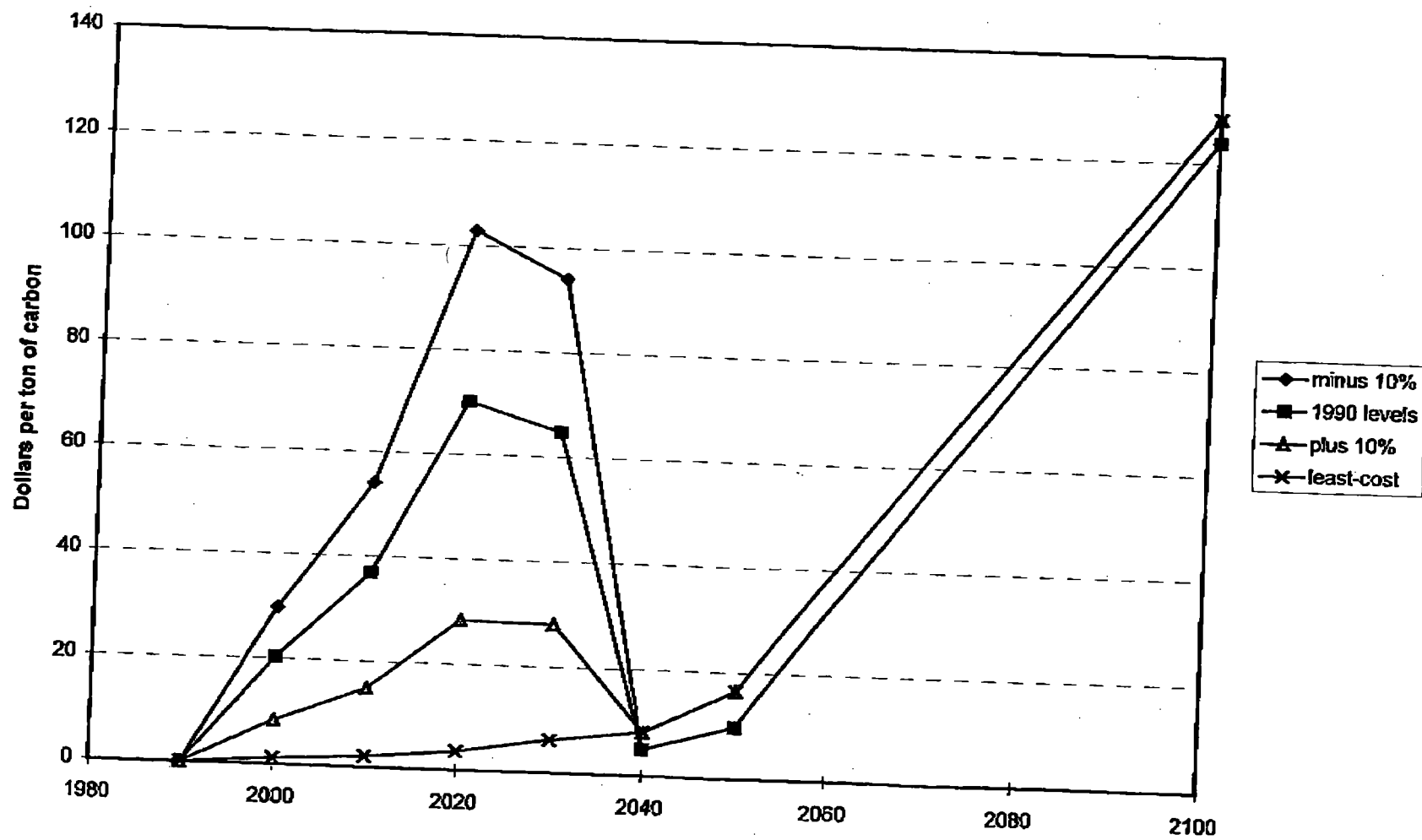


RICHELS2.WK4

	A	B	C	D	E	F
1	Foregone Consumption (trillions\$, 5% discount rate, 1990-2100)					
2	Path	LDC Part.	Where	When	U.S.	Annex I
3	WRE	yes	global	no	0.28	0.62
4	WRE	no	annex I	no	0.36	0.91
5	WRE	no	domestic	no	0.41	1
6	Least Cost	yes	global	yes	0.124	0.282
7	1990 in 2010	yes	global	no	0.303	0.619
8	1990+10%	yes	global	no	0.293	0.564
9	1990-10%	yes	global	no	0.429	1.054
10	WGI	yes	domestic	no		
11	WGI	yes	global	no	1.28	
12						
13	Permit Prices					
14	Path	Where	When	2000	2010	2020
15	Least Cost	global	yes		2	3.4
16	1990 in 2010	domestic	no		204	
17	1990 in 2010	annex I	no		132	
18	1990 in 2010	global	no		67	88
19	1990+10%	global	no		4	65
20	1990-10%	global	no		120	112
21						
22	early runs	Where	When	2000	2010	2020
23	Least Cost	global	yes	1.161	1.998	3.48
24	1990 in 2010	global	yes	20.261	36.834	70.08
25	1990+10%	global	yes	8.247	14.929	28.208
26	1990-10%	global	yes	29.717	54.019	102.839

	G	H	I	J	K
1					
2	World				
3	0.77				
4					
5	1.57				
6	0.556				
7	0.939				
8	0.782				
9	1.276				
10	8.6				
11	3.3				
12					
13					
14	2030	2040	2050	2100	
15	5.9	9.8	20	156	
16					
17					
18				129	
19				129	
20				129	
21					
22	2030	2040	2050	2100	
23	6.126	8.129	16.445	128.394	different from
24	64.772	4.932	9.629	123.829	
25	27.954	8.115	16.447	128.388	
26	94.134	4.925	9.629	123.826	

Figure 3. Value of Carbon Emission Rights



TAXR

Table 4. Value of Carbon Emission Rights in Dollars/Ton

	minus 10	1990 level	plus 10%	least-cost
1990	0	0	0	0
2000	29.717	20.261	8.247	1.161
2010	54.019	36.834	14.929	1.998
2020	102.839	70.08	28.208	3.48
2030	94.134	64.772	27.954	6.126
2040	4.925	4.932	8.115	8.129
2050	9.629	9.629	16.447	16.445
2100	123.826	123.829	128.388	128.394

New Richels results (MERGE)

1. Table 1 shows peak years for emissions and years in which emissions return to 1990 levels for WG1, WRE and least-cost scenario.
2. Table 2 and Figure 1 show Annex 1 carbon emissions for the above three cases and the reference case.
3. Table 3 and Figure 2 shows the global least-cost path for each region.
4. For WG1 case, global emissions rise approximately 8% between 1990 and 2010 while Annex 1 emissions fall approximately 24% over same period.
5. When Annex 1 emissions level off at 10% below 1990 levels by 2010 and Non Annex 1 adheres to their baseline, concentrations decrease by approximately 7% in 2100. In the least-cost 550 case, concentrations decrease by 22% in 2100.
6. Table 4 and Figure 3 show taxes required to meet alternative reductions.
(Annex 1 target maintained 2010-2030, followed by transition to burden-sharing scheme for developing-country participation.)

Figure 1. Annex 1 Carbon Emissions

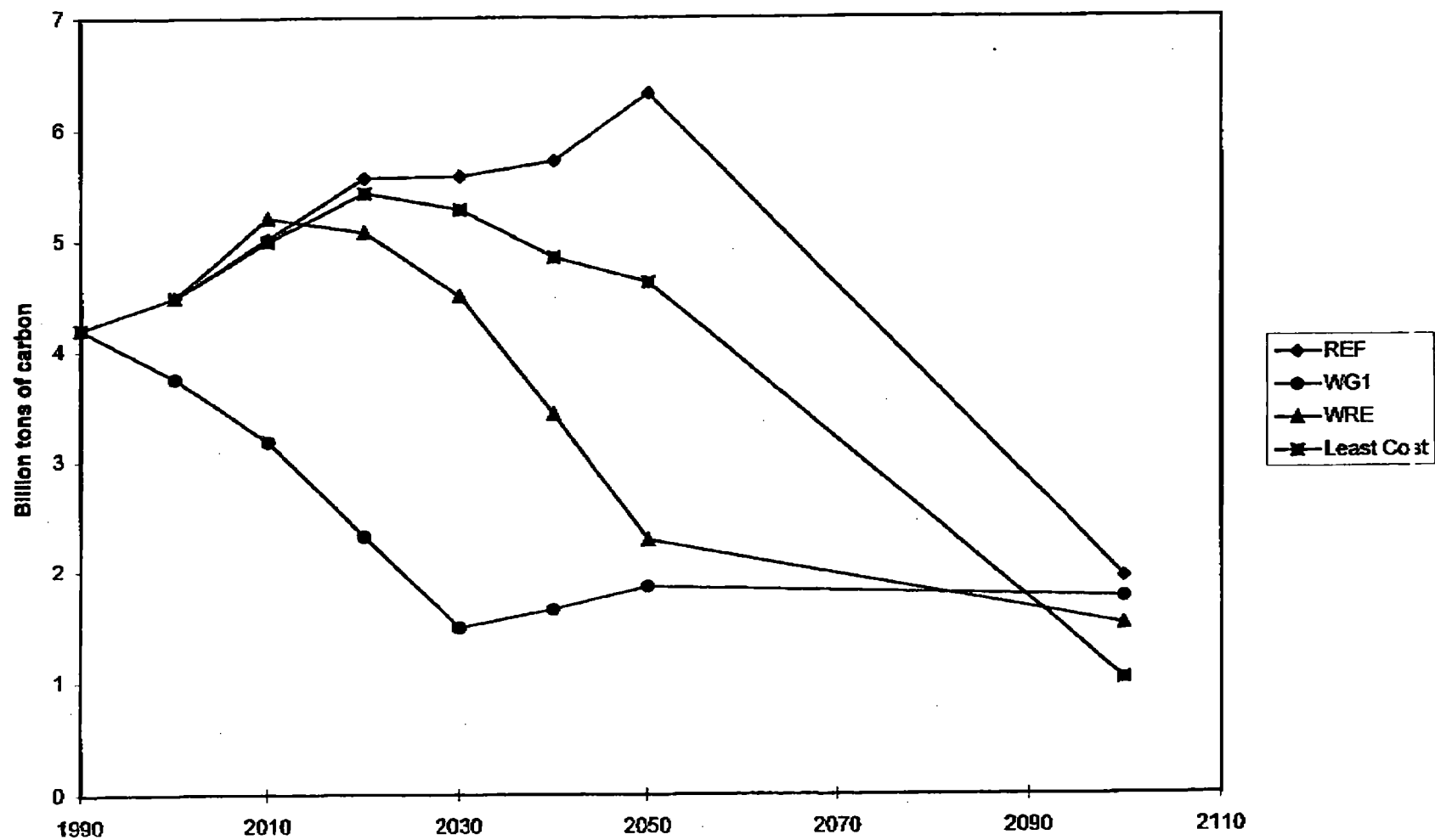


Table1. Peak Years

	WG1	WRE	Least-cost
Annex 1	1990	2010	2020
Non Annex 1	2100	2050	2050
Global	2075	2030	2050
Year return to 1990 levels	post-2100	post-2100	pre-2100 (2090)

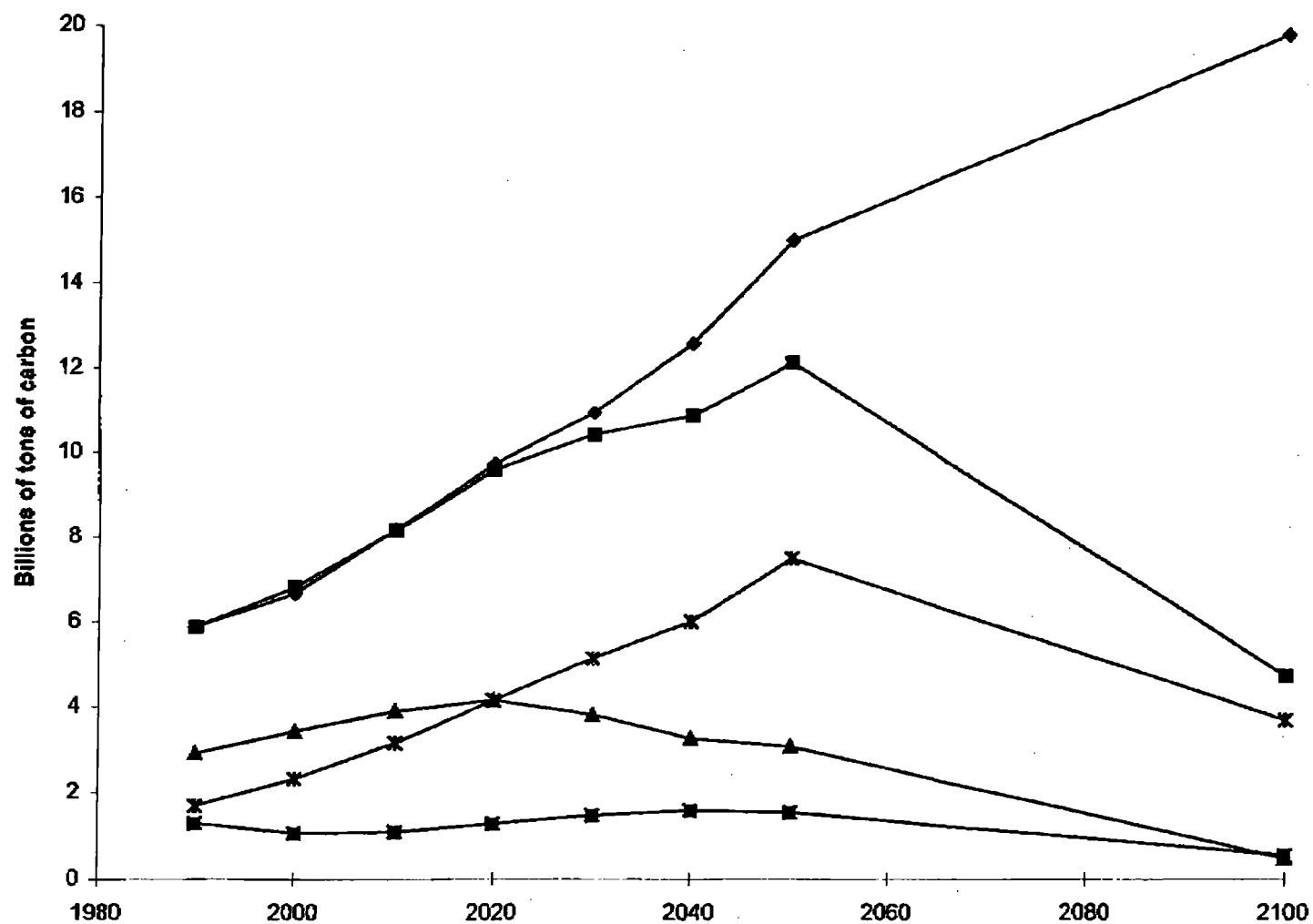
Table 2. Annex 1 carbon emissions in billions of tons

	REF	WG1	WRE	Least Cost
1990	4.196	4.196	4.196	4.196
2000	4.488	3.752	4.488	4.488
2010	5.018	3.177	5.204	4.993
2020	5.563	2.315	5.073	5.429
2030	5.576	1.483	4.496	5.277
2040	5.714	1.649	3.423	4.845
2050	6.321	1.859	2.282	4.622
2100	1.945	1.758	1.509	1.03

Table 3. Carbon Emissions for Least-Cost Mitigation Case in Billions of Tons

	ref	global	OECD	EEFSU	Non Annex 1
1990	5.885	5.885	2.91	1.286	1.689
2000	6.663	6.808	3.425	1.063	2.32
2010	8.164	8.149	3.897	1.096	3.156
2020	9.708	9.572	4.149	1.28	4.143
2030	10.925	10.413	3.811	1.466	5.136
2040	12.558	10.846	3.259	1.586	6.001
2050	14.987	12.111	3.078	1.544	7.489
2100	19.757	4.717	0.478	0.552	3.687

Figure 2. Least-Cost Mitigation Paths



p3 evd

The gain seems small relative to the ~~rest~~ economic cost.

ps bottom

p10 (n) macro shock
(h)

1. 1990 by 2010

2. 1990 by 2020

3. Peak in 2015, 1990 by 2040

4. 1995 by 2010

[illegible]

Oil Prices: 2010, 2025, 2050	Conc. (ppmv) in 2050 (Deviation from BAU)	Conc. (ppmv) in 2100 (Deviation from BAU)	Year Conc. (550 ppmv) Reaches 2x Pre-Ind. Level (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2050 (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2100 (Deviation from BAU)	Emission s Peak, mntce (year)	Year Returns to 1990	Intl. Trade of Permits, 2010, 2050 (mntce)	Date Received Run	File
	502	711	2065	1.06	2.36	no peak: 2245 (2050)	n/a	n/a	08/21/97	aldy/sgmruns/c ea90_~1.xls
	485 (-17)	658 (-53)	2072 (+7)	0.99 (-0.07)	2.16 (-0.20)	1637 (2005)	2010	n/a	08/21/97	aldy/sgmruns/c ea90_~2.xls
	485 (-17)	658 (-53)	2072 (+7)	0.99 (-0.07)	2.16 (-0.20)	no peak: 1714 (2050)	never returns	-202, -364	08/21/97	aldy/sgmruns/c ea90_~2.xls
	485 (-17)	658 (-53)	2072 (+7)	0.99 (-0.07)	2.16 (-0.20)	no peak: 2102 (2050)	never returns	-313, -752	08/21/97	aldy/sgmruns/c ea90_~2.xls
	481 (-21)	648 (-63)	2074 (+9)	0.98 (-0.08)	2.12 (-0.24)	1637 (2005)	never returns	n/a	08/21/97	aldy/sgmruns/c ea95_~1.xls
	481 (-21)	648 (-63)	2074 (+9)	0.98 (-0.08)	2.12 (-0.24)	1637 (200	never returns	36, -122	08/21/97	aldy/sgmruns/c ea95_~1.xls
	481 (-21)	648 (-63)	2074 (+9)	0.98 (-0.08)	2.12 (-0.24)	no peak: 2073 (2050)	never returns	-131, -593	08/21/97	aldy/sgmruns/c ea95_~1.xls
	481 (-21)	653 (-58)	2074 (+9)	0.97 (-0.09)	2.11 (-0.25)	1637 (2005)	2010	n/a	08/21/97	aldy/sgmruns/c ea90m_~1.xls
	481 (-21)	653 (-58)	2074 (+9)	0.97 (-0.09)	2.11 (-0.25)	1637 (2005)	never returns	-180, -332	08/21/97	aldy/sgmruns/c ea90m_~1.xls
	481 (-21)	653 (-58)	2074 (+9)	0.97 (-0.09)	2.11 (-0.25)	no peak: 2060 (2050)	never returns	-332, -845	08/21/97	aldy/sgmruns/c ea90m_~1.xls
	489 (-13)	653 (-58)	2072 (+7)	1.01 (-0.05)	2.15 (-0.21)	1807 (2015)	2040	n/a	08/21/97	aldy/sgmruns/c ea90_~1.xls
	489 (-13)	653 (-58)	2072 (+7)	1.01 (-0.05)	2.15 (-0.21)	1807 (2015)	never returns	0, -367	08/21/97	aldy/sgmruns/c ea90_~1.xls
	489 (-13)	653 (-58)	2072 (+7)	1.01 (-0.05)	2.15 (-0.21)	no peak: 2102 (2050)	never returns	0, -752	08/21/97	aldy/sgmruns/c ea90_~1.xls
	n/a	n/a	n/a	n/a	n/a	no peak: 2066 (2025)	n/a	n/a	08/26/97	aldy/markal~1/ 8_26run1.wk4
	n/a	n/a	n/a	n/a	n/a	1586 (2005)	2010	n/a	08/26/97	aldy/markal~1/ 8_26run1.wk4
	n/a	n/a	n/a	n/a	n/a	1600 (2005)	n/a	n/a	08/26/97	aldy/markal~1/ 8_26run1.wk4
	n/a	n/a	n/a	n/a	n/a	1749 (2010)	2020	n/a	08/26/97	aldy/markal~1/ 8_26run1.wk4
	n/a	n/a	n/a	n/a	n/a	1767 (2015)	2040*			aldy/markal~1/ 8_26run1.wk4

ID	Scenario	Model	Modelers	Target	Timetable	Trading	Permit Allocation	Revenue Recycling	Burden Sharing	BAU Emissions Path Assumption	Paper Tons or Corresponding Reductions	AEEI	Ramp-up	Time Path	Outputs PDV (\$%; 2000-2050) Foregone Consumption	GDP in 2010 (deviation from BAU)
SGM1	BAU	SGM, MAGICC	Battelle	n/a	n/a	n/a	n/a	n/a	n/a	IAT	n/a	1.0	n/a	-->2050, -->2100 (climate)	\$121,650 billion (BAU consumption)	\$9,185 billion (BAU GDP)
SGM9	-10% of 1990 in 2010	SGM, MAGICC	Battelle	-10% 1990 emissions level	stabilize in 2010	Annex I	auction	lump-sum	no LDC part.	IAT	P1	1.0	no	-->2050, -->2100 (climate)	\$485 billion	\$9,155 billion (-\$30 billion)
SGM8	-10% of 1990 in 2010	SGM, MAGICC	Battelle	-10% 1990 emissions level	stabilize in 2010	domestic only	auction	lump-sum	no LDC part.	IAT	P1	1.0	no	-->2050, -->2100 (climate)	\$980 billion	\$9,149 billion (-\$36 billion)
SGM10	-10% of 1990 in 2010	SGM, MAGICC	Battelle	-10% 1990 emissions level	stabilize in 2010	worldwide	auction	lump-sum	no LDC part.	IAT	P1	1.0	no	-->2050, -->2100 (climate)	\$50 billion	\$9,171 billion (-\$14 billion)
SGM18	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	Annex I	auction	lump-sum	LDC stabilizes at 2030 in 2030	IAT	P1	1.0	in 2005	-->2050, -->2100 (climate)	\$255 billion	\$9,172 billion (-\$13 billion)
SGM21	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	Annex I	auction	lump-sum	LDC BAU to 2030, equal per capita in 2050	IAT	P1	1.0	in 2005	-->2050, -->2100 (climate)	\$260 billion	\$9,172 billion (-\$13 billion)
SGM3	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	Annex I	auction	lump-sum	no LDC part.	IAT	P1	1.0	no	-->2050, -->2100 (climate)	\$225 billion	\$9,172 billion (-\$13 billion)
SGM20	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	domestic only	auction	lump-sum	LDC BAU to 2030, equal per capita in 2050	IAT	P1	1.0	in 2005	-->2050, -->2100 (climate)	\$740 billion	\$9,164 billion (-\$21 billion)
SGM17	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	domestic only	auction	lump-sum	LDC stabilizes at 2030 in 2030	IAT	P1	1.0	in 2005	-->2050, -->2100 (climate)	\$740 billion	\$9,164 billion (-\$21 billion)
SGM2	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	domestic only	auction	lump-sum	no LDC part.	IAT	P1	1.0	no	-->2050, -->2100 (climate)	\$665 billion	\$9,165 billion (-\$20 billion)
SGM22	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	worldwide	auction	lump-sum	LDC BAU to 2030, equal per capita in 2050	IAT	P1	1.0	in 2005	-->2050, -->2100 (climate)	\$25 billion	\$9,180 billion (-\$5 billion)
SGM19	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	worldwide	auction	lump-sum	LDC stabilizes at 2030 in 2030	IAT	P1	1.0	in 2005	-->2050, -->2100 (climate)	\$20 billion	\$9,180 billion (-\$5 billion)
SGM4	1990 in 2010	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2010	worldwide	auction	lump-sum	no LDC part.	IAT	P1	1.0	no	-->2050, -->2100 (climate)	\$5 billion	\$9,180 billion (-\$5 billion)

