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[Climate Change] [Binder 2] [2]

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investment credit for the purchase of combined heat and power systems. The package also contains \$2.7 billion over the next 5 years in additional research and development investments -- 37 covering the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and cross-cutting analyses and research. One example of the R&D effort is the Partnership for a New Generation of Vehicles (PNGV). PNGV is a government-industry effort to develop attractive, affordable cars that meet all applicable safety and environmental standards and get up to three times the fuel efficiency of today's cars. In FY99, the combined proposal for PNGV is \$277 million, up from \$227 million appropriated in FY98. Similar government-industry efforts are proposed to develop more efficient diesel engines for both light trucks and heavy trucks. 38 see CCI

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

The third step is the promotion of an environmentally-responsible electricity restructuring bill, which the President identified as part of his domestic climate change package in his address to the National Geographic Society on October 22. An electricity sector freed from government regulation would be a more efficient energy sector. Costs to consumers would fall. In addition, stronger incentives for improved generation efficiency in conjunction with provisions to conserve energy and promote use and development of renewable energy sources will achieve modest reductions in emissions. A reasonable overall estimate of the contribution of federal electricity restructuring to the rest of the President's program to address climate change is that it would make further progress to the same emission reduction goals at a cost saving of roughly \$20 billion per year. These steps should be taken regardless of Kyoto, because they make sense in terms of energy efficiency. But they have the added benefit of preparing us for Kyoto. 11 Randy?

Estimated Reduction in Costs from Annex I Trading

In the language of the treaty, "Annex I," is the set of countries that have agreed to take on binding limitations in emissions of greenhouse gases. Even without meaningful developing country participation -- which, again, the President has emphasized is essential before the treaty would be submitted for ratification -- costs could be reduced substantially by emission trading among the Annex I countries. To provide some indication of the possible efficiency improvements, Russia and Ukraine consume six times as much energy per dollar of output as does the United States. Such large international differences in energy efficiency suggest that adoption of existing U.S. technology would yield very large emissions reductions in these countries. Art 26.3 Joe's table

Estimates derived from the SGM model confirm that emissions trading among Annex I countries can reduce the cost to the United States of achieving its targets for 2008-2012 emissions by about half relative to a situation in which such trading was not available. This concept of costs is meant to capture aggregate resource costs to the US economy, including the master SGM table

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

Estimated reduction in costs from umbrella trading

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

It is too early to state the precise form the umbrella will take. But we can envision a number of potential benefits. The umbrella could, for example greatly reduce costs to the U.S. Results that we have derived from various SGM simulations suggest that, relative to the situation in which there is no trading at all, the umbrella can reduce costs by an estimated 60-75 per cent, depending on whether the former Warsaw Pact countries fall within the umbrella. The Kyoto Protocol classifies these countries outside of the EU bubble for the first budget period 2008-2012.

Estimated reduction in costs from developing country participation

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

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

Another possibility is that we persuade some of the key developing countries that are the largest emitters to commit to targets, and allow us to buy emission reductions from those paths. Simulations with the SGM model suggest that full participation by non Annex I countries could cut roughly 55 percent off the reduced costs that result from Annex I trading. The actual cost reduction would depend on the extent of

US									2010 GDP (b92\$)	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