ID	Permit Prices: 2010	Permit Prices: 2025	Permit Prices: 2050	Conc. (ppmv) in 2050 (Deviation from BAU)	Conc. (ppmv) in 2100 (Deviation from BAU)	Year Conc. (550 ppmv) Reaches 2x Pre-Ind. Level (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2050 (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2100 (Deviation from BAU)	Emissions Peak, mmtce (year)	Year Returns to 1990	Intl. Trade of Permits, U.S., 2010 (MMTCE), (\$)	Intl. Trade of Permits, U.S., 2050 (MMTCE), (\$)	Date Received Run	File (h:\jaldy\)
SGM1	\$0	\$0	\$0	502	711	2065	1.06	2.36	no peak: 2245 (2050)	n/a	n/a	n/a	08/21/97	cea90_~1.xls
SGM9	\$91	\$137	\$238	481 (-21)	645 (-66)	2074 (+9)	0.97 (-0.09)	2.11 (-0.25)	1637 (2005)	never returns	-180, (-\$16.4 billion)	-332, (-\$79.0 billion)	08/21/97	cea90m_~1.xls
SGM8	\$175	\$304	\$924	481 (-21)	645 (-66)	2074 (+9)	0.97 (-0.09)	2.11 (-0.25)	1637 (2005)	2010	n/a	n/a	08/21/97	cea90m_~1.xls
SGM10	\$33	\$37	\$45	481 (-21)	645 (-66)	2074 (+9)	0.97 (-0.09)	2.11 (-0.25)	no peak: 2060 (2050)	never returns	-332, (-\$11.0 billion)	-845, (-\$38.0 billion)	08/21/97	cea90m_~1.xls
SGM18	\$39	\$83	\$150	478 (-24)	565 (-146)	2091 (+26)	0.96 (-0.10)	1.82 (-0.54)	no peak: 1712 (2050)	never returns	-209, (-\$8.2 billion)	-362, (-\$54.3 billion)	08/21/97	case2.xls, 9/4/97 fax
SGM21	\$39	\$83	\$150	n/a	n/a	n/a	n/a	n/a	no peak: 1712 (2050)	never returns	-209, (-\$8.2 billion)	-362, (-\$54.3 billion)	08/21/97	case3.xls
SGM3	\$42	\$84	\$149	486 (-16)	655 (-56)	2072 (+7)	0.99 (-0.07)	2.15 (-0.21)	no peak: 1714 (2050)	never returns	-202, (-\$8.5 billion)	-364, (-\$54.2 billion)	08/21/97	cea90_~2.xls
SGM20	\$108	\$188	\$582	n/a	n/a	n/a	n/a	n/a	1550 (2000)	2010	n/a	n/a	08/21/97	case3.xls
SGM17	\$108	\$188	\$582	476 (-26)	564 (-147)	2092 (+27)	0.95 (-0.11)	1.82 (-0.54)	1550 (2000)	2010	n/a	n/a	08/21/97	case2.xls, 9/4/97 fax
SGM2	\$110	\$191	\$582	485 (-17)	658 (-53)	2072 (+7)	0.99 (-0.07)	2.16 (-0.20)	1637 (2005)	2010	n/a	n/a	08/21/97	cea90_~2.xls
SGM22	\$15	\$23	\$0	n/a	n/a	n/a	n/a	n/a	no peak: 2239 (2050)	never returns	n/a	n/a	08/21/97	case3.xls
SGM19	\$15	\$23	\$110	478 (-24)	565 (-146)	2091 (+26)	0.96 (-0.10)	1.82 (-0.54)	1883 (2040)	never returns	-316, (-\$4.7 billion)	-500, (-\$55.0 billion)	08/21/97	case2.xls, 9/4/97 fax
SGM4	\$16	\$23	\$32	486 (-16)	655 (-56)	2072 (+7)	0.99 (-0.07)	2.15 (-0.21)	no peak: 2102 (2050)	never returns	-313, (-\$5.0 billion)	-752, (-\$24.1 billion)	08/21/97	cea90_~2.xls

ID	Scenario	Model	Modelers	Target	Timetable	Trading	Permit Allocation	Revenue Recycling	Burden Sharing	BAU Emissions Path Assumption	Paper Tons or Corresponding Reductions	AEEI	Ramp-up	Time Path	PDV (5%; 2000-2050) Foregone Consumption	GDP in 2010 (deviation from BAU)
SGM36	1990 in 2020	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2020	Annex I	auction	lump-sum	no LDC part.	IAT	PI	1.0	yes	-->2050, -->2100 (climate)	\$195 billion	\$9,179 billion (-\$6 billion)
SGM35	1990 in 2020	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2020	domestic only	auction	lump-sum	no LDC part.	IAT	PI	1.0	yes	-->2050, -->2100 (climate)	\$660 billion	\$9,172 billion (-\$13 billion)
SGM37	1990 in 2020	SGM, MAGICC	Battelle	1990 emissions level	stabilize in 2020	worldwide	auction	lump-sum	no LDC part.	IAT	PI	1.0	yes	-->2050, -->2100 (climate)	-\$1 billion	\$9,183 billion (-\$2 billion)
SGM6	1995 in 2010	SGM, MAGICC	Battelle	1995 emissions level	stabilize in 2010	Annex I	auction	lump-sum	no LDC part.	IAT	CR	1.0	no	-->2050, -->2100 (climate)	\$380 billion	\$9,175 billion (-\$10 billion)
SGM5	1995 in 2010	SGM, MAGICC	Battelle	1995 emissions level	stabilize in 2010	domestic only	auction	lump-sum	no LDC part.	IAT	CR	1.0	no	-->2050, -->2100 (climate)	\$425 billion	\$9,174 billion (-\$11 billion)
SGM7	1995 in 2010	SGM, MAGICC	Battelle	1995 emissions level	stabilize in 2010	worldwide	auction	lump-sum	no LDC part.	IAT	CR	1.0	no	-->2050, -->2100 (climate)	\$30 billion	\$9,179 billion (-\$6 billion)
SGM33	1995 in 2020	SGM, MAGICC	Battelle	1995 emissions level	stabilize in 2020	Annex I	auction	lump-sum	no LDC part.	IAT	CR	1.0	yes	-->2050, -->2100 (climate)	\$410 billion	\$9,176 billion (-\$9 billion)
SGM32	1995 in 2020	SGM, MAGICC	Battelle	1995 emissions level	stabilize in 2020	domestic only	auction	lump-sum	no LDC part.	IAT	CR	1.0	yes	-->2050, -->2100 (climate)	\$445 billion	\$9,176 billion (-\$9 billion)
SGM34	1995 in 2020	SGM, MAGICC	Battelle	1995 emissions level	stabilize in 2020	worldwide	auction	lump-sum	no LDC part.	IAT	CR	1.0	yes	-->2050, -->2100 (climate)	-\$40 billion	\$9,180 billion (-\$5 billion)
SGM27	Peak in 2015	SGM, MAGICC	Battelle	2010 BAU emissions in 2015; 1990 level in 2040	stabilize in 2040	Annex I	auction	lump-sum	LDC BAU to 2030, equal per capita in 2050	IAT	PI	1.0	in 2005	-->2050, -->2100 (climate)	\$75 billion	\$9,185 billion (0 billion)
SGM24	Peak in 2015	SGM, MAGICC	Battelle	2010 BAU emissions in 2015; 1990 level in 2040	stabilize in 2040	Annex I	auction	lump-sum	LDC stabilizes at 2030 in 2030	IAT	PI	1.0	in 2005	-->2050, -->2100 (climate)	\$75 billion	\$9,185 billion (0 billion)
SGM12	Peak in 2015	SGM, MAGICC	Battelle	2010 BAU emissions in 2015; 1990 level in 2040	stabilize in 2040	Annex I	auction	lump-sum	no LDC part.	IAT	PI	1.0	no	-->2050, -->2100 (climate)	\$55 billion	\$9,185 billion (\$0 billion)
SGM30	Peak in 2015	SGM, MAGICC	Battelle	2010 BAU emissions in 2015; 1990 level in 2040	stabilize in 2040	Annex I	auction	lump-sum	no LDC part.	IAT	PI	1.0	in 2005	-->2050, -->2100 (climate)	\$75 billion	\$9,185 billion (0 billion)
SGM11	Peak in 2015	SGM, MAGICC	Battelle	2010 BAU emissions in 2015; 1990 level in 2040	stabilize in 2040	domestic only	auction	lump-sum	no LDC part.	IAT	PI	1.0	no	-->2050, -->2100 (climate)	\$235 billion	\$9,185 billion (\$0 billion)

ID	Permit Prices: 2010	Permit Prices: 2025	Permit Prices: 2050	Conc. (ppmv) in 2050 (Deviation from BAU)	Conc. (ppmv) in 2100 (Deviation from BAU)	Year Conc. (550 ppmv) Reaches 2x Pre-Ind. Level (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2050 (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2100 (Deviation from BAU)	Emissions Peak, mmtce (year)	Year Returns to 1990	Intl. Trade of Permits, U.S., 2010 (MMTCE), (\$)	Intl. Trade of Permits, U.S., 2050 (MMTCE), (\$)	Date Received Run	File (h:\jaldy)
SGM36	\$23	\$86	\$150	486 (-16)	656 (-55)	2072 (+7)	0.99 (-0.07)	2.16 (-0.20)	no peak: 1714 (2050)	n/a	-180 (-\$4.14 billion)	-364 (-\$54.6 billion)	09/10/97	case20~1.xls
SGM35	\$71	\$192	\$582	484 (-18)	656 (-55)	2073 (+8)	0.98 (-0.08)	2.15 (-0.21)	1550 (2000)	2020	n/a	n/a	09/10/97	case20~1.xls
SGM37	\$9	\$24	\$33	486 (-16)	656 (-55)	2072 (+7)	0.99 (-0.07)	2.16 (-0.20)	no peak: 2101 (2050)	n/a	-246 (-\$2.21 billion)	-751 (-\$24.78 billion)	09/10/97	case20~1.xls
SGM6	\$74	\$119	\$202	483 (-19)	648 (-63)	2074 (+9)	0.98 (-0.08)	2.12 (-0.24)	1637 (2005)	never returns	36, (+\$2.7 billion)	-122, (-\$24.6 billion)	08/21/97	cea95_~1.xls
SGM5	\$62	\$131	\$317	483 (-19)	648 (-63)	2074 (+9)	0.98 (-0.08)	2.12 (-0.24)	1637 (2005)	never returns	n/a	n/a	08/21/97	cea95_~1.xls
SGM7	\$27	\$32	\$41	483 (-19)	648 (-63)	2074 (+9)	0.98 (-0.08)	2.12 (-0.24)	no peak: 2073 (2050)	never returns	-131, (-\$3.5 billion)	-593, (-\$24.3 billion)	08/21/97	cea95_~1.xls
SGM33	\$57	\$120	\$203	482 (-20)	648 (-63)	2074 (+9)	0.97 (-0.09)	2.12 (-0.24)	no peak: 1599 (2050)	n/a	20 (+\$1.14 billion)	-119, (-\$24.16 billion)	09/10/97	case20~2.xls
SGM32	\$51	\$131	\$318	482 (-20)	648 (-63)	2074 (+9)	0.97 (-0.09)	2.12 (-0.24)	1550 (2000)	n/a	n/a	n/a	09/10/97	case20~2.xls
SGM34	\$21	\$33	\$41	482 (-20)	648 (-63)	2074 (+9)	0.97 (-0.09)	2.12 (-0.24)	no peak: 2072 (2050)	n/a	-122 (-\$2.56 billion)	-592 (-\$24.27 billion)	09/10/97	case20~2.xls
SGM27	\$11	\$56	\$153	n/a	n/a	n/a	n/a	n/a	1755 (2015)	never returns	-5, (-\$0.06 billion)	-367, (-\$56.2 billion)	08/27/97	case5.xls
SGM24	\$11	\$56	\$153	481 (-21)	568 (-143)	2089 (+24)	0.98 (-0.08)	1.84 (-0.52)	1755 (2015)	never returns	-5, (-\$0.06 billion)	-367, (-\$56.2 billion)	08/27/97	case4.xls, 9/4/97 fax
SGM12	\$0	\$47	\$155	491 (-11)	n/a	n/a	1.02 (-0.04)	n/a	1807 (2015)	never returns	0, (n/a)	-367, (-\$56.9 billion)	08/21/97	cea90_~1.xls
SGM30	\$11	\$56	\$153	489 (-13)	658 (-53)	2071 (+6)	1.00 (-0.06)	2.17 (-0.19)	1755 (2015)	never returns	-5, (-\$0.06 billion)	-367, (-\$56.2 billion)	08/27/97	case6.xls, 9/4/97 fax
SGM11	\$0	\$84	\$559	489 (-13)	n/a	n/a	1.01 (-0.05)	n/a	1807 (2015)	2040	n/a	n/a	08/21/97	cea90_~1.xls

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ID	Scenario	Model	Modelers	Target	Timetable	Trading	Permit Allocation	Revenue Recycling	Burden Sharing	BAU Emissions Path Assumption	Paper Tons or Corresponding Reductions	AEEI	Ramp-up	Time Path	PDV (5%; 2000-2050) Foregone Consumption	GDP in 2010 (deviation from BAU)
MM1	BAU	Markal	DOE	n/a	n/a	n/a	n/a	n/a	n/a	IAT	n/a	~1.0	n/a	-->2025	n/a	\$9,205 billion (BAU GDP)
MM2	1990 in 2010	Markal	DOE	1990 emissions level	stabilize in 2010	domestic only	auction	lump-sum	no LDC part.	IAT	n/a	~1.0	n/a	-->2025	n/a	\$9,137 billion (-\$68 billion)
MM3	1995 in 2010	Markal	DOE	1995 emissions level	stabilize in 2010	domestic only	auction	lump-sum	no LDC part.	IAT	n/a	~1.0	n/a	-->2025	n/a	\$9,152 billion (-\$53 billion)
MM4	1990 in 2020	Markal	DOE	1990 emissions level	stabilize in 2020	domestic only	auction	lump-sum	no LDC part.	IAT	n/a	~1.0	n/a	-->2025	n/a	\$9,197 billion (-\$8 billion)
MM5	Peak in 2015	Markal	DOE	2010 BAU emissions in 2015; 1990 level in 2040	stabilize in 2040	domestic only	auction	lump-sum	no LDC part.	IAT	n/a	~1.0	n/a	-->2025	n/a	\$9,201 billion (-\$4 billion)

ID	Permit Prices: 2010	Permit Prices: 2025	Permit Prices: 2050	Conc. (ppmv) in 2050 (Deviation from BAU)	Conc. (ppmv) in 2100 (Deviation from BAU)	Year Conc. (550 ppmv) Reaches 2x Pre-Ind. Level (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2050 (Deviation from BAU)	Change in Temp. (deg. C) from 1990 in 2100 (Deviation from BAU)	Emissions Peak, mmtce (year)	Year Returns to 1990	Intl. Trade of Permits, U.S., 2010 (MMTCE), (\$)	Intl. Trade of Permits, U.S., 2050 (MMTCE), (\$)	Date Received Run	File
MM1	\$0	\$0	n/a	n/a	n/a	n/a	n/a	n/a	no peak: 2066 (2025)	n/a	n/a	n/a	08/26/97	8_26run1.wk4
MM2	\$148	\$192	n/a	n/a	n/a	n/a	n/a	n/a	1586 (2005)	2010	n/a	n/a	08/26/97	8_26run1.wk4
MM3	\$136	\$146	n/a	n/a	n/a	n/a	n/a	n/a	1600 (2005)	n/a	n/a	n/a	08/26/97	8_26run1.wk4
MM4	\$0	\$198	n/a	n/a	n/a	n/a	n/a	n/a	1749 (2010)	2020	n/a	n/a	08/26/97	8_26run1.wk4
MM5	\$0	\$99	n/a	n/a	n/a	n/a	n/a	n/a	1767 (2015)	2040*	n/a	n/a	08/26/97	8_26run1.wk4

p2 end 9/11 Pay Russia, LDCs. "but the remaining ΔP nevertheless substantial"

p9 P1 suggests require much greater increases in the price than in trade of oil shocks

p18-1a "almost utopian scenarios"

p21 Top gains from trading highly uncertain. If Russia gains strongly, trade might not lower, at all.

Aldy scenario #	permit price	----- household level -----					-----end-user level-----				
		ch, en exp household	ch, en exp d(elast)	index	adj for elec restruct	net of elec restruct			index	adj for elec restruct	net of elec restruct
1	148	0.299	0.263	126	4.5	122	0.414	0.365	136	5.5	131
2	171	0.345	0.304	130	4.7	126	0.479	0.421	142	5.8	138
3	48	0.097	0.085	109	3.9	105	0.134	0.118	112	4.5	108
4	43	0.087	0.076	108	3.9	104	0.120	0.106	111	4.5	107
5	26	0.053	0.046	105	3.8	101	0.073	0.064	106	4.3	102
6	36	0.073	0.064	106	3.8	103	0.101	0.089	109	4.4	105
7	20	0.040	0.036	104	3.7	100	0.056	0.049	105	4.3	101
8	19	0.038	0.034	103	3.7	100	0.053	0.047	105	4.2	101
9	10	0.020	0.018	102	3.7	98	0.028	0.025	102	4.2	98
1990 expen				100					100		
ch, expend @\$100/ton		0.202					0.280				

Notes:

1. energy expenditure calculations based on an exercise of 10/97, which calculated that \$100/ton carbon tax implies 76% increase in energy expenditure at primary fuel level, 28% at end-use level, 20.2% at hhld level.

2. Change in energy expenditure calculated by multiplying (residential expenditure on elec, nat gas, fuel oil, and LPG = \$124b in 1993 + expenditure on gasoline = \$100.7b in 1993) by the % change in energy sector expenditure, calculated above for each scenario.

3. Index number reflects per capita energy expenditure.
EIA projects primary energy consumption to grow at 1.0%/yr.
Census Bureau middle series population projection rises at 1.0%/yr until 2010, so per capita energy consumption is flat.
EIA projects energy prices, aggregated over all fuels, to be flat, as calculated in attached spreadsheet.

4. ch en exp d(elast) means change in energy expenditure taking account of price elasticity. Offline calculation indicates for a given expenditure calculated as "ch en exp" price elasticity effect offsets about 12% of the calculated total, averaged across household fuels. Thus, "ch en exp" multiplied by 88% to get "ch en exp d(elast)"

5. elec restructuring savings: 1993 exp, residential sector: \$81 b.
2010 exp = \$81 b x (index of hhld en exp for 2010). Demoninator is 1993 exp on all energy, hhld sector = \$124b
+ \$100b gasoline = \$224b, which is the basis of the base year index = 100. At end-use level, we assume \$20 b/yr savings, growing with index of energy exp growth, out of \$493 b total for all fuels (Stat Abstract Table 919)

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INTERPRETATION OF KYOTO PROTOCOL

U.S.

Kyoto mandates that the U.S. reduces its emissions (through domestic abatement, international trading, and joint implementation) to -7% of its 1990 levels for six categories of gases, net of the effects of certain sinks. Not accounting for carbon sinks, the U.S. may need to abate about 600 MMTCE relative to its 2010 BAU over the 2008-2012 commitment period. The following chart illustrates this target relative to business as usual.

Table 1. U.S. Greenhouse Gas Emissions, 1990/95 Baseline and 2010 BAU (MMTCE)

Gas/Sinks	1990/95 Emissions	-7% of 1990/95	2010 BAU Emissions
CO ₂	1374		1838
CH ₄	181		152
N ₂ O	38		34
HFCs, PFCs, SF ₆	36		91
Kyoto Sinks	n/a		?
Total	1629	1515	2115

Sources: AEO98, 1997 Climate Action Report

Annex I

Most Annex I countries must undertake substantial cuts from their BAU greenhouse gas emissions projection over the 2008-2012 period to comply with their Kyoto targets. Several countries undergoing economic transition will have paper tons available to sell to other countries.

Table 2. Required Greenhouse Gas Emissions Reductions Under Kyoto (MMTCE)

Country/ Region	Kyoto Target	2010 BAU Projection	Required Emissions Cut without Sinks
U.S.	1515	2115	600
EU	940	1217	277
FSU	1313	995	-318 (PT) ¹
EE	511	403	-108 (PT)
Australia	89	110	21
Japan	266	379	113
Canada	129	191	62

¹ PT refers to paper tons.

Source: CEA

Sinks

The Protocol states that the effects of carbon sinks, defined as “direct human-induced land-use change and forestry activities, limited to afforestation, reforestation, and deforestation since 1990, measured as verifiable changes in stocks”, should be used by Annex I countries to meet their commitments. The State Department is working on a legal interpretation of the sinks provision, and the Department of Agriculture will make an estimate of the size of the U.S. sinks in 2010 in the near future. For this analysis, we employ an estimate of U.S. sinks from the 1997 Climate Action Report, and we assume that BAU sinks do not affect the target, but should be considered as “free” tons deducted from the projected BAU for estimating the control costs of meeting the U.S. target. We use estimates of carbon sinks for other countries based on data in National Communications, FAO statistical website, and the IPCC (see appendix for discussion of methodology).

Given the uncertainty in the sinks, we use three measures in our calculations. First, we consider the costs of complying with Kyoto by scoring sinks as 0 for all countries. This presumably makes the target more stringent for most Annex I countries (Australia is a significant exception because of their deforestation rate). Then we consider sinks based on the estimates for land use change and forestry provided in the national communications or in Climate Change 1995 (IPCC, WG-II). Given that the Protocol definition appears to be more constrained than this, we halve the sequestration in each country and assess those values as well. The no sinks and full sinks definitions serve as reasonable bounds, and the half of sinks could lie close to actual sink estimates.

Table 3. Annex I Sinks (MMTCE)

Country/Region	No Sinks	Half of Sinks	Full Sinks
U.S.	0	52	104
EU	0	30	60
Japan	0	13	25
Australia	0	-17	-33
Canada	0	40	80
Former Soviet Union	0	103	205
EE	0	4	8
Total	0	225	449

Sources: national communications, U.S. Climate Action Report 1997, CEA

Note that the sinks could significantly increase paper tons for FSU countries, and could possibly provide Canada with paper tons. Indeed, under the definition of full sinks, paper tons on an Annex I market could total nearly 700 MMTCE, which if sold to other Annex I countries, would account for nearly 80% of all required emissions reductions in the buying countries. Further, in the case where an umbrella trading bloc is formed without EU participation, the paper tons available would exceed the demand for emissions rights (which in the model would result in a \$0 permit price).

THE COSTS OF KYOTO

Domestic Only Abatement

If the U.S. had to meet its Kyoto target exclusively through domestic emissions abatement, the costs would likely be quite high. To provide some context of what Kyoto means, recall that domestic only abatement to get CO₂ to 1990 level in 2010 would cost \$108/ton (SGM: 380 MMTCE of abatement). By including the other gases and net-net sinks in the U.S. position and using the updated carbon dioxide projection in AEO98, our 1990 in 2010 proposal would likely cost about \$148/ton (SGM and EPA cost curves for other gases and expanding sinks: 552 MMTCE of abatement; total abatement cost: \$40.8 billion, 0.4% of GDP).¹ Note that the cost

¹ Dropping sinks entirely, the U.S. 6 gas position with AEO98 data would result in a permit price of \$121/ton.

curves for the other gases can significantly influence the permit price. If the sinks provision in Kyoto results in the U.S. having 48 MMTCE of carbon sequestration credits, then Kyoto will be comparable to the original U.S. position. Sinks that exceed this value would result in Kyoto being less stringent than the Administration's position.

The following chart provides estimates of permit prices and total costs to the U.S. with domestic abatement with several different assumptions about the size of the carbon sinks. Further, we consider the effects of the Administration's electricity restructuring proposal on carbon emissions. The last row provides an estimate of Annex I trading, but it assumes that the abatement cost curves in other countries for all six gases and sinks are the same as their cost curves for carbon dioxide (this assumption biases upward the permit price and the extent the U.S. purchases emissions rights from abroad).

Table 4. U.S. Domestic Only Abatement Costs in 2010 for U.S. to Meet Kyoto Target

sinks	elect. res.	permit price	domestic reductions	domestic abatement TC	permits from abroad	capital transfer	TC to US	TC/ GDP
0	0	\$171	600	\$51.3 b	0	0	\$51.3 b	0.6%
52	0	\$146	548	\$40.0 b	0	0	\$40.0 b	0.4%
52	33	\$130	515	\$33.5 b	0	0	\$33.5 b	0.4%
104	0	\$121	496	\$30.0 b	0	0	\$30.0 b	0.3%
104	33	\$105	463	\$24.3 b	0	0	\$24.3 b	0.3%
0	33	\$155	567	\$43.9 b	0	0	\$43.9 b	0.5%
0*	0	\$48	202	\$4.8 b	398	\$19.1 b	\$24.0 b	0.3%

* Annex I trading

Source: CEA

Annex I Trading

We assess a number of scenarios. In the first set we consider variations of Annex I trading regimes without joint implementation or trading with key developing countries.

Table 5. Annex I Trading, Abatement Costs in 2010 for U.S. to Meet Kyoto Target

case	sinks	permit price	domestic reductions	domestic abatement TC	permits from abroad	capital transfer	TC to US	TC/ GDP
Annex I	none	\$48	281	\$6.7 b	319	\$15.3 b	\$22.0 b	0.2%
Annex I	half	\$26	187	\$2.4 b	361	\$9.4 b	\$11.8 b	0.1 %
Annex I	full	\$11	95	\$0.5 b	401	\$4.4 b	\$4.9 b	0.1%
Umbrella w/o EU	none	\$26	187	\$2.4 b	413	\$10.7 b	\$13.1 b	0.1%
Umbrella w/o EU	half	\$11	95	\$0.5 b	453	\$5.0 b	\$5.5 b	0.1%
Umbrella w/o EU	full	\$0	0	0	496	0	0	0
Umbrella w/o EU, EE	none	\$43	258	\$5.5 b	342	\$14.7 b	\$20.2 b	0.2%
Umbrella w/o EU, EE	half	\$20	157	\$1.6 b	391	\$7.8 b	\$9.4 b	0.1%
Umbrella w/o EU, EE	full	\$5	51	\$0.1 b	445	\$2.2 b	\$2.3 b	0.03%

Source: CEA

International Trading (Annex I plus Developing Countries)

Table 6. Summary Table on U.S. Permit Prices (Total Cost) for Different Sinks and Trading Scenarios

Scenario	No Sinks	Half of Sinks	Full Sinks
Domestic Only	\$171/ ton (\$51.3 b)	\$146/ton (\$40.0 b)	\$121/ton (\$30.0 b)
Annex I	\$48/ton (\$22.1 b)	\$26/ton (\$11.8 b)	\$11/ton (\$4.9 b)
Umbrella w/o EU	\$26/ton (\$13.2 b)	\$11/ton (\$5.5 b)	\$0/ton
Umbrella w/o EU, EE	\$43/ton (\$20.2 b)	\$20/ton (\$9.4 b)	\$5/ton (\$2.4 b)
Annex I + 100% JI (worldwide trading)	\$19/ton (\$10.0 b)	\$12/ton (\$6.0 b)	\$5/ton (\$2.4 b)
Umbrella w/o EU + 100% JI	\$10/ton (\$5.6 b)	\$4/ton (\$2.1 b)	\$0/ton
Umbrella w/o EU, EE + 100% JI	\$14/ton (\$7.6 b)	\$8/ton (\$4.1 b)	\$2/ton (\$1.0 b)
Annex I + Key LDC	\$20/ton (\$10.5 b)	\$12/ton (\$6.0 b)	\$5/ton (\$2.4 b)
Umbrella w/o EU + Key LDC	\$12/ton (\$6.6 b)	\$5/ton (\$2.6)	\$0/ton
Umbrella w/o EU, EE + Key LDC	\$16/ton (\$8.6 b)	\$9/ton (\$4.6 b)	\$2/ton (\$1.0 b)
Annex I + 20% JI	\$36/ton (\$17.5 b)	\$21/ton (\$9.8 b)	\$9/ton (\$4.1 b)
Umbrella w/o EU + 20% JI	\$20/ton (\$10.4 b)	\$9/ton (\$4.6 b)	\$0/ton
Umbrella w/o EU, EE + 20% JI	\$30/ton (\$14.9 b)	\$16/ton (\$7.7 b)	\$4/ton (\$1.9 b)
Annex I + Key LDC + 20% JI in ROW	\$20/ton (\$10.4 b)	\$12/ton (\$6.0 b)	\$5/ton (\$2.4 b)
Umbrella w/o EU + Key LDC + 20% JI in ROW	\$11/ton (\$6.1 b)	\$5/ton (\$2.6)	\$0/ton
Umbrella w/o EU, EE + Key LDC + 20% JI in ROW	\$15/ton (\$8.1 b)	\$9/ton (\$4.6 b)	\$2/ton (\$1.0 b)

Source: CEA

METHODOLOGY

Trading

Abatement Cost Curves in Industrialized Countries: Marginal cost curves in countries derived from SGM for CO₂ hold for all six gases and sinks for all countries except for the United States (this likely overstates costs of abatement under international trading). The U.S. cost curves are derived from SGM outputs for CO₂ and from EPA/OAR for the other gases and sinks. The cost curve for the other gases and sinks ends at \$70/ton -- we assume that no other reductions are available beyond those achievable at that price.

Intergas Trading: Trading is assumed to occur across all gases and sinks based on 100-year global warming potential.

Trading Blocs: We assessed three different industrialized country trading blocs.

- Annex I implies trading between all Annex I countries (note that in model, some small countries, e.g., New Zealand, Norway, Iceland, are not included).
- Umbrella with Eastern Europe implies trading among all Annex I countries except for the EU.
- Umbrella without Eastern Europe implies trading among all Annex I countries except for the EU and Eastern Europe.

Abatement Cost Curves in Developing Countries: Marginal abatement cost curves for developing countries only include opportunities to reduce carbon dioxide released through energy consumption. Given that numerous options for sequestration projects in these countries exist, these curves overestimate the costs of developing country participation.

AEI: All of the SGM derived marginal abatement cost curves are based on model outputs assuming an AEI of 1.0.

Electricity Restructuring: Interagency staff analysis on the Administration's electricity restructuring proposal indicates that carbon reductions resulting from RPS, PBF, and green marketing could range between 13 and 33 MMTCE. For this analysis, we assume the upper end of this range.

Baseline Construction

Carbon Dioxide Emissions: For projections of carbon dioxide, we used the business as usual projections in SGM, with the exception of the U.S., where we employed the more recent AEO98 estimate of 2010 BAU for energy-based CO₂ and the Climate Action Report (U.S. National Communication) projection for non-energy-based CO₂. For the EU, an adjustment was made to the Western Europe value in SGM to reflect the non-participation of Iceland, Norway, Switzerland, and Turkey in the EU bubble. Based on CO₂ emissions estimates from Oak Ridge National Lab, 66.1 MMTCE were deducted from the Western Europe estimate to derive the EU 1990 baseline CO₂ emissions value. For 2010 BAU, 85 MMTCE were deducted (this increase assumes that the four non-participating countries increase their BAU emissions at the same rate as the EU).

Emissions of Other GHG: For projections of the other five categories of greenhouse gases, we used the information provided in the national communications to the Framework Convention on Climate Change.

- Australia: Non-CO₂ GHG comprise 33% of all GHG emissions in 1990. These are assumed to be 25% of all GHG emissions in 2010 based on the trends projected in the U.S. and the EU. The 1990/95 baseline excludes SF₆ and HFCs.
- Austria: For methane and nitrous oxide, 2010 emissions are based on a linear extrapolation from the projected 2000 level using the average annual growth rate over the 1990-2000 period. For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Belgium: For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Canada: For non-CO₂ gases, Canada is assumed to have the same non-CO₂ emissions/total GHG emissions ratio as the US (.17 in 1990/95 and .13 in 2010). Total GHG emissions are then calculated based on historical and projected CO₂ emissions.
- Denmark: For methane and nitrous oxide, 2010 emissions are based on a linear extrapolation from the projected 2005 level using the average annual growth rate over the 2000-2005 period.
- Eastern Europe: For non-CO₂ gases, Eastern European countries are assumed to have the same non-CO₂ emissions/total GHG emissions ratio as the Former Soviet Union (.25 in 1990/95 and .19 in 2010). Total GHG emissions are then calculated based on historical and projected CO₂ emissions.

- Finland: For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Former Soviet Union: Non-CO2 GHG comprise 25% of all GHG emissions in 1990. These are assumed to be 19% of all GHG emissions in 2010 based on the trends projected in the U.S. and the EU. The 1990/95 baseline excludes SF6, PFCs and HFCs.
- France: For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Germany: For methane and nitrous oxide, 2010 emissions are based on a linear extrapolation from the projected 2005 level using the average annual growth rate over the 1990-2005 period. For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Greece: For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Ireland: For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Italy: For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.
- Japan: Non-CO2 GHG comprise 4% of all GHG emissions in 1990. These are assumed to be 3% of all GHG emissions in 2010 based on the trends projected in the U.S. and the EU. The 1990/95 baseline excludes SF6, PFCs, and HFCs.
- Luxembourg: For methane and nitrous oxide, 2010 emissions are based on a linear extrapolation from the projected 2000 level using the average annual growth rate over the 1990-2000 period.
- Portugal: For the three minor gases, estimated emissions for 1995 and 2010 are based on multiplying 1995 GDP times the emissions/GDP(1995) average ratios derived from the Netherlands, Sweden, and the UK.

- Spain: The United Nations has not posted a national communication for Spain on the FCCC webpage. Estimates of the methane and nitrous oxide emissions are based on the average methane/GDP(1995) and nitrous oxide/GDP(1995) ratios for the other 14 EU countries multiplied by Spain's 1995 GDP. Similar calculations were done for the three minor gases, but only based on the average of the Netherlands, Sweden, and the UK's emissions.

Converting to Carbon Equivalence: In all cases where data are provided in tons of gas, or tons of carbon dioxide equivalent, the data were converted to tons of carbon equivalence based on their 100 year time horizon global warming potential (IPCC 1996, p. 121). Some countries aggregated all HFCs into one value (and in some cases, all PFCs into one value). We constructed an HFC weight and a PFC weight based on specific HFC and PFC emissions in the U.S. in 1995. For HFCs, I used the following weight:

$$[2 * \text{GWP}(\text{HFC-134a}) + \text{GWP}(\text{HFC-23})]/3 = 1300$$

HFC-134a was 52% and HFC-23 was 21% of all U.S. HFC emissions in 1995. For PFCs, I used the following weight:

$$[2 * \text{GWP}(\text{CF}_4) + \text{GWP}(\text{C}_6\text{F}_{14})]/3 = 1854$$

CF_4 was about 60% and C_6F_{14} was about 25% of all U.S. PFC emissions in 1995.

Sinks: Sink estimates are subject to significant uncertainty due to ambiguities in the Protocol definition of carbon sinks. The UN webpage provides a data set on carbon sequestration due to land use change and forestry activities. In addition, the compilation and synthesis of national communications document includes projections for some countries. In cases where only 1990 or 2000 data are available, it is assumed that the sequestration will be the same in 2010 for that country. Carbon sink data were available for the following countries: Australia (2000), Austria (1990), Belgium (2010), Bulgaria (2000), Czech Republic (2010), Denmark (2000), Estonia (1990), Finland (2010), France (2000), Germany (2000), Hungary (1990), Ireland (2010), Italy (2000), Japan (2000), Latvia (2000), Liechtenstein (1990), the Netherlands (2010), New Zealand (2010), Norway (2010), Poland (1988), Romania (1989), Russian Federation (1990), Slovakia (2010), Spain (2000), Sweden (2010), Switzerland (2010), United Kingdom (2000), and the U.S. (2010 -- 1997 Climate Action Report).

Given the uncertainties regarding the definition of sinks in the protocol, we are using these estimates without modification. Upon receiving more guidance from State and Agriculture, we may undertake some revisions to appropriately account for the three designated sink categories of afforestation, reforestation, and deforestation.

- EU Bubble Countries: Twelve of the fifteen EU bubble countries provide estimates of carbon sinks for at least some year between 1990 and 2010. The total for these twelve countries was scaled up proportional to the land area under forest cover in the fifteen countries (forest area from FAO statistical webpage).
- Canada: Since Canada has not provided a sinks estimate, we used the sink estimate from Climate Change 1995, Volume II (p. 777). The value of 80 MMTCE is based on the carbon flux estimated during the 1990s for Canada, and reflects sequestration in forest vegetation and forest soils.
- Eastern Europe: All but two countries in Eastern Europe provided carbon sink estimates. Again, we used the scaling procedure employed with the EU to estimate a total for all of Eastern Europe.
- Japan: The national communication estimated removal of carbon through managed forests is approximately 25 MMTCE. The provided data point was not modified for soil sinks, since the communication appears to exclude soils in its sequestration estimate.
- Former Soviet Union: All but two countries of the Former Soviet Union in Annex I provided carbon sink estimates. Again, we used the scaling procedure employed with the EU to estimate a total for all of FSU.
- United States: Three estimates of U.S. sinks in 2010 are used. First, a very conservative estimate of 0 is used simply for the purposes of establishing an upper bound on control costs. Second, 52 MMTCE refers to half of the amount of above ground sequestration and wood in use and landfill sinks estimated in the 1997 Climate Action Report. Third, all of the sequestration in these sink categories is used.

Kyoto Targets: The targets for countries were from the Kyoto Protocol. For the Former Soviet Union, the Russian Federation and Ukraine target of 1990/95 levels was used. For the Eastern Europe region, a target of 1990/95 - 2% was used, because it is roughly the average target for Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia. While several of the Eastern European countries have selected a year or period or years other than 1990 as their base year/period, we continue to use the 1990 SGM estimate for carbon dioxide.

Sources:

IPCC. 1996. Climate Change 1995: The Science of Climate Change. Cambridge, UK: CUP.
First National Communication from Australia
First National Communication from Austria

Second National Communication from Belgium
First National Communication from Denmark
First National Communication from Finland
First National Communication from France
First National Communication from Germany
First National Communication from Greece
First National Communication from Ireland
First National Communication from Italy
First National Communication from Japan
First National Communication from Luxembourg
Second National Communication from the Netherlands
First National Communication from Portugal
First National Communication from the Russian Federation
Second National Communication from Sweden
First National Communication from the United Kingdom
Second National Communication from the United States (Climate Action Report 1997)
Communications from Parties Included in Annex I to the Convention, Addendum
Annual Energy Outlook 1998
Emissions of Greenhouse Gases in the United States 1996
Food and Agriculture Organization Statistical Webpage
Unpublished Cost Curve on Non-CO2 GHG from EPA

Cuts include paper tons				Cuts include paper tons			
	Cut1	Cut2	Cut3		Cut1	Cut2	Cut3
US	600	548	496	US	600	548	496
EU	277	247	218	EU	277	247	218
FSU	-318	-421	-523	FSU	-318	-421	-523
EE	-108	-112	-116	EE	-108	-112	-116
Aus	21	38	54	Aus	21	38	54
Jap	113	100	88	Jap	113	100	88
Can	62	22	-18	Can	62	22	-18
Annex I	647	422	199	Annex I	647	422	199
Umb-EU	370	175	-19	Umb-EU	370	175	-19
Umb-EU,EE	478	287	97	Umb-EU,EE	478	287	97
Emissions Cuts Under Various Sinks and Scenarios							
	No Sink	Sink1	Sink2	Sink3			
US	600	0	52	104			
EU	277	0	30	59			
FSU	-318	0	103	205			
EE	-108	0	4	8			
Aus	21	0	-17	-33			
Jap	113	0	13	25			
Can	62	0	40	80			

US MAC includes non-CO2 gas curves, EEFSU include paper tons in non-CO2															
US						Japan		Aus		Canada		FSU			Umb - EU, EE
emissio	price					emissio	price	emissio	price	emissio	price	emissio	price		emissio price
												215	0	318	0
												318	0	318	0
												318	0	318	0
		10	0	10	0							318	0	318	0
16	4	29	4	45	4	2	4	2	4	2	4	237	4	340	4
25	7	35	7	60	7	4	7	3	7	3	7	255	7	358	7
33	9	36	9	69	9	5	9	3	9	3	9	262	9	365	9
41	11	52	11	93	11	6	11	4	11	4	11	271	11	374	11
67	16	62	16	129	16	9	16	5	16	6	16	294	16	397	16
72	17	63	17	135	17	9	17	6	17	7	17	306	17	409	17
92	21	72	21	164	21	12	21	7	21	8	21	325	21	428	21
99	23	72	23	171	23	12	23	7	23	8	23	321	23	424	23
113	26	72	26	185	26	14	26	8	26	9	26	342	26	445	26
115	26	72	26	187	26	14	26	8	26	10	26	344	26	447	26
140	32	72	32	212	32	17	32	9	32	11	32	359	32	462	32
165	38	72	38	237	38	20	38	10	38	13	38	383	38	486	38
177	41	73	41	250	41	21	41	11	41	13	41	382	41	485	41
234	57	88	57	322	57	28	57	14	57	18	57	432	57	535	57
277	70	91	70	368	70	34	70	16	70	21	70	462	70	565	70
282	72	91	72	373	72	34	72	16	72	22	72	465	72	568	72
330	89	91	89	421	89	41	89	19	89	24	89	494	89	597	89
380	109	91	109	471	109	47	109	22	109	29	109	529	109	632	109
514	173	91	173	605	173										

	Umb - EU			WEur		EEur					EuropeOnly			ANnex I			China
	emissio	price		emissio	price	emissio	price				emissio	price		emissio	price		emissio
	426	0				78	0	108	0		108	0		426	0		
	426	0				108	0	108	0		108	0		426	0		
	426	0				108	0	108	0		108	0		426	0		
	436	0				108	0	108	0		108	0		436	0		
	502	4		9	4	81	4	111	4		120	4		511	4		64
	541	7		15	7	83	7	113	7		128	7		556	7		102
	559	9		19	9	84	9	114	9		133	9		578	9		129
	597	11		23	11	86	11	116	11		139	11		620	11		
	665	16		34	16	89	16	119	16		153	16		699	16		207
	686	17		39	17	90	17	120	17		159	17		725	17		
	742	21		48	21	93	21	123	21		171	21		790	21		
	745	23		48	23	93	23	123	23		171	23		793	23		
	787	26		58	26	96	26	126	26		184	26		845	26		
	792	26		58	26	96	26	126	26		184	26		850	26		304
	841	32		68	32	100	32	130	32		198	32		909	32		343
	900	38		82	38	104	38	134	38		216	38		982	38		386
	915	41		83	41	105	41	135	41		218	41		998	41		409
	1063	57		116	57	116	57	146	57		262	57		1179	57		516
	1159	70		138	70	125	70	155	70		293	70		1297	70		
	1169	72		140	72	126	72	156	72		296	72		1309	72		
	1268	89		160	89	136	89	166	89		326	89		1428	89		
	1381	109		190	109	150	109	180	109		370	109		1571	109		

[illegible]

[illegible]

Umb - EU, Key LDC +2		Umb - EU, EE, Key LDC +20%		A1 + China		A1 + India		A1 + Mexico	
emissions	price	emissions	price	emissions	price	emissions	price	emissions	price
426	0	318	0	426	0	426	0	426	0
426	0	318	0	426	0	426	0	426	0
426	0	318	0	426	0	426	0	426	0
436	0	328	0	436	0	436	0	436	0
581	4	470	4	575	4	519	4	515	4
668	7	555	7	658	7	570	7	562	7
718	9	604	9	707	9	595	9	586	9
925	16	806	16	906	16	728	16	713	16
1181	26	1055	26	1154	26	896	26	873	26
1282	32	1152	32	1252	32	962	32	935	32
1399	38	1265	38	1368	38	1043	38	1012	38
				1407	41	1063	41	1030	41
				1695	57	1264	57	1221	57

S.who

Year	Country	MMTCO2	MMTCE	
2000	Australia	121.9	33.24545	
1990	Austria	-13.3	-3.62727	
2010	Belgium	-2.1	-0.57273	
2000	Bulgaria	-5.8	-1.58182	
	Canada		0	
	Croatia		0	
2010	Czech Rep	-5	-1.36364	
2000	Denmark	-2.6	-0.70909	
1990	Estonia	1.8	0.490909	
2010	Finland	-15	-4.09091	
2000	France	-39	-10.6364	
2000	Germany	-20	-5.45455	
	Greece		0	
1990	Hungary	-4.5	-1.22727	
	Iceland		0	
2010	Ireland	-9.7	-2.64545	
2000	Italy	-46.7	-12.7364	
2000	Japan	-92	-25.0909	
2000	Latvia	-8.9	-2.42727	
1990	Lichtenstein	-0.022	-0.006	
	Lithuania		0	
	Luxembourg		0	
	Monaco		0	
2010	Netherland	-1.7	-0.46364	
2010	New Zealan	-21.2	-5.78182	
2010	Norway	-14.8	-4.03636	
1988	Poland	-1.4	-0.38182	
	Portugal		0	
1989	Romania	-2.9	-0.79091	
1990	Russian Fe	-734	-200.182	
2010	Slovakia	-8	-2.18182	
	Slovenia		0	
2000	Spain	-25.7	-7.00909	
2010	Sweden	-22	-6	
2010	Switzerland	-5.1	-1.39091	
	Ukraine		0	
2000	United King	-9.2	-2.50909	
	USA		0	
	EC15		-56.4545	-59.2773
	FSU		-202.118	-204.948
	EEur		-7.52727	-7.83664
	Australia			33.24545
	Japan			-25.0909
	Canada			-118.508

US									2010 GDP	9185
Required Cut Under Kyoto	Sinks	Elect Res	Scenario	Permit Price (92\$)	Domestic Reductions (MMTCE)	Permits Purchased Abroad	US Abatement Cost	US Capital Outflow	US TC (\$b)	TC/GDP
600	0	0	Dom Only	171	600	0	51.3	0.0	51.3	0.005585
600	52	0	Dom Only	146	548	0	40.0	0.0	40.0	0.004355
600	52	33	Dom Only	130	515	0	33.5	0.0	33.5	0.003645
600	104	33	Dom Only	105	463	0	24.3	0.0	24.3	0.002646
600	0	33	Dom Only	155	567	0	43.9	0.0	43.9	0.004784
497	-55	0	10/97 position	148	552	0	40.8	0.0	40.8	0.004447
600	104	0	Dom Only	121	496	0	30.0	0.0	30.0	0.003267
600	0	0	Annex I	48	281	319	6.7	15.3	22.1	0.002401
600	52	0	Annex I	26	187	361	2.4	9.4	11.8	0.001287
600	104	0	Annex I	11	95	401	0.5	4.4	4.9	0.000537
600	0	0	Umb - EU	26	187	413	2.4	10.7	13.2	0.001434
600	52	0	Umb - EU	11	95	453	0.5	5.0	5.5	0.000599
600	104	0	Umb - EU	0	0	496	0.0	0.0	0.0	0
600	0	0	Umb - EU, EE	43	258	342	5.5	14.7	20.3	0.002205
600	52	0	Umb - EU, EE	20	157	391	1.6	7.8	9.4	0.001022
600	104	0	Umb - EU, EE	5	51	445	0.1	2.2	2.4	0.000256
600	0	0	A1 + JI	19	150	450	1.4	8.6	10.0	0.001086
600	52	0	A1 + JI	12	102	446	0.6	5.4	6.0	0.000649
600	104	0	A1 + JI	5	51	445	0.1	2.2	2.4	0.000256
600	0	0	Umb - EU + JI	10	84	516	0.4	5.2	5.6	0.000608
600	52	0	Umb - EU + JI	4	45	503	0.1	2.0	2.1	0.000229
600	104	0	Umb - EU + JI	0	0	496	0.0	0.0	0.0	0
600	0	0	Umb - EU, EE + JI	14	116	484	0.8	6.8	7.6	0.000826
600	52	0	Umb - EU, EE + JI	8	66	482	0.3	3.9	4.1	0.000449
600	104	0	Umb - EU, EE + JI	2	27	469	0.0	0.9	1.0	0.000105
600	0	0	A1 w/ Key LDC	20	150	450	1.5	9.0	10.5	0.001143
600	52	0	A1 w/ Key LDC	12	102	446	0.6	5.4	6.0	0.000649
600	104	0	A1 w/ Key LDC	5	51	445	0.1	2.2	2.4	0.000256
600	0	0	Umb - EU w/ Key LDC	12	102	498	0.6	6.0	6.6	0.000717
600	52	0	Umb - EU w/ Key LDC	5	51	497	0.1	2.5	2.6	0.000284
600	104	0	Umb - EU w/ Key LDC	0	0	496	0.0	0.0	0.0	0

Required Cut Under Kyoto	Sinks	Elect Res	Scenario	Permit Price (\$/t)	Domestic Reductions (MMTCE)	Permits Purchased Abroad	US Abatement Cost	US Capital Outflow	US TC (\$b)	TC/GDP
600	0	0	Umb - EU, EE w/ Key LDC	16	130	470	1.0	7.5	8.6	0.000932
600	52	0	Umb - EU, EE w/ Key LDC	9	72	476	0.3	4.3	4.6	0.000502
600	104	0	Umb - EU, EE w/ Key LDC	2	27	469	0.0	0.9	1.0	0.000105
600	0	0	A1 + 20% JI	36	229	371	4.1	13.4	17.5	0.001903
600	52	0	A1 + 20% JI	21	164	384	1.7	8.1	9.8	0.001065
600	104	0	A1 + 20% JI	9	72	424	0.3	3.8	4.1	0.000451
600	0	0	Umb - EU + 20% JI	20	157	443	1.6	8.9	10.4	0.001136
600	52	0	Umb - EU + 20% JI	9	72	476	0.3	4.3	4.6	0.000502
600	104	0	Umb - EU + 20% JI	0	0	496	0.0	0.0	0.0	0
600	0	0	Umb - EU, EE + 20% JI	30	204	396	3.1	11.9	14.9	0.001627
600	52	0	Umb - EU, EE + 20% JI	16	130	418	1.0	6.7	7.7	0.000841
600	104	0	Umb - EU, EE + 20% JI	4	45	451	0.1	1.8	1.9	0.000206
600	0	0	A1 w/ Key LDC + 20% JI	20	157	443	1.6	8.9	10.4	0.001136
600	52	0	A1 w/ Key LDC + 20% JI	12	102	446	0.6	5.4	6.0	0.000649
600	104	0	A1 w/ Key LDC + 20% JI	5	51	445	0.1	2.2	2.4	0.000256
600	0	0	Umb - EU w/ Key LDC + 20% JI	11	95	505	0.5	5.6	6.1	0.000662
600	52	0	Umb - EU w/ Key LDC + 20% JI	5	51	497	0.1	2.5	2.6	0.000284
600	104	0	Umb - EU w/ Key LDC + 20% JI	0	0	496	0.0	0.0	0.0	0
600	0	0	Umb - EU, EE w/ Key LDC + 20% JI	15	123	477	0.9	7.2	8.1	0.000879
600	52	0	Umb - EU, EE w/ Key LDC + 20% JI	9	72	476	0.3	4.3	4.6	0.000502
600	104	0	Umb - EU, EE w/ Key LDC + 20% JI	2	27	469	0.0	0.9	1.0	0.000105

FAO PRODUCTION YEARBOOK

LAND USE	Land Use Country Notes
IRRIGATION	Specific Country Notes
General Country Notes	

Land use (land cover)

It should be borne in mind that definitions used by reporting countries vary considerably and items classified under the same category often relate to greatly differing kinds of land.