CLIMATE CHANGE
3rd CONFERENCE OF THE PARTIES
KYOTO, NOVEMBER 30 - DECEMBER 11, 1997

<u>NAME</u>	<u>AGENCY</u>	<u>PHONE</u>	<u>FAX</u>
Stuart Eizenstat (Peter Bass)	State/E	202-647-7575	202-647-9763
Tim Wirth (Carol Thompson)	State/G	202-647-6240	202-647-0753
Rafe Pomerance	State/OES	202-647-2232	202-647-0217
John Campbell	State/OES	202-647-1554	202-647-0217
Leslie Gerson	State/OES/SEI	202-647-2958	202-647-0773
Brooke Holmes	State/OES	202-647-4542	202-647-0191
Steve Muller	State/EB	202-647-3423	202-647-4037
Meg Donovan/Jaci Wilson	State/H	202-647-1048	202-647-2762
Todd Stern	White House	202-456-2702	202-456-2215
Steve Seidel	White House	202-343-1060	202-343-1162
Andrew Kanders/Paul Risley	White House	202-343-1060	202-343-1162
David Sandalow	White House/CEQ	202-456-6543	202-456-2710
Shelley Fidler	White House/CEQ	202-456-6224	202-456-2710
John Hilley	WHLA	202-456-6620	202-456-2604
Peter Orzag	White House/NEC	202-456-5358	202-456-2223
Diana Helios	White House/NS	202-456-9494	202-456-9490
Jim Steinberg	NSC	202-456-9491	202-456-9490
Rosina Bierbaum	OSTP	202-456-6202	202-456-6025
Jennifer Haverkamp	USTR	202-395-7320	202-395-4579
Jeffrey Frankel	CEA	202-395-5046	202-395-6958
T. J. Glauthier	OMB	202-395-4561	202-395-4639
Burgess Laird	USUN	736-7555	736-7551
Sherri Goodman	Defense	703-697-1013	703-693-7011
Jerry Stephens	DoD/ICS	703-697-5738	703-614-0905
Linda Silverman	DOE/PO	202-586-3896	202-586-4341
John Lieber	DOT	202-366-4450	202-366-7127
Sandra Hawkins	DOC	202-482-6055	202-482-4636
Laurence Campbell	DOC	202-482-3038	202-482-0325
Al McGartland	EPA/OPPE	202-260-3354	202-260-6405
Paul Stolpmann	EPA/OAR	202-564-9140	202-565-2149
Richard Rominger (or) Jessica Wasserman	USDA	202-720-6158	202-720-5437
Elli Kaplan	Treasury	202-622-0409	202-622-0073
David Wilcox/John Gruber	Treasury	202-622-1260	202-622-0073
Lois Schiffer/Jim Simon	DOJ/EURD	202-514-2701	202-514-0557

JLY
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AM

RL

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10

Clean Development Fund Nears Approval (the "new" JI with credit)

Joint Implementation (JI) with credit has been subsumed under a new device called a "clean development funding mechanism." After its somewhat lukewarm support for this Brazilian-inspired concept, the EU has now agreed to give it its full backing and support. Similar support from other Parties is also expected and while not completely assured of passage, we would give it more than a 60/40 prospect. These have increased enormously due to the support received from China - probably because many developing countries seen this new mechanism as one providing "free or at least easy" money.

The Future of Developing Country Mechanisms Less Robust

Remaining quite problematic is the question of Article 10, the voluntary graduation mechanism for key developing countries. We met with the Indonesia delegation on Dec 10 and received assurances from them of their active support of this concept. Similar meetings are also planned for other delegations, including those of Egypt, Argentina, and South Africa. However, from a Dec 9 meeting with Latin American and Caribbean delegations as a whole - and from our frequent contacts with the Chinese, Indians, and Brazilians on this point (all are strident critics, as is OPEC) - it is distinctly an uphill fight to get this concept on board.

Similarly, it is not known what kind of follow-on process - if any - may be feasible. Suffice it to note that New Zealand has prepared another proposed COP decision which would encapsulate a review process along the lines of the "contraction" theories of South African-born NGO Aubrey Meyer. This version is unlikely to go anywhere.

Corridor gossip continues to maintain that India has drafted a text which would be used both as a substitute for Article 10 and as a propellant for some kind of post-Kyoto follow-on process. However, this proposal, if it exists, has not as yet surfaced. When and if it does, it will undoubtedly have to be edited extensively to give it any chance of acceptability with Annex I Parties, generally, and with the U.S., specifically.

Opening a Kyoto Umbrella: "Double Bubble; Double Trouble?"

15
2
Another interesting twist to the conference was added on Dec 9 with the informal establishment of a Kyoto Umbrella Initiative. Designed as a purely emissions trading regime, this "umbrella" will operate, in effect, as a second bubble under the terms of the Convention. Initially conceived by the Russians in response to the EU "Bubble", the concept was subsequently endorsed and essentially organized by the U.S. because of the significant benefits which could accrue to us, and to other umbrella partners, through cost-reductions achieved under the umbrella's trading arrangements. These arrangements and allocations will all have to be worked out sometime in 1998.

Among the countries actively participating in the umbrella discussions or who have indicated an interest in doing so are Russia, the U.S., Canada, New Zealand, Ukraine, Australia, Iceland, and Norway. There are plans at the time of this writing (1500 hours local) to announce this arrangement at a press conference tonight after the meeting ends. However, given the expected lateness of that hour and the groundwork which would have to be laid to get an appropriate declaration prepared, it is unclear whether or not such an event will be practical.

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developing country participation that is ultimately obtained. The more developing countries that take on modest binding targets and trade in international permit markets, the lower will be costs.

These cost-saving opportunities are fundamental tenets of the U.S. position. The promise of Kyoto cannot be achieved without effective emissions trading. Moreover, if we do not get meaningful participation by key developing countries, we won't submit the treaty for ratification to the Senate. So, while our analysis may be predicated on some ambitious conditions concerning trading and developing country participation, it is exactly those conditions that form the foundation of the U.S. position in international negotiations including those at Buenos Aires.