Definitions of land use (land cover) categories are as follows:

11 Total Area 1000ha:

the total area of the country, including area under inland water bodies. Data in this category are obtained mainly from the United Nations Statistical Division, New York. Possible variations in the data may be due to updating and revisions of the country data and not necessarily to any change of area.

31 Land Area 1000ha:

total area excluding area under inland water bodies. The definition of inland water bodies generally includes major rivers and lakes. Data in this category are obtained mainly from the United Nations Statistical Division, New York. Possible variations in the data may be due to updating and revisions of the country data and not necessarily to any change of area.

51 Agricultural Area 1000ha:

up to 1994, this element shows total of data under Elements 061 (Arable land and Permanent crops) and 131 (Permanent pastures).

61 Arable and Permanent Crops 1000ha:

Arable land and land under permanent crops shows the total of data in Elements 071 (Arable land) and 121 (Permanent crops).

71 Arable Land 1000ha:

land under temporary crops (double-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (less than five years). The abandoned land resulting from shifting cultivation is not included in this category. Data for "Arable land" are not meant to indicate the amount of land that is potentially cultivable.

121 Permanent Crops 1000ha:

land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee and rubber; this category includes land under flowering shrubs, fruit trees, nut trees and vines, but excludes land under trees grown for wood or timber.

131 Permanent Pasture 1000ha:

land used permanently (five years or more) for herbaceous forage crops, either cultivated or growing wild (wild prairie or grazing land). The dividing line between this category and the category "Forests and woodland"; is rather indefinite, especially in the case of shrubs, savannah, etc., which may have been reported under either of these two categories. In the year 1995 and onward there will be no data for this element.

141 Forests and Woodland 1000ha:

land under natural or planted stands of trees, whether productive or not. This category includes land from which forests have been cleared but that will be reforested in the foreseeable future, but it excludes woodland or forest used only for recreation purposes. The question of shrub land, savannah, etc. raises the same problem as in the category "Permanent meadows and pastures". In the year 1995 and onward there will be no data for this element.

181 All Other Land 1000ha:

up to 1994, this category includes any other land not specifically listed under elements 051

(Agricultural land) and 141 (Forests and Woodland). This element includes: built-on areas, roads, barren land, etc. for which no specific data are available.

191 Non arable and permanent crops 1000ha:
from 1995 this element includes any other land not specifically listed under elements 061 (Arable land and Permanent crops) i.e.: permanent pastures, forests and woodland, built on areas, roads, barren lands, etc.

LAND USE COUNTRY NOTES

The following are specific country notes pertaining to land-use (land-cover) categories:

Australia: Data on arable land include about 27 million hectares of cultivated grassland.

Greenland: "Total area" refers to area free from ice.

Mauritius: Data on total area exclude dependencies.

Russian Federation: Data on total area exclude the portion of land under the White Sea and the Azov Sea.

Switzerland: Data from 1992, with the exception of "Total area" are not comparable with those of the previous years because of a new statistical method recently applied by the country.

Ukraine: Data on total area exclude the portion of land under the Azov Sea.

USSR: Data on total area include the White Sea (9 million hectares) and the Azov Sea (3.73 million hectares). Data on arable land and land under permanent crops and on permanent meadows and pastures refer to the land being used by agricultural undertakings and farms, i.e. excluding State land reserves and areas belonging to nonagricultural undertakings.

Irrigation

051 Irrigated Area 1000ha:

Data on irrigation relate to areas equipped to provide water to the crops. These include areas equipped for full and partial control irrigation, spate irrigation areas, and equipped wetland or inland valley bottoms.

The following are specific country notes:

Cuba: Data refer to State sector only.

Hungary: Data exclude complementary farm plots and individual farms.

Japan; Korea, Republic of; Sri Lanka: Data refer to irrigated rice only.

GENERAL COUNTRY NOTES

Anguilla

Data for Anguilla are included with those of Saint Kitts and Nevis.

China

Data for China generally include those for Taiwan (Province of China).

Cyprus

As a result of the present situation in Cyprus, data refer to the government-controlled area only, except for total area and Population where data refer to all Cyprus.

Czech Republic, Slovakia

Starting in 1993, these independent republics, formerly Czecho slovakia, are shown separately.

East Timor

Most data for recent years are included in those of Indonesia.

Eritrea, Ethiopia

Starting in 1993, Eritrea and Ethiopia, formerly Ethiopia PDR, are shown separately.

Independent republics of the USSR

Starting in 1992, the independent republics Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan are shown separately in Asia, while Belarus, Estonia, Latvia, Lithuania, Moldova, the Russian Federation and Ukraine are shown separately in Europe. However, they are not included in the continental totals. Data before 1992 are shown under USSR.

Independent republics of Yugoslavia SFR

Starting in 1992, the independent republics Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia, Slovenia, and the Federal Republic of Yugoslavia (Serbia and Montenegro) are shown separately. Data for the years prior to 1992 are shown under Yugoslavia SFR.

India and Pakistan

Data relating to KashmirJammu, whose final status has not yet been determined, are generally included under India and excluded from figures for Pakistan. Data for Sikkim are included under India.

Pacific Islands

This heading includes data for the Republic of the Marshall Islands, the Commonwealth of the Northern Mariana Islands, the Federated States of Micronesia and the Republic of Palau.

Saint Helena

Data for Saint Helena include those for Ascension and Tristan da Cunha.

Yemen

Data for the former Yemen Arab Republic and the former Yemen, Democratic, have been combined.

LAND USE	Year					
LAND AREA (1000HA)	1990	1991	1992	1993	1994	1995
ALBANIA	2,740	2,740	2,740	2,740	2,740	2,740
AUSTRALIA	768,230	768,230	768,230	768,230	768,230	768,230
AUSTRIA	8,273	8,273	8,273	8,273	8,273	8,273
BEL-LUX	3,282	3,282	3,282	3,282	3,282	3,282
BULGARIA	11,055	11,055	11,055	11,055	11,055	11,055
CANADA	922,097	922,097	922,097	922,097	922,097	922,097
CZECHOSLOVAK	12,536	12,536	12,536			
DENMARK	4,239	4,239	4,243	4,243	4,243	4,243
ESTONIA			4,227	4,227	4,227	4,227
FINLAND	30,459	30,459	30,459	30,459	30,459	30,459
FRANCE	55,010	55,010	55,010	55,010	55,010	55,010
GERMANY	34,927	34,927	34,927	34,927	34,927	34,927
BOSNIA HERZG			5,100	5,100	5,100	5,100
GREECE	12,890	12,890	12,890	12,890	12,890	12,890
HUNGARY	9,234	9,234	9,234	9,234	9,234	9,234
CROATIA			5,592	5,592	5,592	5,592
ICELAND	10,025	10,025	10,025	10,025	10,025	10,025
IRELAND	6,889	6,889	6,889	6,889	6,889	6,889
ITALY	29,406	29,406	29,406	29,406	29,406	29,406
JAPAN	37,652	37,652	37,652	37,652	37,652	37,652
LATVIA			6,205	6,205	6,205	6,205
LIECHTENSTEN	16	16	16	16	16	16
LITHUANIA			6,480	6,480	6,480	6,480
NETHERLANDS	3,392	3,392	3,392	3,392	3,392	3,392
MACEDONIA			2,543	2,543	2,543	2,543
NEW ZEALAND	26,799	26,799	26,799	26,799	26,799	26,799
NORWAY	30,683	30,683	30,683	30,683	30,683	30,683
CZECH REP				7,728	7,728	7,728
POLAND	30,442	30,442	30,442	30,442	30,442	30,442
PORTUGAL	9,150	9,150	9,150	9,150	9,150	9,150
ROMANIA	23,034	23,034	23,034	23,034	23,034	23,034
RUSSIAN FED			1,688,850	1,688,850	1,688,850	1,688,850
YUGOSLAVIA			10,200	10,200	10,200	10,200
SLOVENIA			2,012	2,012	2,012	2,012
SLOVAKIA				4,808	4,808	4,808
SPAIN	49,944	49,944	49,944	49,944	49,944	49,944
SWEDEN	41,162	41,162	41,162	41,162	41,162	41,162
SWITZERLAND	3,955	3,955	3,955	3,955	3,955	3,955
UK	24,160	24,160	24,160	24,160	24,160	24,160

UKRAINE			57,935	57,935	57,935	57,935
USA	915,912	915,912	915,912	915,912	915,912	915,912
YUGOSLAV SFR	25,540	25,540				
EC (15)	313,183	313,183	313,187	313,187	313,187	313,187
E EUROPE	114,581	114,581	114,488	114,488	114,488	114,488

<i>LAND USE</i>	<i>Year</i>					
<i>FOREST&WOOD (1000HA)</i>	1990	1991	1992	1993	1994	1995
ALBANIA	1,045	1,050	1,051	1,048	1,048	0
AUSTRALIA	145,613	145,000	145,000	145,000	145,000	0
AUSTRIA	3,227	3,227	3,218	3,240	3,240	0
BEL-LUX	709	709	709	709	709	0
BULGARIA	3,345	3,348	3,348	3,348	3,348	0
CANADA	453,300	453,300	453,300	453,300	453,300	0
CZECHOSLOVAK	4,618	4,619	4,618			
DENMARK	417	417	417	417	417	0
ESTONIA			2,016	2,022	2,017	0
FINLAND	23,373	23,222	23,186	23,186	23,186	0
FRANCE	14,811	14,850	14,872	14,931	15,012	0
GERMANY	10,735	10,700	10,700	10,700	10,700	0
BOSNIA HERZG			2,100	2,000	2,000	0
GREECE	2,620	2,620	2,620	2,620	2,620	0
HUNGARY	1,675	1,701	1,712	1,719	1,719	0
CROATIA			2,074	2,076	2,076	0
ICELAND	123	120	120	120	120	0
IRELAND	500	570	570	570	570	0
ITALY	6,760	6,764	6,772	6,800	6,809	0
JAPAN	25,105	25,230	25,230	25,100	25,000	0
LATVIA			2,815	2,839	2,870	0
LIECHTENSTEN	3	3	3	3	3	0
LITHUANIA			1,983	1,983	1,983	0
NETHERLANDS	334	334	334	334	334	0
MACEDONIA			1,066	1,020	1,020	0
NEW ZEALAND	7,667	7,667	7,667	7,667	7,667	0
NORWAY	8,330	8,330	8,330	8,330	8,330	0
CZECH REP				2,629	2,629	0
POLAND	8,672	8,732	8,732	8,732	8,732	0
PORTUGAL	3,102	3,102	3,102	3,102	3,102	0
ROMANIA	6,685	6,680	6,682	6,682	6,680	0
RUSSIAN FED			767,693	768,436	765,912	0
YUGOSLAVIA			1,769	1,769	1,769	0
SLOVENIA			1,077	1,077	1,077	0

SLOVAKIA				1,989	1,989	0
SPAIN	15,807	15,858	15,915	16,137	16,137	0
SWEDEN	28,025	28,025	28,025	28,025	28,025	0
SWITZERLAND	1,186	1,186	1,186	1,186	1,186	0
UK	2,326	2,390	2,390	2,390	2,390	0
UKRAINE			9,239	9,239	9,239	0
USA	295,990	295,990	295,990	295,990	295,990	0
YUGOSLAV SFR	9,118	9,120				
EC (15)	112,746	112,788	112,830	113,161	113,251	0
E EUROPE	35,158	35,250	34,229	34,089	34,087	0

Click on the file to download it as .CSV

[00388457.csv](#) (Size <1K)

If you configure your browser to associate the file type `text/comma-separated-values` with your spreadsheet software, then it will be started automatically when you download the file.

How to set this up in Netscape

Number of Database Accesses=388457

I. What specifically can I do to encourage technological advances that will help us to slow carbon emissions? How much is technology development dependent on market incentives rather than Federal spending on R&D and dissemination programs?

Holdren

Jorgensen

Get names of other technology people from TJ et. al.

Solow

II. Very specifically, balancing the benefits of acting against the costs of doing so, how aggressive should we be in reducing carbon emissions?

Cline

Nordhaus

Jorgensen

Dudek (EDF)

Solow
Mintel

Katz
Munnell
Tyson

III. How worried should I be about "competitiveness" arguments and the impact of climate policies on U.S. industry generally? In which specific industries are there likely to be problems?

Krugman

Esty (?) -- good because he has links to the greens

AFL-CIO

Ehrlich

Cooper

Repetto

Sachs
Stiglitz

IV. What is the most efficient way of reducing carbon emissions?

[Follow-up: How much can we learn from the SO2 trading program to ensure that carbon reductions are undertaken efficiently?]

that we already have

V. Are there suggestions you have for how the U.S. Government itself can be more efficient in using energy?

Former government officials

VI. Can you recommend any kind of safety valve to protect the economy against unexpectedly high costs of reducing emissions?

Michele Jolin 08/13/97 11:54:07 AM

Record Type: Record

To: Janet L. Yellen/CEA/EOP, Jeffrey A. Frankel/CEA/EOP

cc: Jason Shogren/CEA/EOP, Randall W. Lutter/CEA/EOP, Joseph E. Aldy/CEA/EOP, Peter R. Orszag/OPD/EOP

Subject: WH Conference on Climate Change

The WH Climate Change Conference is scheduled for October 6. The CEA has been asked to work with the NEC in coming up with panelists for the domestic issues/economy panel and to identify the issues that should be discussed by these panelists.

The following is the tentative plan for the Conference:

Sunday, Oct. 5 --- Breakout sessions: Participants in conference will meet in small groups with members of the Cabinet and Senior White House staff.

Monday, Oct. 6 --- Conference

AM:

- Science Presentation
- Panel on technology
- Panel on domestic issues/economy

LUNCH

PM:

- Panel on International issues
- VP closing ceremony
- WH Reception

JF 8/14/97

Economist candidates to invite to Oct. White House conference on GCC

more senior experts on GCC some other eminent economists of 2300

lead signers of letter

Bill Nordhaus	Ken Arrow *
Dale Jorgenson	Paul Krugman
	Robert Solow *

other signers of letter

Richard Schmalensee	William Baumol, NYU
	Max Corden, SAIS
	Gerard Debreu, UCB *
	Frank Fisher, MIT
other eminent who didn't sign	Claudia Goldin, Harvard
Bill Cline, IIF	Ned Gramlich, U.Mich/ FRB nom.
Richard Cooper, Harvard	Lawrence Klein, U.Penn *
	Anne Krueger, Stanford
	Larry Katz, Harvard
	Robert Litan, Brookings
	Van Ooms, CED
	Jeff Sachs
	James Tobin *
	John Harsanyi *
	Wassily Leontief *
	Franco Modigliani *
	Stephen DeCanio
	Robert Repetto

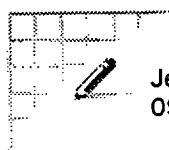
experts in GCC
not quite as senior/big name

signed letter
Stavins

couldn't find name on list
Goulder
Rutherford
McKibbin
Wilcoxon
Richels
Toman

former Admin
Alan Blinder
Laura Tyson
Alicia Munnell
Ev Ehrlich
Joe Stiglitz

* Nobel Prize



Jeffrey A. Frankel
09/15/97 06:50:12 PM

Record Type: Record

To: William J. Antholis/OPD/EOP
cc: Adele C. Morris/CEA/EOP, Janet L. Yellen/CEA/EOP
bcc: Records Management
Subject: Re: draft conference memo

A few quick reactions to your memo re WH GCC conference.

Page 4. You have an awful lot on technology. I would be surprised if Treasury, of all agencies, would want to present what you have listed: technology, item (b), presented as if it is a policy lever to be viewed as comparable/alternative/on a parallel with the true policy options you have listed under (a). At a minimum, you should say "*subsidy* of the development and diffusion of technology", if you intend to talk about a policy. Then, under discussion, you commit the sin even more explicitly by describing emission reduction technologies as possible policy tools. We believe that suggesting technology as a way of cutting emission, independently of price (or R&D subsidies, or regulation, etc.) is like suggesting that heart/lung rate is a way of burning calories, independently of physical exertion.

page 6. Something is missing from the end of Repetto.

Under economist A, Blinder was not a co-author of the letter (or even a signer?), though he is of course very good. If you want knowledgeable co-authors of the letter, you are limited to Nordhaus and Jorgenson (or, to some extent, Krugman and Solow). I think you really have to have Nordhaus, for full credibility. Personally, I would also do Krugman. (He is nowhere near as ornery as his reputation.)

Other trade economists: Cooper, Sachs*, Max Corden*.
women: Claudia Goldin*, Anne Krueger*, Laura Tyson, Alicia Munnell
(* signed the letter)

page 9. I'm a bit surprised at the role given to national security here, since there are so many more important dimensions to this problem. In particular, I am not sure what you want Jessica Matthews (whom I think is good) to do. And I fear that the use of the word "competitiveness" here is even more dangerous (to borrow from Krugman's phrase "competitiveness: a dangerous obsession") than in the usual context.

last line: drop word "both"

Under economist B, what do you mean by "helping key industries"?

William J. Antholis

Foreign Policy Invites:

Les Gelb, Council on Foreign Relations
Mort Abromowitz, Carnegie Commission on Preventing Deadly Conflict
Richard Solomon, United States Institute of Peace
Brookings Institute
Thomas Lovejoy, Smithsonian Institution
Interactions

Foundation Invites

President, Pew Global Stewardship Initiative
President, Ford Foundation
President, Rockefeller Brothers Foundation
President, Olin Foundation
President, Bradley Foundation
President, Hudson Institute

Academics

12
Dan Jorgensen, MIT
Laura Tyson, Berkeley
Donald Kennedy, Stanford
Robert Solow, MIT
William Nordhaus, Yale University
Paul Krugman, MIT
Jeffrey Sachs, Harvard University
Dan Esty, Yale University



DEPARTMENT OF ENERGY
Washington, DC 20585

OFFICE OF THE SECRETARY

OFFICE OF THE UNDER SECRETARY**FACSIMILE TRANSMISSION SHEET**

TO: T.J. Glauthier	FROM: Ernie Moniz
OFFICE:	DATE:
FAX NUMBER: 395-4639	FAX NUMBER: (202) 586-7210
OFFICE NUMBER:	OFFICE NUMBER: (202) 586-3500

TOTAL PAGES INCLUDING COVER SHEET 3**Comments:**

Here is a proposed letter of acceptance for the
11 Lab Study. Sorry to get it to you so late.
Ernie

IF TRANSMITTAL IS INCOMPLETE, PLEASE PHONE _____ AT
(202) 586-3500

Dr. Alvin Trivelpiece
Director
Oak Ridge National Laboratory
P.O. Box 2008, Mail stop 6255
Oak Ridge, TN 37830

Admiral Richard Truly
Director
National Renewable Laboratory
1617 Cole Blvd.
Golden, Colorado 80401

Dear Dr. Trivelpiece and Admiral Truly:

Thank you for responding to my request for evaluating technology pathways to reduce greenhouse gas emissions with sustained economic growth. President Clinton framed this issue in his June 1977 United Nations speech, when he said:

"In order to reduce greenhouse gases and grow the economy, we must invest more in the technologies of the future. I am directing my cabinet to work to develop them. Government, and universities, business and labor must work together. All these efforts must be sustained over years, indeed over decades."

I am pleased to receive your report, "Technology Opportunities to Reduce U.S. Greenhouse Gas Emissions," and ask that you convey my gratitude to the other laboratory directors who contributed to it.

Your report, together with that of the President's Committee of Advisors on Science and Technology, will help significantly as we shape the Department's R&D portfolio in response to evolving environmental, economic and security concerns. Your analysis of nearly fifty technology pathways, together with the associated R&D opportunities and potential for greenhouse gas emission reduction, elucidates the considerable potential impact of energy R&D investments.

As your report indicates, substantial further analysis is needed. First, we need to prioritize our increased R&D investments to lay the foundation for future breakthroughs, to accelerate introduction of new technologies, and to complement and stimulate private sector research, development and deployment. For the most promising pathways, the Department, under the auspices of the R&D Council, will work with stakeholders to produce technology roadmaps. Your report provides an excellent foundation for this activity, and your assistance will be sought together with that of academia and the private sector. The roadmaps will themselves evolve over time in the face of new challenges and opportunities.

Second, although technology is the key for long term response to the environmental, economic and security issues surrounding energy production and use, numerous policy initiatives will greatly leverage R&D investments by spurring deployment. Indeed the President's climate change initiative for the next five years is based on coordinated tax incentives and R&D investments, amplifying the impact that either would have in isolation. I recognize that your efforts focused solely on the technology pathways, as requested. The Administration will fold your work into the broader policy context in order to achieve greenhouse emission reductions in the most cost effective manner.

I am optimistic that the Department of Energy laboratories, together with our partners in the private sector and in academia, will make significant contributions to clean and affordable energy sources that meet America's environmental goals for the twenty-first century. I look forward to working with you towards that end.

Sincerely,

Federico Peña

DEPARTMENT OF THE TREASURY
WASHINGTON

March 13, 1998

cc: JAF
Aur
KIL
JAF
JY

MEMORANDUM FOR DISTRIBUTION

FROM: Truman Semans *TTS*

RE: World Bank and Climate Change

PAGES: 7 total

Please see, attached, a rough draft position paper on three possible approaches to increasing World Bank support of climate change mitigation -- shadow pricing, carbon accounting and offsets, and lending targets/quotas. This draft is not yet cleared in Treasury at the DAS level. Please provide us any comments by COB Thursday, March 19 at fax (202) 622-1228.

attachment

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Options for a World Bank Role in Addressing Climate
Proposed USG Positions

Rough Draft

This paper discusses three proposals for reducing carbon emissions associated with World Bank's operations and sets forth possible USG policy positions on them: (1) whether to use shadow carbon pricing to internalize the cost of carbon emissions in the Bank's energy portfolio, (2) whether to insist on the Bank including "offsets" for projects that produce an increase in carbon emissions, either as part of individual loans or part of its overall portfolio, and (3) whether to urge the Bank to adopt quotas for energy efficiency and renewables. A key underlying issue is the degree to which these and other initiatives would (a) advance "meaningful contributions" in line with the Byrd Resolution, and (b) achieve real climate change mitigation.

(1) Shadow Pricing

Under this proposal, the Bank would be asked to include the cost of carbon emissions in the economic rate of return calculations of projects through the use of shadow prices. This would internalize the global and local economic externalities that are not currently taken into consideration. A range of shadow carbon prices could be used, depending on the extent to which the costs would be fully internalized. For example, the lower end of the range (e.g., \$5 per ton) might represent an analysis that takes into account only the costs associated with health problems, while the upper range would incorporate all the identified local externalities plus the global costs related to the impact on climate change.

The Bank has already piloted shadow pricing (based on a USAID model) on a number of projects, with interesting results. The Carbon Backcasting Study analyzed the effect of using a shadow price on carbon emissions for a sample of recently approved energy loans to determine whether the shadow price could adversely affect their economic analyses, and whether a shadow price would encourage investment in low-carbon alternatives. The results showed that a significant share of projects (10-40 percent depending on the shadow price) would have had a negative rate of return, while a number of clean energy investments become significantly more attractive with carbon costs included. The Bank's Global Overlays program has identified win-win project opportunities in specific countries that the Bank could finance as alternatives to higher carbon options.

Pros and Cons:

-- Applying a shadow price, even if it does not fully internalize costs, would give a more accurate picture of the costs and benefits of projects than current Bank practice. Once the true costs are understood, there may be greater willingness on the part of borrowers to choose low-carbon energy production paths, and greater borrower interest in pursuing the cost savings of energy efficiency projects. Over time, these choices would lead to sounder energy policies in developing countries, more efficient use of World Bank resources, and lower carbon emissions than would have otherwise occurred.

-- Better data on global and local externalities would help identify which costs are and are not eligible for Global Environment Facility (GEF) funding. Shadow pricing that distinguishes between local versus global impacts may be justifiable given higher domestic benefits for borrowers -- measures to reduce local pollution often have ancillary carbon reduction benefits. Finally, there is an inherent appeal in project evaluation being done on the basis of a comprehensive, all-in cost estimation.

-- However, borrowers are likely to resist, arguing that they have no binding commitment to reduce emissions, much less to select projects on the basis of global costs and benefits. It can also be argued that baseline energy development only includes projects with sufficiently high local economic return, whereas the Convention obligates Annex I countries to cover costs associated with "global" benefits.

-- Shadow pricing is not as precise as other economic measures on which projects are typically judged. For example, where should the line be drawn on the cost of local externalities of carbon emissions? One can make a solid argument for including health costs, but should it also include the costs of sandblasting walls of buildings more frequently? These types of issue mean that shadow pricing can require significant additional time and expense in project preparation.

Proposed Position

- Support expansion of the Bank's shadow pricing efforts, efforts to identify win-win project opportunities upstream in the project pipeline development process. Address not only carbon but also sulfur, nitrogen oxides, and particulates.
- Support covering the cost of this work as a normal part of the project development process, i.e., out of the Bank's operating budget, and ultimately paid for by the borrowers. If needed (and possible), offer U.S. bilateral support. (As fallback, agree to use of GEF funds for sectoral shadow pricing studies if done in the context of borrowers' national climate action plans.)

Carbon Accounting and Requiring Offsets

Under this proposal, the Bank would be required to keep track of the change in carbon emissions associated with its projects and provide "offsets" for projects that produce an increase in carbon emissions, either as part of individual loans or part of its overall portfolio. Currently, the Bank does not keep a tally of what level of carbon emissions growth results from Bank operations, although it often claims that many high-carbon projects are better off with Bank involvement than without.

Pros and Cons

-- Accounting for Bank-related carbon emissions could provide leverage to reduce Bank support for high carbon projects and augment support for carbon reduction (including forestry sinks). Carbon accounting by borrower, project, or region could also leverage efforts to push specific developing countries toward stronger climate commitments, cleaner alternative projects and better underlying policies.

-- Accounting for gross, direct carbon emissions resulting from Bank projects is feasible in the power sector. Beyond that, however, the task becomes difficult. First, accounting is much less straightforward for other sectors, including primary energy supply and transport. Second, the Bank and its borrowers argue that all Bank projects are, by definition, part of the baseline. Third, the Bank claims that its net contribution is to reduce emissions below the baseline scenario, owing to its efforts at rationalizing energy prices and promoting increased efficiency through sector reforms.

-- Requiring the Bank to offset its portfolio carbon emissions could increase the flow of energy efficiency, renewable energy, and "clean" fossil fuel projects. However, such a requirement would run into a host of technical challenges, including the determination of methodologies for baselining and measuring additionality (which have not yet been agreed under the Climate Convention). An offsets requirement would not necessarily result in the most economically efficient portfolio, although the parallel use of shadow pricing externalities could help address this. Accounting and offsets would be most workable for the power sector and could mesh with existing Bank climate-related initiatives (Solar Energy Initiative, Photovoltaic Market Transformation Initiative, possibly the Carbon Investment Fund).

Proposed Position

- Call for the Bank to begin accounting gross emissions resulting from projects in the energy sector and to work toward methodologies for carbon accounting in end-use sectors. Set a general goal for making Bank operations achieve net reductions in developing country emissions growth beginning in [2005].

Establishing Quotas for Energy Efficiency and Renewable Energy

The Bank acknowledges that it has not succeeded in providing sufficient support for renewables and efficiency, despite strong policy mandates. Setting quotas for lending could be used to shift Bank support toward clean energy away from primary and secondary energy production.

Pros and Cons

Lending targets or quotas are a "blunt object." A main strength of their use is simplicity: they allow easy measurement of success or failure, and they are easily understandable to a broad audience. The signal they send may be able to penetrate the Bank's bureaucracy better than finer policy instruments, provided upper management passes quotas on to regional operations

departments.

However, quotas have historically promoted economically inefficient outcomes. At least in the short run -- until the Bank improves its expertise -- minimum quotas for clean energy could lead to bad investments, given the Bank's high failure rate for efficiency and renewables projects. In addition, the costs of preparing efficiency and renewables projects are higher than for many "normal" projects.

Reduction targets for primary energy production projects might be viable, especially since these projects can be increasingly financed through the private sector alone.

Proposed Position

- Do not push for quotas on energy efficiency and renewables, but establish growth targets of [15% annually] for the number and value of these projects. If possible, offer bilateral assistance (or secondment) in the short-term for staff training and project preparation.
- Call for the Bank to phase out support of primary energy supply projects by [2005].

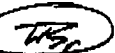
Conclusion: A U.S. push on any of these items would require support at the World Bank Board from several other countries. Typically, few other Board members support such activist approaches on environment at the Bank. The G-7 appear increasingly willing to push "mainstreaming" of environment at the Bank. However, winning support for any of the three measures discussed here would likely require considerable diplomatic effort. Each of the initiatives would increase the costs of doing business for the Bank. Providing bilateral assistance, at least in the early stages, could improve our prospects of winning support from the Bank and other countries. Finally, it would take some time for the measures to be adopted by the Board, let alone implemented by the Bank. We should not expect these measures to be a quick fix.

DEPARTMENT OF THE TREASURY
WASHINGTON

March 23, 1998

cc: JAF
JY
AM
RL
JA

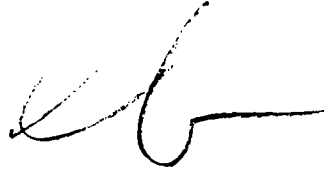
MEMORANDUM FOR DISTRIBUTION

FROM: Truman Semans 
RE: World Bank and Climate Change
PAGES: 3 total

Bill Schuerch will chair a follow-up meeting on the Bank's Carbon Fund proposal and other possible Bank climate measures this Thursday, March 26, 11:00-12:00 in the Treasury Annex First Floor Conference Room (north across Pennsylvania Avenue from the Main Treasury Building, with entrance facing Lafayette Park).

If you plan to attend the meeting, please provide your name and birthdate to Ms. Dianne Graham or Ms. Earline Hoffman by COB Wednesday (TEL 622-1810, FAX 622-1228). Thank you.

eff: will you attend?
just a staff?





WASHINGTON

Facsimile Transmittal

From

Office of Multilateral Development Banks (OASIA/IDB)

1500 Pennsylvania Avenue, N.W.

Room ~~500~~ 5315

Washington, D.C. 20220

(Fax # 202-622-~~1228~~ 2525)

Date: 3/23/98

Page 1 of 3 Page(s)

To:

JEFF Frankel - CEA

Tel. #

FAX #

395-6958

From:

Truman Semans

Comments:

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DOD	Sherri Goodman	703-693-7011	703-695-6639
	David Weisman	703-614-1158	703-697-1887
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	Bill Antholis	456-5334	456-2198
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	Bill Schuerch	622-2536	622-0154
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	Helen Walsh	622-1228	622-1265



DEPARTMENT OF THE TREASURY
WASHINGTON

March 25, 1998

MEMORANDUM FOR DISTRIBUTION

FROM: Helen Walsh *HW*
RE: World Bank and Climate Change
PAGES: total

Attached are additional materials for the Thursday meeting on the World Bank Carbon Fund proposal and other possible Bank climate measures. The meeting will be from 11:00-12:00 in the Treasury Annex First Floor Conference Room (north across Pennsylvania Avenue from the Main Treasury Building, with entrance facing Lafayette Park).

If you plan to attend and have not yet provided your name and birthdate to Ms. Dianne Graham or Ms. Earline Hoffman by COB Wednesday (TEL 622-1810, FAX 622-1228), please by 10:00 a.m. Thank you.

Attachments

- Agenda
- Agency comments
- Draft Carbon market functions paper

*cc: JAF
JY
Am
RL
JVA*

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	Joe Eichenberger	622-1228	622-1231
	Helen Walsh	622-1228	622-1265

IFIs and the Environment**March 26, 1998*****Agenda*****1. Continued Discussion of World Bank's Proposed Carbon Investment Fund**

- Agency Positions (written submissions attached)
- Possible World Bank Role (Draft Functions paper* attached)
- World Bank Request for Consultations on USG Position

2. Preliminary Discussion of Paper on Shadow Pricing, Offsets and Quota or Benchmark for Energy Efficiency/Renewables Projects**3. Other Business**

- Additional Options: Subsidies/Energy Pricing
- NGO Request for Policy Papers

* State is drafting separate paper on CDM, which we have not yet seen.

DRAFT
Draft Functions of CDM/Carbon Investment Fund
and Possible Role for World Bank
(3/25/98 4:00 p.m.)

I. Description of Market Functions

A. Offsets Traders

- *Functions:* Handles the purchases and sales of offsets for its own account or for clients' accounts, making mkt between those who have excess offsets and those who need offsets.
- *Desired characteristics:* trading skills, adequate financial resources to back up trades, ethical standards, presumably subject to some form of regulation (NASD).
- *Potential Conflicts with Other Functions:* possible conflict if also trading on own account.

B. Offsets Creators

- *Functions:* Finds investment projects that will generate offsets; works with regulatory body to obtain certification of emissions reductions.
- *Desired characteristics:* could be private or public sector, although goal is to create largely private sector market in order to mainstream environmental concerns into largest volume of investment flows. It may be necessary to have transparent international public institution pilot efforts, provided a clear exit strategy is in place; some ethical standards enforced by intergovernmental body (in absence of clear international enforcement), no conflicts of interest.
- *Potential Conflicts with Other Roles:* Should be separate from any regulatory roles.

C. Offsets Bundlers

- *Functions:* Puts together packages of emissions reduction projects; promotes standardization to facilitate packaging.
- *Desired Characteristics:*
- *Potential Conflicts with Other Roles:*
-

D. Certifiers and Verifiers

- *Functions:* These entities ("operational entities" in Kyoto Agreement?) would be responsible for verifying that emissions are actually occurring, certifying offsets as being above the agreed baseline and unique (no double counting of same emissions); ensures appropriate methodology for such functions; promotes standardization to facilitate packaging. Ensures that offsets derived from developing countries are properly taxed for CDM purposes.
- *Desired Characteristics:* high standards of financial probity and professional integrity that are recognized internationally; specialized knowledge of GHG calculation methodologies. Possible candidates might include major accounting firms, environmental engineering

firms, international agencies.

- *Potential Conflicts with Other Roles:* no conflicts of interest that might influence determination of amount of offsets, i.e., no financial holdings in offsets or investment related to them.

E. Regulator(s) of Markets and Operational Entities

- *Functions:* ultimate authority for certifying, registering, and verifying emissions, i.e., these regulatory functions are delegated to operational agencies, clearing houses or other entities, which can lose their status if they do not properly perform their functions; sets methodology for calculating offsets. May also license traders and other market participants (or delegate this to stock exchange or SROs like NASD); some enforcement capability to act against fraud (delicensing) or trading violations; sets fees to pay for regulatory expenses and provide for adaptation funds.
- *Desired Characteristics:* government agency; high standards of professionalism and integrity that are recognized internationally

F. Adaptation Institution(s) (part of CDM)

- *Functions:* Accepts adaptation funds derived from CDM fees. Responsible for disbursement of these funds to those most at risk from climate change. Evaluates requests/projects for adaptation; organizes normal due diligence and project cycle procedures -- including evaluation and portfolio oversight -- of typical IFI (though services can be contracted to other public or private sector institutions).
- *Desired Characteristics:* Governed by Parties to FCCC or subset; Board and management structure are operationally oriented versus political.

G. Settlements

- *Functions:* provides international clearinghouse/stock exchange function; provides complete trade data for verification of national carbon "accounts" to Regulators. Registers emissions so no double counting.
- *Desired Characteristics:* Highly transparent; closely linked to COP and FCCC Secretariat.

II. World Bank Role

The World Bank's proposed Carbon Investment Fund (CIF) would act as a market intermediary by pooling government and private sector funds and investing in projects that result in carbon emissions reductions in client countries, in effect creating a mutual fund of projects that pay offset dividends to investors. The Bank views the CIF as an instrument to finance the "carbon component" of a regular World Bank Group pipeline project. The resulting carbon reductions could be traded or used as offsets for the investors' own emissions. Eventually, the CIF would be

a well-diversified portfolio of carbon offsets, which will reduce considerably the risks of investing in carbon reducing projects. With standardised deals, a CIF could limit transactions costs. The Bank claims that a CIF would be competitive with future players in the market; the Bank would not have a privileged position. As competition increases over time, the role of the Bank is intended to gradually diminish.

This proposal appears to have the World Bank play the roles of Offset Creator, Trader, Bundler and Certifier/Verifier. This last regulatory role presents an obvious conflict of interest. The World Bank probably should not perform any regulatory function, since it has a portfolio that could be affected by rulemaking and enforcement of those rules. However, it has and will probably continue to contribute to analysis that underlies rules that COP and regulators would adopt.

Could or should it engage in other functions? Would look at a number of considerations: whether Bank involvement would negatively affect the development of the offsets market;

MAR 20 1998

cc: Bill, Helen, Mary, Ray, JGruher, DWilcox

MEMORANDUM TO: TRUMAN SEAMAN
CC: DAVID SANDALOW
FROM: JEFFREY HUNKER *JH*
SUBJECT: COMMENTS ON WORLD BANK STRATEGIES

Thank you for the opportunity to comment on both the World Bank Energy and Environment Strategy and the proposed Carbon Investment Fund. These views reflect those of the Department of Commerce, which has a strong interest in outcomes which promote economically efficient mechanisms for greenhouse gas trading, incentives for energy-efficient infrastructure, and a successful Clean Development Mechanism. While our interests reflect the broader environmental agenda, this memo will focus on the Bank's strategy as it relates to advancing the US climate change agenda -- because that is the locus of intense interest.

To summarize:

- The Carbon Investment Fund (CIF) as proposed is seriously flawed. We concur with the views of the Treasury comments;
- We are highly skeptical -- given the record of the Bank -- as to the effectiveness and impact of the proposed Energy and Environment Strategy (EES). It is too general and too diffuse to suggest that it will have any real effect;
- We are particularly concerned that both the CIF and the EES appear to be add-ons to existing Bank operations, which, together with the GEF and other mechanisms, present a confusing patchwork that is supposed to address a new set of 'environmental' issues -- while indicating little changes in its core operations.
- We believe that the Bank needs to adopt an approach that integrates incentives that promote investment in environmentally appropriate projects with actions that promote an economically efficient greenhouse gas trading/Clean Development Mechanism (CDM) system. Such an approach will -- not incidentally -- support US diplomatic objectives.
- A new approach would both 1) set incentives for Bank lending across all projects to reduce greenhouse gas emissions, 2) promote a Bank role in opening its projects for competitive bidding for CDM projects, and 3) encourage the Bank to engage in developing a market for CDM credits.

Background

It is important to note that the Bank has four potential functions with regard to greenhouse gas emissions reduction and trading (or its variants, like CDM):

- *pooling of investment funds* for projects that, while promoting other Bank objectives, also reduce greenhouse gas emissions (perhaps from a business as usual case);
- *identifying, structuring, and investing in projects* (note that these functions could be disaggregated -- so that the Bank could pool funds for investment in non-Bank projects);
- *verifying greenhouse gas reductions* (from an established baseline) for projects invested in, thereby developing 'reduction credits';
- *trading or otherwise making a market in such credits.*

The CIF as proposed would place all four such functions within the Bank. Such a combination is seriously flawed for several reasons already identified in the Treasury comments, especially, conflicting incentives within the Bank; and competition with appropriate private sector roles.

An Alternative to the Current Bank Proposals

Both Bank proposals -- the CIF and EES -- are flawed as proposed. Instead of trying to fix them -- an impossible task given that one of their fundamental failings is that they are incremental to a Bank system that has failed to deliver on earlier commitments -- we recommend the following:

1) *The Bank should adopt a policy of ensuring zero net greenhouse gas emissions from its energy and energy-related lending.* Such a policy goal could be accomplished by greater emphasis on renewable energy, or by investment in offsetting emissions projects (e.g.: reforestation). In any case, cost of offset investments should be charged against the originating project. Such a policy would for the first time create an incentive structure for Bank lending that was climate-friendly.

Note that the issue of hydro-electric power remains outstanding, and would need to be clarified.

2) *The Bank should open its project portfolio/pipeline for competitive bidding for CDM projects.* CDM credits -- applicable from 2000 on -- are the most relevant greenhouse gas credit mechanism for the immediate future. By opening its project pipeline for competitive bidding by interested parties (governments, corporations, etc) and making the process transparent, we remove much of the concern about conflicting incentives within the Bank structure. We would envision that the Bank would capture a portion of the greenhouse gas credits established for itself for subsequent trading, as mentioned below.

3) *The baseline verification should be done by a non-Bank entities or entities.* We suspect that there will emerge -- and the Bank actions can do much to encourage -- a vigorous private or non-Bank industry in providing such services.

4) *The Bank should be encouraged to trade, barter, and otherwise help establish a market in greenhouse gas emissions credits.* As one of multiple players in an emerging market for CDM

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credits, we see a useful role for the Bank in helping to create active interest and trading in these credits. The key point is that the Bank will be only one of many players in such a market -- in contrast to the current CIF proposal, which would establish the Bank as a predominant role

We would appreciate further dialogue with you about this important issue. Please call me to discuss.

MAR-24-1998 13:45

OES/ENV

202 647 5947

P.01/01

Date: 3/23/98**FAX TRANSMISSION**TO: Truman SemansFax: 622-1228Tel: 622-1229PAGES: 1

FROM: Pam Pearson, Office of Environmental Policy
OES/ENV, Room 4325
Department of State
Washington, DC 20520

Fax: 202-647-5947
e-mail: ppearson@state.gov

Tel: 202-647-1123

**SUBJECT: Consolidated State Department Comments on CIF and
"Bank Approaches" papers**

On the CIF position paper, we have two changes to request in the para.
on "USG Position":

add to first sentence, "a number of positive features, including the fact
that it is a rare forward-thinking initiative to reduce carbon
emissions."

To the final sentence of that para., add, "...and we should sit down with
project designers at the Bank to discuss our concerns as soon as
possible, and in any case prior to the Board seminar."

Also, at the bottom of the same page, perhaps amend the question
re: consulting the private sector to reflect the need for "broad-based
consultation" or something similar; it's obvious from the current "pilot"
participants list that at least some private actors have been contacted.

Along the lines of the second change, we request that Treasury ask
USED to schedule such a meeting.

Regarding the second paper on methodologies available to the Bank to
address climate change, we agree with the general thrust of the Treasury
paper and have no specific comments.



UNITED STATES DEPARTMENT OF COMMERCE
International Trade Administration
Washington, D.C. 20230

Options for World Bank Role in Addressing Climate

Comments U.S. Department of Commerce Office of Finance

The Office of Finance supports Treasury's recommended positions on shadow pricing, carbon accounting and offsets, and establishing quotas for energy efficiency and renewable energy associated with World Bank operations. We believe that adoption of any or all of these positions, especially shadow pricing, would demonstrate continued U.S. commitment to the environmental impact of projects financed by World Bank¹.

From a Commerce point of view, we would like to see that infrastructure and other sectors in which the United States is competitive are not neglected when new policy proposals are developed at the multilateral development banks. While implementation of Treasury's recommended positions may hasten the reduction of the World Bank lending to the energy sector (and thus reduce the business opportunities for these types of U.S. suppliers), we can envision that these losses could more than be offset by an increase in business opportunities in fuel switching, energy efficiency, "clean energy", renewable energy, and other types of energy projects. Increased World Bank financing for the latter types of energy projects may also spur development of alternative energy firms by creating a new market for these products. Our industry desks covering environmental technologies and renewable energy support this initiative.

Prepared by: MFuchs/TD/SIF/OF/ext. 3277

¹ We note that Eximbank was the first export credit agency to adopt environmental procedures and guidelines in 1995 and that OPIC is required by statute to assess the environmental impact of projects under consideration for political risk insurance and financing.



**U.S. Department of Energy Comments on Draft Paper Prepared by
Department of Treasury Entitled:
"Options for a World Bank Role in Addressing Climate, Proposed USG Positions"**

The paper prepared by Treasury does a good job of explaining the issues and laying out the associated pros and cons.

With regard to the first issue, **Shadow Pricing**, we concur that in spite of its lack of precision, the use of shadow pricing forces acknowledgment that carbon emissions have a price which must be recognized as part of the facility/project planning and investment decision process. However, we wish to note that it is unclear whether the "shadow price" applied by the Bank would actually be charged, and, if so, how the funds generated would be used. While we support the proposed positions, we would like more details on the terms under which the shadow price is applied and any linkage that may be contemplated with other Bank initiatives on climate such as carbon offsets (discussed below).

With regard to the second issue, **Carbon Accounting and Requiring Offsets**, we agree that accounting for the carbon emissions from energy related projects should be made a routine reporting requirement by the Bank. Further, the establishment of standardized methodologies for such carbon accounting at both the project and country levels will contribute to the perceived credibility of the information reported to the Bank. This will help to address leakage concerns and potentially make for a smoother graduation for some countries into accepting an emissions limitation commitment. We also feel that there may be a role for some limited form of carbon offsets program, possibly linked/coupled with the "revenues" collected through shadow pricing. Therefore, we support the proposed position, but wish to note that it is unclear whether the Bank intends to apply shadow pricing in conjunction with a carbon accounting/offsets program.

With regard to the third issue, **Establishing Quotas**, we agree with the establishment of growth targets, but strongly disagree with phase out of support of primary energy supply projects by 2005. By all accounts, fossil fuels, particularly coal, will for the foreseeable future remain the fuel of choice for many of the countries whose energy sector is expanding most rapidly. Having the Bank involved provides an opportunity to use its financial leverage to influence the technology choices that are made, such as greater application of cogeneration and clean coal technologies. Given that most of the growth in developing countries will not be met with environmentally benign technologies, the Bank can continue to provide an important role in insuring that, at a minimum, marginal improvements in the efficiency and emissions associated with a given project will continue to be made so that the rate of emissions growth is slowed in the near-term, with the longer term goal of stabilization and reduction.

We would be pleased to discuss these comments further. Thank you for the opportunity to comment.



U.S. AGENCY FOR
INTERNATIONAL
DEVELOPMENT

MEMORANDUM

March 19, 1998

TO: Bill Schuerch, Treasury
FROM: DAA/G/ENV, David F. Hales
CC: G/ENV/EET, Jeff Seabright
G/ENV/EET, Leslie Cordes
SUBJECT: World Bank Climate Options Paper

USAID supports Treasury's efforts to advance GHG considerations in World Bank lending and welcomes the opportunity to comment on the draft paper. We note that the paper suggests a role for development assistance in meeting these objectives. USAID is prepared to expand its direct assistance to the Bank in support of the goals noted in Treasury's paper. Below are specific comments:

Shadow Pricing: We believe that the proposed inclusion of a carbon shadow price in individual loan reviews would help force the Bank to address climate considerations in its lending practices, but would also (and perhaps more importantly) help develop a broader analytic foundation for the internalization of environmental/health/economic externalities. USAID is prepared to provide direct bilateral support to the Bank in meeting this challenge. Bank staff, however, seems reluctant to take a project specific approach to shadow pricing, preferring instead to focus on the broader sectoral strategy outlined in the new energy/environment strategy paper. USAID assistance could help overcome some of the obstacles in implementing this approach.

Offsets: We support the offset approach as a complement to shadow pricing and believe that it should be proposed as an immediate non-binding goal of the Bank rather than waiting till 2005. This would help increase incentives for renewable and efficiency lending without setting hard targets. This option may also be the most palatable to the Bank.

Targets: The offset approach outlined above would help generate 'internalized' targets which may be more attractive to Bank staff.

TO: Truman Semans

FROM: Jackie Krieger, OPPE
Tracy Narel, OAR
Christopher Herman, OIA

RE: Comments on World Bank GHG Options

This responds to your request for comment on options for World Bank programs to reduce greenhouse gas emissions.

(1) Shadow Pricing

The proposed Treasury position is to support expansion of Bank shadow pricing efforts and efforts to identify "win-win" project opportunities "upstream", to address emissions with local and regional as well as global impacts, and to integrate this work into normal project development. EPA tentatively supports this position.

Specific comments:

Pros and Cons:

Second bullet: The second sentence suggests that GHG reductions, unlike reductions of conventional pollutants, may not have domestic benefit. Yet GHG reductions resulting from energy efficiency improvements could well result in domestic savings. This is not gainsay the major point that shadow pricing might, as a spin-off, help improve GEF analysis.

Third bullet: It is true that developing country borrowers have not committed to GHG reductions and are not obligated to cover costs associated with achieving "global" benefits. It is also true that such borrowers may "resist" shadow pricing on these grounds. It seems to us however that the argument mistakenly implies a borrower entitlement to Bank funds. Neither the Bank nor donor countries are obliged to support carbon-intensive projects; both are entitled to the information, including information about energy alternatives, that shadow-pricing might produce; both may fairly elect to support such alternatives in country dialogue and lending operations; both, like the borrower itself, make their own decision in the last analysis.

Fourth bullet: It is true that shadow prices are imprecise and that eligible costs vary in consequentiality. But these qualities does not constitute a "con", given that they are no more imprecise than other guesstimates which are often, even typically, accepted as the basis of project economic analysis, e.g., in deriving consumer surplus or travel demand. And it can be expected that weighting factors or good practice protocols will emerge to avoid make-work exercises.

Proposed bullet: A bullet might address how a "shadow pricing" initiative would 'advance "meaningful contributions"' under the Byrd Resolution.

(2)

Proposed position:

First bullet: It is important that shadow pricing be comprehensive. Just as assigning a zero cost to emissions distorts energy "market", so might assigning costs only to "global" pollutants or only to air emissions. There is considerable danger, due to lack of comprehensiveness and the persistent practice of valuing water as "free", that the exercise could have the perverse effect of encouraging large-scale hydro projects. This danger could be avoided by a separate policy on dams involving adequate weighting of up-and down-stream hydrologic, social and ecosystem impacts.

Second bullet: Using GEF to fund shadowpricing exercises at the national energy planning level may be appropriate. The danger is that without GEF funds, which are limited, countries would decline to conduct any exercise, notwithstanding the potential for local benefit. Using GEF for analysis at the level of a conventional carbon project seems inconsistent with GEF goals.

(2) Carbon Accounting/Offsets

The proposed Treasury position would initiate energy sector gross carbon accounting and "work towards" end-use sector gross carbon accounting. A date certain would be set by which time the Bank would be expected to demonstrate a net carbon reduction in its developing country operations. EPA tentatively supports the Treasury position which, however, may need clarification in some respects.

--what is an "offset" here? Is it physical, e.g., a ton of carbon sequestered in sinks, or is it conjectural, e.g., a ton of carbon avoided in renewables, price reform or some other form of carbon demand management? EPA tentatively recommends the former. Even assuming that reasonable scoring conventions were agreed (e.g., how to derive a counterfactual baseline), the latter would present considerable room for manipulation of results. It could however lead directly to Bank support for renewable and energy efficiency projects. The former would be easier to count, would promote Bank support for reforestation if not necessarily protection of intact forests, and would constrain carbon projects to the pace of carbon sequestration projects without necessarily inviting Bank support for non-carbon energy projects. It is possible, even likely, however, that the constraint of an indirect approach would have that effect.

--would the offset requirement apply to Bank operations on an economy-wide basis or to operations in selected sectors? Limiting the offset requirement to the power sector could divert carbon-intensive operations into other sectors, i.e., transportation, primary production. EPA tentatively urges that it apply at least to power, primary production, transportation, forestry and mining.

--could the target date be calibrated to the ambitiousness of the offset requirement?

(4)

project materials of the staff response. The recent Coal India II project is a disturbing example of a first-rate expert analysis of carbon inefficiency in coal extraction that was virtually ignored in a coal expansion project that funded and perpetuated old carbon-inefficient technologies.

(5) Bank Support for Private Sector Energy Projects

Bank support for the private sector is increasing. The relation of shadow pricing, carbon accounting and subsector growth objectives to private sector guarantees, lending to intermediaries and funds, etc., should be developed.

(6) Transportation

The Bank should support development of sustainable transport planning capability in developing countries, at a minimum through a proactive program of technical assistance for integrated transport planning and demand management. Support currently is focussed, rather perversely, on improving and disseminating the Bank's highway design and capacity models. Transportation (dominated by gas-powered motor vehicles) is expected to be the fastest growing carbon-emitting sector in developing countries as well as one of the largest contributors to high levels of urban air pollution and congestion. Capacity expansion ultimately exacerbates these negative trends. Transport- and transport demand management are complex subjects requiring technical capacity and planning capabilities not available in many developing countries.

(3)

Selecting a fairly-distant target date, e.g., 2005, suggests a fairly ambitious carbon offset requirement.

Pros and Cons:

Second bullet: It is not clear why the second and third sentences are germane. They seem to be true-but-irrelevant. To state that Bank projects are part of the baseline does not Claiming that Bank involvement "reduces emissions below the (counterfactual) baseline" that would otherwise have prevailed is not the same as claiming that the Bank's portfolio already offsets carbon production with equivalent or greater carbon sequestration or non-carbon alternatives. Price reform, if actually implemented, that would not have occurred without Bank involvement allows the Bank to make the former, but irrelevant, claim--unless, of course, Bank support, although linked to price reforms, diluted and forestalled market pressures that might have led to sector reform sooner.

Third bullet: An offset requirement could also lead to renewed Bank support for large-scale hydropower projects. EPA urges that needed strategies to reduce Bank-generated carbon emissions be accompanied by measures to reduce risk of perverse consequences.

Potential bullet: A bullet might address how "carbon accounts and offsets" would 'advance "meaningful contributions"' under the Byrd Resolution.

(3) Quotas for Energy Efficiency and Renewable Energy

The proposed Treasury position would seek annual growth targets in the number and value of energy efficiency and renewable energy projects. It would not seek a portfolio share for these subsectors. It would seek to end Bank support for primary energy supply projects by a date certain. EPA tentatively supports this position.

Pros and Cons

For ease of reference, a bullet format would be helpful.

"Blunt object" is forensics. Do you mean "blunt instrument"?

(4) Energy Efficiency Analysis

EPA urges that consideration be given to seeking energy efficiency analysis in projects in the power (including coal mining) and industrial sectors. Such analysis would highlight opportunities for energy efficiency components. It should be linked to explicit discussion in

To: Tommy Semans
From: Ray Squitieri
Subject: Draft position paper on the World Bank and climate change

The draft position paper on the World Bank and Climate Change makes a good case. The three possible approaches discussed -- shadow pricing, requiring offsets, and adopting lending quotas are all worth considering. At the same time, I wonder if draft doesn't occasionally lose sight of the forest.

First, shouldn't energy subsidies be our first target? I know we have conflicting evidence on this. Several years ago, calculations made with OECD's GREEN model several years ago showed that eliminating energy subsidies would reduce carbon emissions by 18 percent, compared with the baseline. I also recall a more recent WB research paper that concluded that restructuring in the FSU had rendered most of the fat previously contained in energy subsidies. Perhaps we should consider a condition that limits WB loans to countries that have made progress in eliminating energy subsidies?

Second, there is something to be said for shadow pricing, but isn't it a better idea, at least in principle, simply to adjust existing taxes so they better reflect the carbon content of fuels? Shadow pricing is based on the same idea, but introduces additional opportunities for rent-seeking and market distortions; it won't take the affected parties long to see this. We have seen the unintended consequences of shadow pricing already, in New York, Massachusetts, and several other states, where public utilities commissions have applied "adders" to electricity generated by out-of-favor fuels. The result has been to produce an industry whose product is neither cheap nor green.

Third, and most generally, we should be careful about asking the World Bank to divert resources from its central mission, which is to improve the lives of the world's poor. Traditionally -- and appropriately -- the Bank has addressed its mission by focusing on long-term growth in poor countries. We should cast a skeptical eye on anything that diverts resources from this objective. The World Bank's 1992 Development Report (under the general direction of Larry Summers) made this point emphatically. Pointing out the great opportunities for improving lives in poor countries, the report noted that : " ... investments with real rates of return as low as 5 percent could do more for future generations than investments in large reductions of greenhouse emissions."

MEMORANDUM TO: TRUMAN SEAMANS
CC: DAVID SANDALOW, MIKE COPPS, JEFFREY HUNKER
FROM: NAZIR BHAGAT Ph: 482-3855
SUBJECT: COMMENTS ON WORLD BANK STRATEGIES

I would like to add to Jeffrey's comments on a new approach for the Bank. Specifically, Jeffrey's recommendations were to: "1) set incentives for Bank lending across all projects to reduce GHG, 2) promote a Bank role in opening its projects for competitive bidding for CDM projects, and 3) encourage the Bank to engage in developing a market for CDM credits." My comments on each are as follows:

1. Setting Incentives for Bank Lending:

I propose that the Bank be urged to accept a CAFE like constraint on all new power plant lending it does. Thus, the Bank should formally commit that the portfolio of power plant projects that it will approve in the year 1999 (and each succeeding year) will have an average Emissions per Kilowatt Hour of power delivered to be X percent below the average emissions/KWH of project portfolio it approved in the last five years. The standard of X percent for a particular year should include credits for emission reductions due to any projects to modernize and improve the energy efficiency of existing power plants and T&D systems that the Bank approves in that year.

I suggest that the X percent should be negotiated first within the G-7, and then the OECD and/or Annex-I, prior to its wider discussion and adoption of a specific target by the Bank. Moreover, the X percent target should be set for the initial few years and the percentage should be revised (presumably tightened gradually) periodically to reflect new data and technologies.

2. Competitive Bidding for CDM on Bank Projects:

If proposal 1 above is accepted, then the Bank will need to track the projected Emissions per KWH of Bank projects prior to their approval. Moreover it would be in the Bank's interest to reduce the average emissions per KWH on its portfolio. Thus, it would be in the Bank's interest to act as a matchmaker and help the developers of proposed high emission power projects to seek out firms that can help reduce emissions and include the emission reduction portion as an integral part of the project submitted to the Bank for approval. Presumably, the issue of proving "additionality" would be easier for such two part projects.

3. Engage in Developing A Market For CDM Credits:

The Bank's role in developing a market for CDM credits should be approached with care because the CDM rules are yet to be negotiated at COP 4. Whether the Bank itself can generate any CDM credits (if, for example, the average Emissions/KWH on its portfolio falls below its established target) is yet to be decided. However, even if the Bank is allowed to generate credits, the Bank generated credits will be only a small part of the total. Hence, the Bank role in developing a market for CDM credits should be primarily as a catalyst and facilitator, as recommended by Jeffrey.

DEPARTMENT OF THE TREASURY
WASHINGTON

March 16, 1998

cc: JAF
AM
JA
RL
JL

MEMORANDUM FOR RAFE POMERANCE
BARBARA GRIFFITHS
DAVID SANDALOW
PETE JORDAN
WILLIAM NITZE
JIM HESTER
DAVID HALES
BROOKS YEAGER

CC: Distribution

FROM: William E. Schuerch *WES (for WES)*
Deputy Assistant Secretary
International Development, Debt and
Environment Policy

RE: Global Environment Facility (GEF) Assembly

PAGES: 5 total

Deputy Secretary Larry Summers has asked me to lead the U.S. delegation to the upcoming GEF Assembly and GEF Council meeting on March 29 - April 3 in New Delhi, India. A schedule for the both meetings is attached.

The Council meeting will focus on preparations for the Assembly (rules of order, final agenda, joint Assembly Statement), new project proposals, the FY99 GEF budget, and the GEF-2 Replenishment Report. On the margins of the meetings, there may be contact groups to address current financial issues involving the Biodiversity and Climate Conventions, although nothing is scheduled at present.

I strongly believe that the delegation should be small, especially given the relatively simple agenda. Most other donors plan not to send high-level officials and some indicated they will send small delegations.

You may obtain further details about arrangements from Truman Semans, at TEL (202) 622-1229.

Thank you.

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Global Environment Facility

GEF/C.11/1/Rev.1

GEF Council Meeting
March 30-31, 1998
(NGO Consultations March 29, 1998)

PROVISIONAL AGENDA

1. Opening of the meeting
2. Election of a Chairperson
3. Adoption of the agenda
4. Statement by the Chair of STAP
5. Report on the second Replenishment of the GEF Trust Fund
6. Review of evaluation reports and follow-up actions
7. Review of CEO Report and other documentation prepared for the GEF Assembly
8. Work Program
9. GEF Corporate Budget for FY99
10. Other business
11. Joint Summary of the Chairs

GEF ASSEMBLY PROVISIONAL TIMETABLE

Wednesday, April 1

Morning session

8:00 - 9:30	Registration ¹
9:00 - 10:30	Opening Session Welcoming address by the host Government Welcoming address by the CEO/Chairman of the GEF Statements by the Heads of the Implementing Agencies
10:30 - 11:00	Break
11:00 - 12:00	Election of the Chairperson of the Assembly Adoption of the Rules of Procedure Election of Vice-Chairs Adoption of the agenda Organization of work
12:00 - 12:30	Statement by Representatives of Conventions, STAP, NGOs
12:30 - 2:30	Constituency meetings (box lunches available)

Afternoon session

2:30 - 3:30	Overall Performance of the GEF and Lessons Learned	
3:30 - 4:30	Policies, Operations and Future Development of the GEF	
4:30 - 7:00	Statements by Representatives of GEF Participants	5:00 - 7:00 Panel of Eminent Persons on the Global Environment and Sustainable Development

Thursday, April 2***Morning session***

9:00 - 9:30 Status of GEF Trust Fund
 9:30-10:00 Report on Membership
 10:00 - 1:00 Statements by Representatives

Afternoon session

1:00 - 3:00 Constituency Meetings (box lunches available)
 3:00 - 7:00 Statements by Representatives

9:00 - 7:00 Workshops and Seminars
 9:15 - 10:45 Panel Organized by the Government of India: Efforts towards Sustainable Development: Role of GEF
 11:15 - 1:00 Panel on Science and the Global Environment
 3:00 - 4:30 Panel organized by NGO's
 5:00 - 7:00 Panel on Parliamentarians and the Global Environment

Friday, April 3***Morning session***

9:00 - 1:00 Roundtable of Representatives
 1:00 - 3:00 Lunch

Afternoon session

3:00 - 4:00 Statement of the Assembly
 4:00 - 5:00 Break/Press Conference
 5:00 - 6:00 Closing of the Assembly

9:00 - 1:00 Workshops and Seminars
 9:00 - 10:30 Panel on the Media and the Global Environment
 11:00 - 12:30 Panel on the Private Sector

I many pieces. Overview.

One sentence. Focus on major decisions.

Then Jon nos.

Joe + Raulo
costs + benefits

I Costs from SOM summ. Table 1

Low provided optimistic ass. Truly B.A.

e.g. last bus \$6-\$13 b purchases from Russia

II Benefits Nonclimate

Reduced air pollution, congestion, accidents

$\approx 1/5$ to $1/3$ of costs

Leaves • sinks

• other models

} mostly for study

• How to close gap

This group
have to develop

- electr. resist.

"Net benefits of
package even before
GCC benefits..."

- Don't close

"Net cost is small..."

considered but recommended against

"Net ben. incl. GCC is X"

(Assume will be )

I Many pieces

I will give overview of the big pieces
of the puzzle, how they fit together,
+ the questions you all have to decide
+ important elements of defense strategy I won't talk about, e.g. address job loss.
Rather work toward what is the one sentence summary that we'd want to put out.
Focus on major decisions group has to make. (or "will there be a Report")
Then who writes

Jon will walk you thru the numbers on costs + benefits.
Joe + Randy are prepared to answer questions on costs + benefits respectively

I costs from sample (as p2 says)

Table 1

How low...? Very low, provided very optimistic
assumption re trading. (Fortunately Buenos Aires has not yet
happened.) e.g. last rows of Table 1 down to \$6 - \$13 b

(one drawback means • most reductions abroad • transfer to Russia
• 1/3 • even more like
• auto foreign aid people)

II Benefits non climate

Leaves

sinks

other models

} mostly for us

How to close the gap

- electr. restr.

- Don't close

This group

One sentence "Net benefits
of package"

"Net cost is small" even better

we considered but recommend against

"net benefit incl. GCC is X"

requiring a single monetary no.

Gunter → Gardner



Al McGowan - Rawy

Call Gardner

spoke to Jon.

We're preparing as principals

we may disagree

we're going to go with other
might make it

if that causes problem

May be better not engage

We reserve the right
not a sign off

now source clearing
to per your offer to
him interaction with
MAX reg.

we understand
agencies differ.
(Max per you
don't mention
specifically)

To Los
selling \$66

1 as base

pns
trans 1.

Ben Jones main contact
622 4447 as Treas.

He has rights of appeal

**Climate Change
January 29, 1998
11:00 - 11:45
Room 7250, Main State Department Building
Agenda**

I. Quick Review of Last Week's Action Items

- Presidential Decision on Signing
- Economic Analysis
- Testimony Preparation
- Hill Info Packet
- Cabinet Q&As
- Cable/Letter to Umbrella Group
- Letter to Gilman

II. Diplomatic Issues -- Setting Priorities

A. Diplomatic Priorities for 1998

Status of Internal Discussions (What issues have been identified?
What issues remain?)

- Clean Development Mechanism
- Emissions Trading Rules (including umbrella issues)
- Carbon Sinks
- Commitments of Advanced Developing Countries
- Others..

B. Timetable for Priority Setting and Principals' Action

C. Developing Country Programs

- Rollout of AID Initiative
- Power Plants Initiative (Atwood, Fuerth, Wirth/Eizenstat Initiative)

III. Next Steps and Next Meeting

Trading Scenario	Technology Assumption	Sinks Assumption	Permit Price	Resource Cost	Value of Transfers	% Reductions in U.S.
Annex I	1.0	100% reported	\$11/ton	\$5 billion	\$4 billion	19%
Umbrella - EU, EE + 100% JI	1.0	no sinks	\$14/ton	\$8 billion	\$7 billion	19%
Umbrella - EU, EE + key LDCs	1.0	no sinks	\$16/ton	\$9 billion	\$7 billion	22%
Umbrella - EU, EE + Key LDC + 20% JI	1.0	no sinks	\$15/ton	\$8 billion	\$7 billion	20%

Trading Scenario	Technology Assumption	Sinks Assumption	Permit Price	Resource Cost	Value of Transfers	% Reductions in U.S.
Annex I	1.0	50% reported	\$26/ton	\$12 billion	\$9 billion	34%
Umbrella - EU	1.0	no sinks	\$26/ton	\$13 billion	\$11 billion	31%
Annex I + 20% JI	1.0	no sinks	\$36/ton	\$17 billion	\$13 billion	38%
Umbrella - EU, EE + 20% JI	1.0	no sinks	\$30/ton	\$15 billion	\$12 billion	34%

Todd's

1/27/92

920 or less

Answer 2

+207.

1.0 or 1.1 AEI

5270 SILAS 514 TON (31% reduction at 400)

Electr p + 8.02 / 100

offset by electr. resist.

No Smkg.

VERSION SENT TO
OMB, 2/5/98**Q's & A's for Climate Change testimony 2/98**THE PROTOCOL

How can you say the Kyoto Protocol is a success if there is no mention of developing countries? The Protocol is severely flawed.

On the contrary, most of the elements of the President's package were put firmly in place at Kyoto. The Protocol includes the market-based mechanisms of international emissions trading (across all six greenhouse gases) and joint implementation among developed countries. Moreover it allows for full flexibility on the kinds of policies and measures a country may enact domestically to achieve compliance, and sets the targets on the basis of a multi-year objective, rather than a single fixed-year obligation. With regard to developing countries, it allows for investment in projects in developing countries to be used as offsets against obligations in developed countries (through the Clean Development Mechanism (CDM)). The Protocol also beefs up all Parties' national communications and gives advanced developing countries the option of adopting an emissions budget and trading under the Protocol – potentially providing more development resources than the project-based CDM. There is of course more work to do, particularly on gaining the meaningful participation of developing countries, and we plan to make bilateral and multilateral efforts to this end.

INSTITUTIONAL/PROCEDURAL/SIGNATURE/RATIFICATION ISSUES

Do you plan to sign the Kyoto Protocol and then ignore Senate advice and consent?

Absolutely not, and we are here today to begin this dialogue. As we have said, U.S. ratification will require the advice and consent of the Senate. The United States may choose to sign the Protocol during the year that it will be open for signature, but that would not bind the United States to the Protocol's requirements.

When do you expect the President to sign the Kyoto Protocol?

The Kyoto Protocol opens for signature in March 1998 and remains open until March 1999. We hope and expect to sign during that period.

When do you expect the President to submit the Protocol to the Senate for its advice and consent? Isn't the President disregarding the Senate's appropriate constitutional role of advice and consent?

As we have said, U.S. ratification will require the advice and consent of the Senate. The United States may choose to sign the Protocol during the year that it will be open for signature but that would not bind the United States to the Protocol's requirements.

If the Kyoto Protocol is such a positive achievement, why has the Administration said it will not submit it to the Senate for its advice and consent to ratification?

The Kyoto Protocol is an historic step forward in the effort to meet the challenge of global warming. We believe it reflects an environmentally strong and economically sound approach to this very difficult problem. But there are details of additional elements we need to work out in order to have a package ready for submission to the Senate. In particular, we have not yet established the mechanism and activities to ensure that the President's requirement for meaningful participation from key developing countries is fully met. Though the Protocol makes a down payment on such participation, more needs to be done in this area. Additional work also needs to be done in fleshing out the rules and procedures for market-based emissions trading. The Administration is working hard to fill in these pieces and looks forward to submitting the Kyoto Protocol to the Senate once these objectives have been achieved.

Why did you agree to a provision that will allow this Protocol to go into effect all over the world without U.S. ratification? Didn't you intentionally diminish the role of the Congress?

The U.S. entered these negotiations with the very clear position that we did not want to reserve the power to block this important international treaty simply by not ratifying it. It is not in American interests to prevent the international community from acting against the very serious threat of climate change.

Nevertheless, for the Kyoto Protocol to be effective in reducing global emissions, it must apply to the majority of the world's large emitters. Accordingly, to enter into force, the Protocol must be ratified by at least 55 countries including Annex I nations, accounting for at least 55 percent of the total 1990 carbon dioxide emissions of developed countries. We anticipate that to meet this threshold, either the Russian Federation or the United States will have to ratify, even if the European Union and other developed Parties ratify as well as most developing countries. Regardless of when we ratify, we will still participate as a Party under the UN Framework Convention on Climate Change and have significant influence over the related processes.

SCIENCE

How do we know there is any reason for taking action? Isn't this just too costly?

The science of global warming is compelling. A 1995 report, representing the work of more than 2,000 of the world's leading climate change scientists, concludes that "the balance of evidence suggests that there is a discernible human influence on global climate." While a clear empirical relationship between cause and effect is difficult to establish, 1997 is the warmest year on record for average global surface temperatures, and nine out of the last 11 years are among the warmest ever recorded. More record warm years are in the forecast. The Administration does not believe it is responsible to delay taking preventative action on the climate change issue; however, we recognize that any action must proceed sensibly in a way that is economically sound.

Background: The cost of inaction would be devastating in human and financial terms: a greater incidence of droughts and storms, relocating entire communities because of the inundation of our coastal areas, a higher incidence of tropical disease, and a threat to plant and animal species throughout the United States. Droughts and storms are indeed costly: the Southern Plains drought of 1996 was estimated to cost \$4 billion, and the Northwest floods of 1996-97 about \$3 billion. Although recent examples of severe droughts cannot be unequivocally attributed to global warming, they do indicate a pattern consistent with scientific understanding. Abroad, climate change could devastate the Middle East and Africa, exacerbating political tensions, and the world's poorest countries, already hurt by food production and distribution problems, are expected to suffer more in these areas because their countries will not be able to adapt to further challenges posed by climate change.

We are shown graphs and data depicting global warming, but we have heard reports that say NOAA satellite data refutes this warming; and in fact shows a cooling trend...How do you explain this contradiction?

There is no contradiction. Satellites measure temperature above ground (5,000-30,000 feet), taking into account aerosols and ozone loading (due to volcanic eruptions). Surface measurements are taken at ground and sea levels, where aerosols and ozone loading are not as effective as in the atmosphere. NOAA Satellite data consistently has shown over the past 17 years a global warming trend, when adjusted for the influence of aerosols and ozone loading due to volcanic eruptions such as Mt. Pinatubo. This pattern is consistent with the warming trend assessed from balloon temperature readings and surface temperatures readings.

Is it true that even if all the developed countries complied with their targets that their actions would be just a "drop in the bucket" in addressing climate change? Over what time scale is global action likely to be required?

The Kyoto Agreement is an historic step in the effort to address climate change. The binding targets agreed to by developed nations provide important real reductions and lay the groundwork for additional reductions in the future.

Clearly, however, Kyoto is only one step in a long process. To ultimately stabilize emissions at a safe level in the atmosphere, significant reductions – beyond those agreed in Kyoto – will be needed. Furthermore, developing countries – whose emissions are likely to eclipse those of industrialized nations by 2030 – must also begin to limit their emissions if we are to effectively address the problem. The Administration is firmly committed to working to secure meaningful participation from key developing countries and will not submit the Protocol to the Senate until such participation has been achieved.

Background: Even the most stringent proposal tabled for consideration by the Parties in Kyoto (that proposed) by the Alliance of Small Island States, requiring developed country Parties to reduce emissions by 20 percent below 1990 levels by 2005) would have had only a small impact

on the overall problem. It is anticipated that to maintain global concentrations at current levels, global reduction of approximately 60-70 percent of CO₂ emissions would be needed.

How can we trust the data emerging from the Intergovernmental Panel on Climate Change (IPCC)?

The Intergovernmental Panel on Climate Change (IPCC) is the most authoritative body on the science of climate change reflecting the views of the world's pre-eminent climate experts. The more than 2,000 scientists concluded in the IPCC's 1995 Second Assessment that there is a "discernible human influence on the climate system." For the first time, we have a clear scientific indication from experts around the world that human emissions of greenhouse gases are affecting the climate system, and we have ample indications about the potential impacts of climate change.

ENFORCEMENT & COMPLIANCE/U.N./SOVEREIGNTY

Given the rules of procedure of the Conference of the Parties, aren't we turning over decisions that will affect the prosperity of American citizens to the very developing countries that are exempt from any obligations under the agreement?

No, we are not. The emission reduction commitments in the Kyoto Protocol were adopted with the full participation and consent of the Parties to which they will apply. To take effect, each of these Parties must ratify the protocol. In the United States, ratification would occur only after the advice and consent of the Senate under our Constitution. Moreover, under the Kyoto Protocol, we will have full national flexibility in how we meet our emission reduction commitment because we succeeded in Kyoto in rejecting calls for mandatory standardized policies and measures, such as energy taxes. Any change in the emission reduction commitments made in Kyoto could only occur through an amendment to the protocol. Any party that objected to such an amendment would not be bound by it. Thus, decisions that could affect the prosperity of American citizens will continue to be taken nationally by the United States and not by others.

If we ratify the protocol, won't developing countries be able to dictate the U.S. target in the future—and penalize us, if we fail to comply?

No. Any subsequent targets would have to be agreed to by the Parties to whom they would apply.

Is the Kyoto Protocol a threat to U.S. sovereignty?

No, it is not. Under the Kyoto Protocol, individual nations decide for themselves how best to comply with greenhouse gas emissions targets they have agreed to. The Conference specifically rejected proposals which would have imposed mandatory, standardized policies and measures,

such as energy taxes. It does not threaten our sovereignty for us to agree to cooperate with other nations in combating climate change. We cannot solve a global problem alone. The Administration believes that the Kyoto Protocol is in the best interests of the United States and will provide important environmental protection while ensuring continued economic growth and competitiveness.

Isn't this just another way of establishing another UN mega-Secretariat? Do we need anymore big international bureaucracies subsidized by the U.S. taxpayer? Moreover, aren't these people going to become an enforcement operation – and if we don't comply – what will happen? International penalties for noncompliance?

The Protocol contains several provisions intended to promote compliance. It calls for each Party to establish a system for national reporting and measurement of greenhouse gas emissions. As a result of a U.S.-proposed provision, a Party not in compliance with its measurement and reporting requirements cannot receive credit for joint implementation projects. Thus, the primary responsibility for enforcement is at the national level, and the will to act is a domestic matter which cannot be imposed by any foreign authority. We will work with other Parties to ensure that future compliance systems, as yet undetermined, will be strong but not overly bureaucratic.

In the Protocol, the Parties sought to use existing institutions and to minimize the creation of new ones. For example, the subsidiary bodies and Secretariat under the Convention will continue their functions under the Protocol. Because the United States contributes approximately one fourth of the Secretariat's budget under the Framework Convention on Climate Change we have considerable influence within the Convention and vis-à-vis its Secretariat. In all of its actions under the Convention, the Secretariat looks to the Parties for guidance, and must answer to the Parties with respect to its activities. If the United States ratifies the Kyoto Protocol, we will have similar influence under that instrument. Furthermore, in the case of the Clean Development Mechanism, the Parties will oversee the mechanism with the help of a small executive board and "operational entities to be designated" will certify emission reductions from specific projects.

What verification procedures are there to ensure that other countries honor their obligations?

There are several examples of different types of verification procedures in the Protocol. In Article 8, expert review teams will assess Parties' implementation of their obligations. These teams, coordinated by the Convention Secretariat and nominated by Parties, would initiate a thorough and comprehensive technical assessment of all aspects of the implementation by Parties. These teams are taken from the model of the existing system of in-depth review teams that examine Parties' national communications. There is also provision for the creation of verification and monitoring systems for emissions trading (Article 16 bis), joint implementation (Article 6), and the Clean Development Mechanism (Article 12). These will be developed in the coming years, beginning at COP-4 this November, as stipulated in the Protocol. The U.S. will use every opportunity to influence their formulation to ensure their acceptability.

How will the Protocol be enforced? Either it will be an honor system, without any real enforcement, in which case the United States will get taken advantage of as we honor our obligations while others ignore their own; or there will be a real enforcement system, in which case international bureaucracies will be able to sit in judgment on whether we are meeting our obligations. Which will it be? And aren't both these alternatives unacceptable?

As with most compliance systems, whether they are legal or regulatory in nature, there is usually some middle ground. There is still a tremendous opportunity to craft the compliance system of the Protocol as effective procedures and a mechanism to determine and address non-compliance are to be decided at later meetings. For both environmental and competitiveness reasons, the United States will be working on proposals to strengthen the compliance and enforcement regime under the Protocol but no international bureaucracy will be able to "sit in judgment" on whether we are in compliance. The primary responsibility for enforcement is at the national level, and the will to act is a domestic matter which cannot be imposed by any foreign authority. We will work with other Parties to ensure that level of responsibility is preserved.

ROGUE NATIONS

Why doesn't the Protocol exclude rogue nations like Iran, Iraq or Libya? Do you think they should be able to benefit from this Protocol?

The Kyoto Protocol is a global effort to reduce the trend of dramatically increasing greenhouse gas emissions. All nations recognized by the United Nations are eligible to join in this effort. Because Iran, Iraq and Libya are oil-producing countries with significant contributions to global emissions, it is especially important to include them in efforts to reduce emissions. The alternative, excluding them from emissions reductions efforts, would allow these countries to be "free riders," that is, to enjoy the global environmental benefits without joining in the global effort. Any possible activities under the Clean Development Mechanism would be governed by existing sanctions or other trade restrictions.

TARGET/ECONOMIC ISSUES

While the President proposed in October that the U.S. reduce emissions to 1990 levels by 2008-2012, the U.S. agreed in Kyoto to a 7% reduction below 1990 levels in the same timeframe. Why did we accept a more stringent target?

The 7% target is close to the President's initial proposal. It represents at most a 3% real reduction below the target of returning to a composite of 1990/1995 baseline levels by 2008-2012.

The remaining 4 percentage points result from changes in the way certain gases and activities that absorb carbon are counted.

Why did the U.S. support binding emissions limitations? I understand that voluntary programs may be equally as successful.

Two factors prompted the U.S. to propose binding limits for greenhouse gas emissions. First, it became clear that only two industrialized nations would meet the voluntary aim, established in Rio, to reduce emissions to 1990 levels by 2000 (and neither of those for reasons related to climate change). Second, the IPCC's 1995 Second Assessment Report provided important new information on the science of climate change, further underscoring the need to take action.

While binding targets provide greater surety that obligations will be met, they by no means preclude voluntary action. Limited voluntary here in the U.S. have proven effective in cutting emissions, and the Administration has proposed significantly expanding such programs in an effort to meet the Kyoto target. As an example, the Administration will be working with industry over the next nine months to develop voluntary, sector-by-sector initiatives for reducing emissions.

What's all the fuss over "sinks"?

The treatment of sinks in the Protocol altered the accounting method for carbon-absorbing activities, such as planting trees, in the U.S. total: sinks account for about 3% of the 7% reduction. The President's original goal assumed that the 1990 baseline would be lowered by carbon-absorbing activities, but under the method agreed in Kyoto, such activities do not lower the 1990 baseline. Because the 1990 level baseline is thus higher under the Kyoto agreement, the U.S. target becomes somewhat less stringent. Specifically, had the U.S. maintained the same level of effort assumed by the President in October, and no other factors had changed, the shift in the accounting method for carbon-absorbing activities would, alone, have transformed the President's goal of 1990 levels into a goal equivalent to at least 3% below 1990 levels. (As noted above, certain carbon-absorbing activities will count against emission reduction commitments in the budget period.) Despite opposition from a number of countries, the United States insisted that they be included in the interest of encouraging activities like afforestation and reforestation. Accounting for the role of forests is critical to a comprehensive and environmentally responsible approach to climate change. It also provides the private sector with low-cost opportunities to reduce emissions.

What is the Administration proposing to do to ensure that the United States is not put at an economic disadvantage?

While the U.S. and other industrialized countries would incur some reduction costs that would only gradually be borne by the developing countries, (e.g. higher short-medium term energy costs in the industrialized countries), the weight of the evidence suggests that, in the aggregate, these costs would be insignificant to U.S. competitiveness or exports.

Where the question addresses competitiveness concerns of a few energy-intensive manufacturing industries, such as aluminum, paper, and chemicals, we should consider the following: In her testimony, Dr. Janet Yellen noted the contraction of some industries and the expansion of others that one could expect in any instance of significant structural change to the economy. Some facts, however, provide a perspective on the issue: 1) on average, energy accounts for only 2.2% of total costs to U.S. industry; 2) energy prices already differ significantly between the U.S. and countries such as Venezuela, and yet U.S. industry does not generally flee to other countries; and 3) 2/3 of all emissions are generated by the transportation and “buildings” sectors – not manufacturing. To those observations I would add one more: the U.S. energy efficiency and alternative energy sectors are among the most advanced and competitive in the world. As other countries expand their own domestic climate change action plans, significant export opportunities are sure to open up for U.S. manufacturers in these fields.

How will the Kyoto Protocol impact the U.S. economy?

The President has put forward a comprehensive program that, if fully implemented, can reduce U.S. greenhouse gas emissions to the targeted levels while maintaining economic growth and competitiveness. In Kyoto, the U.S. succeeded in rejecting unrealistic targets proposed by other countries. Furthermore, we won acceptance of key market-based mechanisms, such as emissions trading, which will substantially lower the costs of complying with emissions targets.

But aren't there studies suggesting that the Kyoto Protocol will cost millions of U.S. jobs and tank the economy?

We see these kinds of studies every time this nation takes action to protect our environment. Whether it's climate change, clean air, or clean water, there continue to be those who believe that environmental protection must come at the expense of economic growth. We must look at the record: Today, unemployment stands at less than 5%, inflation is low, investment is booming, real wages are rising, and the economy has generated more than 14 million new jobs since 1993. All this good news despite the doomsday predictions of self-interested economic studies that warned of the disastrous consequences of the Clean Air Act, Clean Water Act, and other efforts to protect the environment.

How do you respond to the serious concerns of U.S. business, agricultural groups and labor about the Protocol?

In the months leading up to Kyoto, the Administration conducted an extensive outreach effort to solicit the views of major interest groups, including the business, labor, agricultural, and environmental sectors. This effort included a White House Conference which brought together leading experts from around the country to explore different aspects of the climate issue. What we learned contributed heavily to the U.S. policy announced by the President in October.

In Kyoto, we succeeded in gaining agreement on the key elements of the U.S. position, including a realistic, achievable, and comprehensive emissions target and flexible implementation mechanisms like international emissions trading and joint implementation. Accordingly, a number of interest groups have been supportive of the agreement. That is not to say that all sides are happy. A wide range of issues have been raised, and we look forward to working with interested parties to address legitimate concerns.

Did the Vice President's visit – with his call for greater flexibility on the U.S. side – diminish your negotiating leverage and help lead to the cave-in of our position of 1990 levels by 2008-2012?

The Vice President's visit injected new life into the negotiations by urging all Parties to seek common ground. Earlier in the meeting, the U.S. signaled its openness to consider differentiated targets for developed countries. This move helped bring on board a number of critical countries and demonstrated that we were serious about obtaining a successful outcome in Kyoto. The Vice President's call for greater flexibility went further in building trust among our negotiating partners. We were able to convince them to lower their expectations of higher, unrealistic targets and include all six major greenhouse gases and carbon "sinks" – elements which they had previously opposed. In the end, the U.S. level of a 7% reduction in emissions actually represents most a 3% real reduction below the President's initial target for stabilization of emissions at 1990 levels by 2012 when the sinks and all six gases are factored in.

Does the Protocol create a perverse incentive for the destruction of rain forests around the world?

No. The Protocol actually creates incentives through the Clean Development Mechanism in developing countries. The CDM will encourage afforestation and reforestation projects, as well as investments in clean technology, and allow these efforts to partially fulfill the emission reduction commitments of industrialized countries. Thus, industrialized (Annex I) countries will see advantages to working with developing countries in these and other areas as a means of achieving cost-effective reductions. Through such projects, developing countries will be able to obtain the financial resources, technology and know-how to promote their own sustainable development. In terms of temperate rain forests in developed countries, the way in which sinks are counted in the budget period actually penalizes countries that engage in deforestation.

Comment: The deforestation or loss of carbon sinks equates to increased emissions. Annex B Parties would have to reduce other emissions to a greater extent in the budget period to meet their targets.

GENERAL IMPLEMENTATION

What enabling legislation might be necessary to implement any agreement that would mandate legally-binding emissions reductions on the United States?

Legislation to implement the agreement domestically will depend on the policies chosen to implement it domestically. For example, bringing a domestic carbon emissions trading program into effect – as the President has proposed to start in 2008 – would in all likelihood require legislation. For now, the President has chosen to emphasize those measures that are more voluntary and incentive-based in nature, such as the his five-year, \$6 billion initiative involving tax cuts and R&D aimed at cutting greenhouse gas emissions. The greater the success of these early efforts, the less we will need to rely on tougher measures to bring us into compliance with our emissions target down the road. The Administration will seek Congress's assistance in fully funding these initiatives and is still evaluating a wide range of options for other domestic implementation efforts, and therefore I cannot state with any specificity what implementing legislation might be required.

Will we wait until the Protocol is ratified to take domestic actions to reduce emissions?

No. President Clinton has laid out a comprehensive plan for cutting U.S. emissions of greenhouse gases that will enhance, not diminish, our economic growth and competitiveness. The President's plan includes \$6 billion in tax incentives and R&D spending on energy efficient and low carbon-emitting technologies, restructuring of the electricity industry that will both cut emissions and save taxpayer dollars, overhauling of Federal energy use and procurement practices, and industry-by-industry consultations to develop specific voluntary plans for reducing emissions. We look to the Congress for support in these endeavors.

Taking quick, decisive, and economically sensible action to cut emissions will also send a powerful signal to the rest of the world that the United States is prepared to lead in the effort to address global warming. In particular, this will help in our efforts to recruit developing countries to play a greater role.

Are you planning to implement the Protocol by Executive Order?

The Administration fully recognizes the important role of the Senate in providing advice and consent to ratification of the Kyoto Protocol; and we look forward to working with the Senate, and with this Committee in particular, toward this end. The President has stated that we will submit the Protocol for ratification once we have secured meaningful participation from key developing countries and further elaborated rules and procedures for international emissions trading.

As the President said in his State of the Union address, there are actions that we can begin taking at home today that will reduce emissions while saving money and making our economy ore efficient. The Administration plans to pursue these initiatives – which began with our 1993 Climate Change Action Plan – with increased vigor in the weeks, months, and years ahead. We look forward to the support of the Congress as we move forward.

Isn't the domestic Climate Change Program just a way of implementing an international agreement without securing Congressional agreement to the policy first?

Absolutely not. The President's recent announcement of a new \$6 billion initiative to address climate change, which includes \$3.6 billion in tax credits and \$2.7 billion in new R & D spending, seeks to place the country on a path intended to reduce emissions before such reductions become binding (if the Protocol is ratified). It is necessary to start this process now, to avoid the much greater costs of starting later. The intent is to build upon the accomplishments of the U.S. Climate Change Action Plan launched in 1993 to meet the voluntary commitments under the UN Framework Convention on Climate Change. Although the Plan is not expected to achieve its stated objective of returning U.S. emissions to their 1990 levels by the year 2000, it has demonstrated that voluntary actions can be effective. As was the case in 1993 and after, the new initiative will require Congressional support to have the widest possible influence.

NATIONAL SECURITY

Is it true that the Kyoto Protocol's binding emissions limits could compromise our national security interests in some way by limiting our capability to participate in certain military activities?

No. In Kyoto, we got everything that the Department of Defense outlined as necessary to protect military operations and our national security. These objectives deal with the treatment of bunker fuels and with emissions related to multilateral operations pursuant to the UN Charter. Moreover, emissions of greenhouse gases by the U.S. military amount to less than one-half of one percent of total U.S. greenhouse gas emissions. Even if these were to increase modestly because of unilateral military actions, it is simply untrue that such an increase would make military actions politically or diplomatically more difficult. We have ample room within the emissions reductions commitments agreed to in Kyoto to accommodate U.S. military emissions, including any that might result from unilateral military actions.

Background: More specifically, the Protocol exempts from emission limits those emissions from "bunker" fuels (for international maritime or aviation use), emissions from multilateral operations pursuant to the United Nations Charter (i.e., not only multilateral operations expressly authorized by the UN Security Council (such as Desert Storm, Bosnia, Somalia) but also multilateral operations not expressly authorized that are nonetheless pursuant to the UN Charter, such as Grenada). Countries may also decide, among themselves, how to account for emissions relating to multilateral operations (for example, U.S. training in another NATO country). This provision avoids the need to use emissions trading to allocate such emissions.

Why don't you just exempt the military rather than use this complex formula for bunker fuels in the Protocol and the decision of the Parties to exempt certain well-defined military operations?

We have ample room within the emissions reductions commitments agreed in Kyoto to accommodate U.S. military emissions, including any that might result from unilateral military actions. Emissions of greenhouse gases by the U.S. military amount to less than one-half of one percent of total U.S. greenhouse gas emissions. To exempt the military would overlook opportunities for the Federal government to make its own operations more energy efficient, thereby saving taxpayers' dollars. DoD has already made significant strides in this area, reducing their logistical burden of procuring fuel.

EMISSIONS TRADING

Isn't it true that your own analysis showed that reducing greenhouse gas emissions would slow economic growth and raise gasoline prices at least \$0.26 per gallon?

The findings to which you refer are projections of the Interagency Analytical Team's draft analysis completed in June of 1997. Since this did not take into account the specifics of the Kyoto Protocol, or the elements of the President's domestic plan, the Administration is currently completing a new economic analysis. [Preliminary findings of the new interagency analytical effort]

How can the Administration set up a verifiable trading regime anyway?

The Administration will build upon its experience with the SO₂ emissions trading program in developing verifiable domestic and international trading regimes. This coming November in Buenos Aires, the Parties to the FCCC will continue their work on emissions trading to define the "relevant principles, modalities, rules and guidelines" for verification and monitoring of emissions trading.

Can you assure the Congress that every other party to the Protocol will have equivalent monitoring and verification procedures for emissions trading?

Parties participating in the international emissions trading regime will have to comply with the monitoring and verification procedures to be agreed in future meetings of the Parties. Compliance procedures and mechanisms also to be developed will help ensure that equivalent monitoring and verification procedures are maintained by all trading parties.

How can you be so sure trading will save us money?

A number of economic studies, as well as our own experience with domestic emissions trading to combat acid rain, indicate that international emissions trading has the potential to substantially lower the costs of complying with emissions targets.

It seems that the trading regime is constructed on the premise that we pay Russia for the reductions that occurred due to the collapse of their economy not because they have taken any action to reduce greenhouse gas emissions. Is this sensible?

The international emissions trading scheme agreed to at Kyoto will be open to all countries with targets. Countries whose actual emissions are below their allocated emissions can sell the difference to other countries seeking more economical emissions reductions. A country can enjoy excess emissions "credits" because it is more efficient at domestic reductions or, as in the case of Germany or several countries of the Former Soviet Union and Eastern Europe, due to a major economic transition. Allowing these countries to sell some of these credits can both help lower domestic costs of greenhouse gas reductions in the U.S., and provide those countries with the resources that will allow them to invest in the most climate-friendly technologies possible as their economies recover.

Aren't we giving Russia a potentially sizable transfer of resources with no guarantee that Russia will use it wisely? We will also have no leverage on Russian policies with these funds. Isn't this a giveaway of taxpayer money?

In funding additional energy research and creating incentives for increased use of renewable and alternative energy sources, the Administration's domestic implementation plan is aimed at creating the domestic capacity to reduce greenhouse gas emissions cost-effectively. However, U.S. firms – not the U.S. government – may also choose to purchase international emissions credits in order to meet their emissions obligations. As with any market transaction, purchases of these credits will have to comply with all U.S. legal and regulatory requirements. At the same time, Russia will have significant incentives to use the revenue generated to invest in the most modern, climate-friendly plants and equipment so that as its economy recovers, it continues to produce emissions credits that it can sell on international markets.

Comment: The Russian Federation will be on a more sustainable path in its use of energy. Initial projections by Department of Energy, Energy Information Administration, indicate that the countries of the former Soviet Union and Eastern Europe may have up to 800 million metric tons of emissions credits available for sale in 2010. End comment.

You claim that getting emissions trading was a great achievement and you base much of your economic case -- that this agreement won't be too costly -- on trading. But the protocol includes only the most general concept of trading, without the principles in your January 1997 proposal. Haven't we lost our leverage by signing onto a binding target and timetable without achieving the specifics on emissions trading?

Clearly additional work needs to be done in establishing appropriate rules and procedures for emissions trading. We will use every multilateral and bilateral opportunity until the November

Conference of the Parties in Buenos Aires, Argentina to develop a consensus on the structure of an emissions trading regime. However, let me be clear. The Protocol locks in the right to trade emissions, and this is not a right that will be surrendered at any future negotiation.

You don't know how trading will be monitored, verified or administered, do you?

The rules and procedures for the international emissions trading regime are to be defined at the Fourth Conference of the Parties (COP-4) in Buenos Aires, Argentina this coming November. Until COP-4, we will work hard to build a consensus on the structure of an emissions trading regime which provides the greatest flexibility for our private sector and domestic implementation.

Can you explain how the system will work if some countries have domestic trading, as is anticipated here, and others, such as the EU, do not? Will U.S. companies trade with foreign countries? Will our trades have to be made through the government?

At this time it is premature to speculate on how foreign governments will choose to design their own domestic emissions reduction programs. From our perspective, however, the private sector will play a critical role; we envision U.S. firms actively participating in our domestic program as buyers, sellers -- and intermediaries -- of emissions trading. We will seek to structure a similar role for the private sector in the international trading regime. One could envision a U.S. company, for instance, purchasing emissions permits from foreign counterparts, or eventually, from private brokers (in the case of a private sector managed program) or dealing directly with a state-run emissions trading office in a foreign country that chooses to maintain more direct government involvement. Of course if need-be, the USG will be prepared to facilitate trades where foreign governments institute public sector managed programs, but we do not envision the USG funding trades directly.

UMBRELLA

You've talked about setting up a potential trading block of countries outside the EU -- an umbrella to counter their bubble. How would the umbrella work? Would you intend to limit trading to countries within the umbrella? Is that legal? Do you think setting up such a block that excluded the EU makes good sense from a broader foreign policy perspective?

We have proposed a meeting of the prospective members of an "umbrella" group -- including representatives from Canada, Japan, Australia, New Zealand, and Russia, among others, -- to discuss the function(s) that the group may have. The umbrella group will serve as a forum to develop consensus among the member countries on important issues involving design of an emissions trading regime leading up to the Fourth Conference of the Parties in Buenos Aires, Argentina this coming November. We will be reviewing other roles of the umbrella group with our partners during this meeting. Whatever function the umbrella serves will be fully compatible with applicable trade agreements (WTO, MAI, etc.) and our broader foreign policy objectives.

THE BUBBLE

If the “bubble” arrangement gives the EU an advantage, as Under Secretary Eizenstat admitted to congressional observers, why did the U.S. agree to it?

Accepting the European Bubble arrangement was essential in reaching agreement with the EU on a number of elements of the Kyoto Protocol which were key to the US, including international emissions trading, joint implementation, and project-based reductions in developing countries under the "Clean Development Mechanism." While we ultimately accepted their proposal, we succeeded in scaling down the benefits of the bubble by excluding new members to the EU from bubble allocation arrangements during an ongoing commitment period and defining the responsibility of the EU and individual members in case of non-compliance.

Haven't we just given the Europeans free “hot air” under their bubble and saddled ourselves with paying for it?

Agreeing to the European Bubble arrangement was essential in reaching agreement with the EU on a number of elements of the Kyoto Protocol key to the U.S., including international emissions trading, joint implementation, and project-based reductions in developing countries under the “Clean Development Mechanism.” Depending upon how the EU decides to allocate EU-wide emissions to its members, several European countries could stand to benefit from reductions generated by the UK and Germany.

These reductions, however, came only at great effort by the UK and Germany, as the UK virtually shut down its coal industry and shifted to natural gas, and Germany's taxpayers funded industrial restructuring and expensive efficiency improvements in the former East Germany. In allowing their reduction to be used to subsidize emissions growth in Portugal, Spain, and Greece, it is the German and UK taxpayers who have “saddled” themselves with paying for it, as these tons will no longer be available for purchase by the U.S. or other potential buyers of emissions credits in an international emissions trading market. At the same time, those same countries will likely be accepting more stringent internal reduction targets which will also have their costs.

DEVELOPING COUNTRIES

What exactly does President Clinton mean by “meaningful participation from key developing countries”?

Climate change is a global problem that requires a global solution. Current projections show that developing country emissions will surpass those from industrialized countries by 2030 or sooner. The problem of climate change cannot be solved unless developing countries take measures themselves to limit greenhouse gas emissions.

The U.S. will be working bilaterally, regionally, and multilaterally in the coming months and years to promote more active efforts by developing countries to limit their emissions. We will concentrate on key countries and on approaches that are consistent with the economic growth and development of these countries and with other environmental objectives. We will not submit the Kyoto Protocol to the Senate for advice and consent to ratification until we feel we have achieved meaningful participation from key players in the developing world.

We must also recognize that the term “developing country” encompasses a wide range of nations which are at various stages of industrialization and contribute differently to global emissions. Accordingly, there is no one-size-fits-all approach to measuring developing country participation. Clearly, a country with high GNP or one that emits a proportionally large share of global emissions should be expected to do more than one that is poor or whose emissions are negligible.

Can developing countries assume binding targets under the Kyoto Protocol?

Yes, they can. Developing countries seeking access to the benefits of international emissions trading may voluntarily assume binding targets through amendment to the annex of the Protocol that lists countries with targets. They may choose to do so to gain access to the (financial) benefits of international emissions trading.

Despite our efforts and the support of some developing countries, the Kyoto Protocol does not include a separate article for developing nations to assume voluntarily targets.

Did developing countries agree to do *anything* in Kyoto?

Yes. The Kyoto Protocol makes a down payment on the meaningful participation of developing countries.

First, developing countries agreed to the creation of a clean development mechanism through which industrialized and developing countries can establish partnerships to cut emissions in the developing world, to the benefit of both parties. Specific projects – such as construction of a high-tech, low-emitting power plant – can include direct participation from the private sector. Industrialized countries (and firms within those countries) will be able to use certified emissions reductions earned from such projects to contribute to their compliance with greenhouse gas reduction targets while developing countries get the technology they need for cleaner, more sustainable development.

Second, developing countries also agreed to advance the implementation of their existing commitments under the 1992 Framework Convention on Climate Change. These commitments, which apply to all Parties, include, in particular, more specific reporting requirements on actions taken to reduce emissions and also call for the identification of specific sectors (including the

energy, transport, and industry sectors as well as agriculture, forestry, and waste management) in which actions should be considered in developing national programs to combat climate change.

Why did the U.S. agree to delete a key provision on developing countries from Protocol?

Although we would have preferred a free-standing provision permitting voluntary adoption of emissions targets by developing countries, we still succeeded in preserving this option in the emissions trading article. Developing countries may participate in emissions trading provided they take on a quantified emissions limitation or reduction commitment under Annex B.

Why did the U.S. agree to a Protocol which exempts developing nations?

The Protocol does not exempt developing nations from action. In fact, Article 10 of the Protocol includes obligations to advance the commitments of all parties, specifically including developing countries. All parties are obligated to implement national programs that consider actions in the energy, transportation, industrial, and other sectors to mitigate climate change. The Protocol also permits developing countries to participate in emissions trading, provided they adopt legally binding emissions targets under Annex B. We are planning further efforts to secure more meaningful participation by developing countries as we continue efforts to address global warming under the Framework Convention on Climate Change.

Isn't it true that the Protocol will permit developing countries to add new binding limitations on the U.S. by a simple 3/4 vote at future climate change meetings?

No. On the contrary, we would need to agree on new binding limitations that would apply to the U.S. and any such agreement would also require Senate advice and consent before the President were to ratify it.

Why do we need "mechanisms" to transfer resources from developed countries to developing countries? These countries are exempt from obligations under the protocol so why transfer resources to them?

These mechanisms are not simple resource transfers. They will accomplish the two important objectives of involving developing countries in reducing global greenhouse gas concentrations and allowing U.S. companies to achieve emissions reductions at lower cost:

First, by supporting Clean Development projects, they will produce real reductions in global greenhouse concentrations in developing countries.

Second, by participating in the CDM, U.S. companies will be able to partially offset their emissions reduction obligations.

The fatal error in this negotiation was the Berlin Mandate, which completely let the developing countries off the hook. Shouldn't we have just let this Kyoto process fail and started over on a sounder footing? As you have said, this is a problem that must be resolved over decades, so why get going on the wrong foot?

In fact, by agreeing in Kyoto, we satisfied the requirements of the Berlin Mandate and can now put it behind us.

Had the Kyoto Conference failed to produce a protocol, not only would international confidence in our ability to achieve an agreement have been eroded, we would still be left with an unfulfilled Berlin Mandate as an excuse for some in the developing world to refuse to take action.

What real incentive do developing countries now have to agree to tough limits of their own?

Developing countries have plenty of incentive to address global warming – most analyses indicate that it is developing countries that will suffer the most from climatic change and its associated effects.

Within the Protocol itself, the most economically attractive flexibility mechanisms – JI between Annex I countries and emissions trading – are only available to those Parties that have undertaken quantified emission limits.

What is the Administration's strategy doing to get developing countries to participate more fully in the Protocol?

Getting developing countries to participate more fully in the global response to climate change is our objective – this is important, because that participation can be accomplished in a variety of ways. First, developing countries can decide that it is in their own interest to take unilateral action to help avert the potential impacts of global warming. Many are already doing so, and we should not lose sight of the efforts they are already making. They have a strong interest here because most of their economies are highly vulnerable to the adverse consequences of global warming – their populations are located in coastal and low-lying areas that are susceptible to storm surges, erosion, and salt-water intrusion. Many are also heavily dependent on agriculture. Most also lack the resources to cope with extreme weather events, much less to implement the extensive infrastructure changes that could be needed to adjust to significant climate change impacts such as sea-level rise, increased drought or flood.

Second, we are working extensively with a broad range of developing countries on a bilateral basis to encourage their participation in the global response to climate change. Last year, the President announced a \$1 billion initiative over a five-year period largely involving the U.S. Agency for International Development but also the Department of Energy and the Environmental Protection Agency in cooperative bilateral efforts related to climate change. We are working also in the U.S. Climate Change Country Studies Program with over 55 developing countries and countries with economies in transition to help them inventory their greenhouse gas emissions, assess their vulnerability to climate change and consider the options available to them to respond. In addition, we have initiated many other programs, including the Inter-American Institute for Global Change Research, to support the efforts of developing countries to participate in scientific research related to global warming. We have a series of bilateral "common agendas" with some of the most important developing countries, including India and Brazil, under which we discuss climate change issues and promote cooperative actions. And, under the aegis of Vice President Gore, we are working cooperatively with China on a range of climate change issues.

Third, following the Kyoto meeting in December, we are engaged in a comprehensive review of our strategy with respect to securing the more meaningful participation of developing countries to determine how we can best make further progress. In particular, we are considering ways to encourage advanced developing countries voluntarily to take on quantified emissions limitation commitments, including how to approach such difficult issues as the bases for such commitments, how they would apply and the advantages that might accrue from signing on to them.

You went into the Kyoto conference with very low expectations regarding developing countries – just seeking a provision that would have allowed individual developing countries to opt into the Protocol voluntarily. Even *that* modest provision was denounced and defeated. In light of that reception by the Chinese, Indians, Brazilians, and others, isn't it self-delusion to think that you will draw the key developing countries into the Protocol even in the next few years?

Given the lack of incentive for developing countries to participate and the lack of leverage over them, won't it be years before we can expect enough key developing countries to participate?

Although there clearly was not as much movement in the positions of the developing country blocs as we would have liked, the fact that the Kyoto Protocol includes provisions that many developing countries opposed prior to the conference -- such as emissions trading and joint implementation -- shows that negotiating flexibility does exist.

Many developing country governments stated bluntly before Kyoto that they would not discuss limits on their emissions until the developed world undertook its own commitments. However, we now have an opportunity to lead the global response by our own example – what the U.S. does matters vitally in these discussions, both because we emit around one-fourth of the world's greenhouse gas emissions and because others look to us for innovation and creativity in confronting problems and resolving them.

If [it does take years to secure meaningful participation by key developing countries], won't it be years before the Protocol is ready to be submitted to the Senate, by your own standard?

Securing more meaningful participation from key developing countries is a top priority for us. Kyoto made a down payment on such participation, and we believe more progress is on the horizon. That said, the President has made clear that the Protocol is a work in progress and that without more developing country involvement, he will not submit it for ratification.

And if years do pass, won't it in effect become impossible to achieve the target you have accepted in the 2008-2012 period?

Clearly, the sooner the Protocol comes into force the better. That said, we did not accept our target premised on immediate ratification and entry into force. The Protocol is a very complicated document, and many details remain to be worked out – entirely separate from the developing country question.

The President's domestic plan for cutting emissions reflects this by offering a phased-in approach to taking action. In the first few years, the emphasis will be on efforts that reduce emissions through creating incentives for the purchase and use of energy efficient technologies. These measures make sense in their own right – by reducing pollution, lowering energy use, and saving money for consumers.

Before the beginning of the first budget period in 2008, there is a window of several years, and I am confident that within that time we can accomplish what we need to submit the Protocol for your consideration.

CLEAN DEVELOPMENT MECHANISM

This CDM is clearly a scheme to saddle us with another international institution. How will this be funded? How will it be set up? Is this yet another arm of the World Bank?

The Clean Development Mechanism provides a means through which industrialized and developing countries can establish partnerships to cut emissions in the developing world, to the benefit of both parties. It was designed to make effective use of existing institutions, not to create a new one. It will be funded from a small share of the proceeds from each project certified to reduce greenhouse gas emissions. It is an arm of the Parties to the Protocol not the World Bank.

Why do we need “mechanisms” to transfer resources from developed countries to developing countries? These countries are exempt from obligations under the protocol so why transfer resources to them?

Climate change is a global problem that requires a global solution, and the U.S. will be working bilaterally, regionally, and multilaterally in the coming months and years to promote more active efforts by developing countries to limit their emissions. One way is to create partnerships through which we can share our technology and cut emissions. As developing countries understand that they can protect the environment without compromising their economies, they may be more inclined to join us in taking on emission reduction commitments. Developing countries may participate in emissions trading if they adopt binding emissions targets under Annex B which could provide even greater benefits for their economies and for the global environment.

How will this advance “meaningful participation” with developing countries?

The CDM and the projects it will generate will advance the meaningful participation of developing countries by helping those countries to develop in a more sustainable manner. These projects may help them acquire and introduce new, less carbon-intensive technologies and show them that what is good for the environment can also be good for the economy.

How can we make this scheme work? What will it take?

With the cooperation of private industry in the U.S. and in developed countries around the world, the CDM can play an important role in advancing the mitigation efforts of developing countries. Ultimately, it will take the combined efforts of businesses in developed and developing countries, as well as the governments of both to adopt reasonable rules and efficient procedures to promote the greatest possible number of projects under the CDM.

As in the case of emissions trading, you are claiming the Clean Development Mechanism as a big success and as a key element in keeping costs down for American business, but, once again, the Protocol only includes the general concept, with no clear outline of how it would work. Haven't we lost our leverage by signing onto a binding target and timetable without achieving the specifics on joint implementation?

No, we have not. The creation of the CDM represents a significant success of the Kyoto Protocol. While currently the Protocol contains only a framework for how the CDM would be set up, modalities and procedures designed to ensure transparency will be elaborated at the Fourth Conference of the Parties in November in Buenos Aires. The U.S. will work throughout the upcoming year to ensure that the components of the program in its final form are as flexible as possible.

Can you describe in detail how the CDM would work?

Yes. The CDM largely embodies our ideas on joint implementation. It will enable help developing countries participate meaningfully in the global response to climate change by encouraging projects in their countries that promote energy efficiency, the diffusion of lower-carbon emitting technologies and the use of renewable forms of energy. The CDM will do so by enabling the private sector in the developed world to share in the greenhouse gas emissions reductions achieved as a result of these projects, either directly as a consequence of their active collaboration and investment in these projects, or indirectly by purchasing the emissions reductions achieved on the open-market. The private sector will then be able to use these reductions to offset greenhouse gas reduction commitments at home.

Background: Parties to the Protocol will form an executive board to supervise the CDM. The will also designate multiple "operational entities" -- existing institutions, such as stock exchanges, regional development banks or international agencies -- that will certify the emissions reductions resulting from each project activity on the basis of agreed criteria. Participation in the CDM will be voluntary, and each Party must approve the project activities within its territory. These project activities will be designed to achieve real, measurable and long-term benefits related to the mitigation of climate change, and they will achieve emissions reductions that are additional to any that would occur in the absence of these activities. At their next session in November this year, we expect that the Parties to the Convention will begin elaborating modalities and procedures to ensure transparency, efficiency and accountability under the CDM, in particular through procedures for independent auditing and verification of project activities

A share of the proceeds from these project activities will be used to cover administrative expenses of the CDM as well as to assist developing countries that are particularly vulnerable to the adverse effects of climate change to meet adaptation costs. Importantly, certified emission reductions obtained during the period from the year 2000 up to the beginning of the first commitment period (2008-2012) can be used to assist in achieving compliance in that first commitment period.

The Protocol indicates that the part of a nation's target that can be met through the CDM will be determined by a later [Meeting of the Parties]. So it is possible that the ability of our companies to use the CDM to meet our target will be very restricted, isn't it?

If it is very restricted, will we walk away from the deal? Wouldn't it be foolhardy to sign the Protocol before we know how restricted our ability to use the CDM is going to be?

At present, the extent to which a country's target that can be met through the CDM is undefined. Our goal is to seek maximum flexibility in this regard.

How will the CDM be financed?

The Clean Development Mechanism is fundamentally a vehicle to allow cost-effective emissions reductions by facilitating private sector investment in clean technologies. Thus, we anticipate that the vast majority of financing for the CDM will be from private sources. Most of this financing will be channeled directly into investments in developing countries. We anticipate that there may be minor administrative transaction costs associated with using the mechanism. While governments would also be free to purchase credits, there is no obligation for governments to contribute in any way.

How big a share of the proceeds will be devoted to assisting developing countries with adaptation to climate change – 5%? 20%? 50%? Do we really have any idea? Who decides?

The Parties will decide. We anticipate that the “proceeds” to be shared will be derived from the value of the emissions reductions achieved by a project, not the value of the underlying project. The Protocol leaves the distribution of the certified emissions reductions up to the entities involved. We anticipate that this figure will be in the 10% range in terms of the funds collected, depending on projections of the volume of traffic under the CDM. Most Parties in Kyoto indicated that they would be comfortable with this figure.

The OPEC countries actually had the nerve to press for a compensation fund so that we would have to pay them to make up for the reduced use of oil that is likely to result from an effort to cut greenhouse gases. We opposed that demand, but couldn't these proceeds end up being applied, at least in part, to pay off OPEC countries?

Article 12 of the Protocol that establishes the Clean Development Mechanism allows for proceeds to go to Parties that “are particularly vulnerable to the adverse effects of climate change” to meet “the costs of adaptation.” The reference to “adverse effects of climate change,” as opposed to, for example, “adverse effects of response measures to climate change,” makes clear that it is intended to benefit small island states and nations with low-lying coastal areas. This concept differs from the so-called “compensation” fund – whose objective included assistance to nations that would be adversely affected by actions taken by developed countries to mitigate climate change.

Since projects under the CDM will be done in developing countries that do not have emissions budgets, who will monitor and verify that the reductions from a given project are real? Who will decide that those reductions are more than would have occurred anyway, and how will they decide that?

The Parties to the Kyoto Protocol will establish operating entities who will certify emission reductions from projects. This certification will verify that the resulting emissions reductions are real and additional to those that would have occurred anyway. Though the rules have to be fleshed out, the operating entities and their procedures will be subject to the authority of the Conference of Parties.

If credits were given for reductions that would have occurred anyway, then the CDM could turn into another environmental sham, couldn't it? That is, industrialized countries could be allowed to satisfy their reduction requirements by getting credit for reductions that were going to have to occur anyway in developing countries; and since the developing countries have no budget, there could be no offsetting reduction of their budgets. Isn't that right?

No. The Kyoto Protocol, in defining the Clean Development Mechanism, clearly establishes that CDM projects be certified only if there are "reductions in emissions that are additional to any that would occur in the absence of the certified project activity." Projects will be independently audited to verify that the emissions reductions are indeed additional. Over the course of the next year or so, Parties to the Convention will design procedures to ensure transparency, efficiency and accountability in the CDM processes.

How will the CDM be administered? Are we going to create yet another international institution? Who will control it?

The Parties will oversee the Clean Development Mechanism with the help of a small executive board, and "operational entities to be designated" (not "created") will certify project emission reductions. At this time the details have not been elaborated by the Parties – they will revisit these issues at the Fourth Conference of the Parties in November 1998.

You say that this idea is in effect the same as our idea for joint implementation, but JI would have operated on a company to company basis without new international bureaucracies, while the CDM will require a new bureaucracy, right?

The concept of the CDM is effectively very similar to that of joint implementation, with the crediting of investments for reductions made in another country. We do not envision the CDM as needing an additional bureaucracy. We plan to consult with already-existing organizations who are likely to be asked to serve as "operational entities" in the CDM. Some general types of organizations possible for this role would be: regional development banks or stock exchanges.

PRELIMINARY AND INCOMPLETE DRAFT #2 (FEB 5): CLOSE HOLD

ADDENDUM. NOT FOR DISTRIBUTION *** SAVE FOR Q AND A**

Q -- Senator Brown: I have seen one study that claims large losses in output and employment from climate change policy [EPI, 8/14/97].

A: But this study is misleading in three important ways. First, it did not in my view take into account the points I have made about the ability of the economy to adjust to structural change with a 15-year warning. In particular, a number of commentators on this specific model have highlighted that this is a model best designed to predict economic impacts in the very near future, two to three years from now, and that it is not useful for long term predictions of this type. Second, the model fully assumes that we "do this dumb", ignoring the efficiencies from international emissions trading, joint implementation, LDC participation. Third, the model ignores any of the benefits of reducing emissions noted above, as well as any benefits of averting climate change, and it does not embody any technological advance in response to our \$6.3 billion technology package, nor any benefits to the economic from our electricity restructuring proposal. These results are therefore exaggerated and present a misleading portrait of the effects of our climate change plan.

Q -- Senator Red-White-&-Blue: Your solution seems to be to buy all the reductions abroad. I can't see American taxpayers paying foreigners for the right to pollute. What share of reductions is done at home?

A: [Unspoken answer: a lot, in the base case...]

I believe the case where we rely heavily on international trading should be viewed as a safety-net case -- a backup if all else fails. Toward the end of my testimony, I discussed the cases where we make some allowances for the effects of sinks and for the payoff from the President's technology initiative. Under those assumptions, with simple Annex I trading, we can accomplish our Kyoto targets by making half our reductions at home: more precisely 52% in the sinks case and 48 percent in the technology case (or 53 % if we allow for *both* the U.S. sinks and the 1.25 AEED). [If we allow for JI, then the percent of reductions accomplished at home falls into the 40s.]

Q -- Senator Green: What is the single trading combination that is most advantageous for the United States?

A: That would be an umbrella that excludes the EU, but that otherwise includes full worldwide participation and trading. In this case, admittedly one that is not particularly likely, the cumulative reduction in costs relative to obtaining all reductions domestically is an estimated 88 percent. (And that's before we count accelerated technology or sinks!)

Q&A QUESTIONS REGARDING TRADING

International trading

It sounds like the conclusion of low costs depends on the idea that we will be buying emission permits from other countries.

What percentage of emission reductions are achieved in this way, versus domestically?

Do you honestly believe that international trading of this sort is feasible?¹

What would be the costs if we to have to meet these targets without international trading?

Transfers

What would be the monetary value of these transfers?

Do you expect the American taxpayer to pay other countries for the right to drive their cars and run their factories?

If it doesn't go directly through the budget, aren't you having the same effect by imposing onerous requirements on private citizens, and then "allowing" them to pay foreigners?

Russia and paper tons

Is it true that you mainly expect the purchases to come from Russia (and the Ukraine)? What percentage? Isn't this a disguised form of foreign aid?

Is it true that we wouldn't even be paying them to reduce their emissions, but instead be paying them for reductions that they have already undergone (so-called "paper tons")?

What makes you think a country that can't even run a functioning legal system or maintain a decent economy is a reliable partner in such a deal? What's to stop them from just taking the money and doing nothing?

Domestic permit trading

How exactly is this permit trading system (2008-2012) supposed to work?

The idea is to drive up the price of energy, right?

Isn't it a disguised tax? A mandate or "taking", then?

How would you rate the relative importance of the permit trading scheme and CC Technology Initiative in accomplishing the emission reductions called for under the treaty?

¹ "However, the proposed schemes for both international permit trading and joint implementation require enforcement and monitoring mechanisms that may be difficult to establish in the near term." ... "your economic advisers are concerned that substantial barriers would arise in implementing any workable analogue of such an idealized system--at least in the near term. Consequently, they would stress that Annex I international permit trading and joint implementation between the U.S. and nonAnnex I countries can realistically serve only a limited role in reducing the costs associated with meeting a "1990 by 2010" target. "..." the actual benefits of such a system are apt to fall short of this utopian portrayal." 9/20/97.

Oil price shock

The only historic experience with restraining emissions (let alone reducing them) was the 1970s, correct? How did the reduction in emissions then compare with that required under the Treaty?² Didn't this take a much bigger increase in oil prices than you are predicting now? Didn't it cause the largest two post-war recessions, with huge increases in unemployment? Why should things be different this time?

What about the study from EPI that predicts large job losses?

² *"If attained through domestic emissions reductions alone this target entails a reduction in CO₂ emissions of about 28% relative to projected 2010 emissions in the absence of policy intervention--a change in energy use in excess of that achieved during the decade of the oil shocks."..."Economic analysis suggests that reaching 1990 emissions by 2010 would result in a stagflationary macroeconomic shock on the economy approximately equal in magnitude to the effects of the combined oil shocks of the 1970's. Both unemployment and inflation would undoubtedly rise for a time"*