Accounting for Carbon Sinks

The preceding discussion has emphasized the importance of trading arrangements and the CDM. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. Again, the U.S. delegation obtained a novel concept, that carbon absorbing activities called sinks could be used to offset emissions. The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. The Kyoto Protocol specifies that removals of CO₂ by sinks count toward meeting the target. The Kyoto Protocol counts the net emissions effects of three sink activities -- afforestation, reforestation, and deforestation. Very preliminary estimates of the implications for the United States of the Kyoto provision on sinks indicate that carbon sinks could comprise nearly 10% of total required emissions reductions. Decreasing the required emissions reduction by 10% would likely result in cost savings greater than 10%.

Even this estimate of the effect of sinks is conservative in one respect: it is based on an assumption for sink activity in the U.S. over the 2008-2012 period, and no assumed benefits from sinks elsewhere in the world. Very preliminary estimates suggest that incorporating the gains from sinks *throughout the world* can substantially reduce the costs of meeting the Kyoto target, on top of the gains from trading among Annex I countries. (Furthermore, no model has yet even tried to take into account that government policies can help increase the activities qualifying as allowable sinks, like some tree-planting.) Because the quantitative uncertainty is so large, we do not yet have an estimate with which we are comfortable. But we expect that complete modelling of the Kyoto provision pertaining to sinks will likely have favorable and potentially large effects on projected costs.

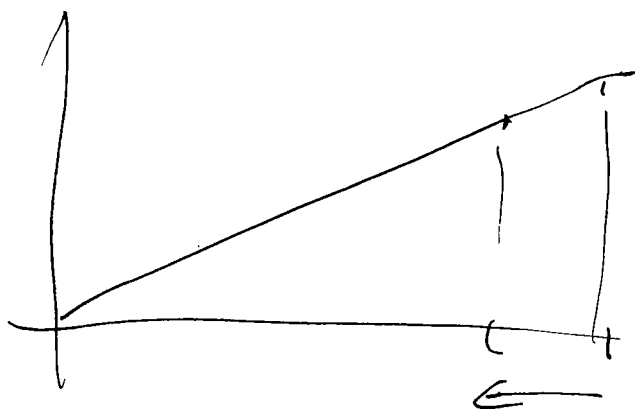
Accounting for the role of improvements in energy efficiency

Another issue in analyzing the Kyoto protocol concerns future improvements in energy efficiency due to innovation and diffusion of existing technology. The parameter that figures most prominently in analysis of energy efficiency is the rate of improvement in the so-called Autonomous Energy Efficiency Index (AEEI), that is the rate at which the total use of energy falls relative to GDP. A plausible assumption on the AEEI is an improvement of 1.0 percent per year. Reflecting a conservative interpretation of the 15-year impact of various

Article 3

Joe's analysis

marks
SKM
KLE



- 8 ▶ Activities that absorb carbon, such as planting trees, will be offset against emissions targets. The treatment of these so-called "sinks" was another controversial issue at Kyoto. Many countries wanted sinks to be excluded. 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.

Is the target the United States agreed to actually 7% lower than what the President proposed in October?

No. The 7% target represents no more than a 3% real reduction below the President's initial proposal of reducing greenhouse gases to 1990 levels by 2008-2012. The remaining 4 percentage points result from certain changes in the way gases and sinks are calculated and do not reflect any increase in effort as compared to the President's original proposal.

- ▶ **Changing the baseline for the three synthetic greenhouse gases from 1990 to 1995 accounts for about 1% of the 7% reduction.** Use of these three gases has grown since 1990, so that permitting a 1995 baseline allows for a higher overall baseline than the Administration assumed last October when the President announced his goal of reaching 1990 levels by 2008-2012. Making reductions to meet a higher baseline is of course easier than making reductions to meet a lower baseline. Had the United States maintained the same level of effort assumed by the President in October, and no other factors had changed, the shift to a 1995 baseline for the three synthetic gases would, alone, have transformed the President's goal of 1990 levels into a goal equivalent to 1% below 1990 levels.
- ▶ **Altering the accounting method for carbon-absorbing activities, such as planting trees, accounts for about 3% of the 7% reduction.** The President's original goal assumed that carbon-absorbing activities would be counted, both in the 1990 base year and in the 2008-2012 budget period. Under the method agreed in Kyoto, carbon-absorbing activities in the 1990 base year are not counted (yielding a higher baseline), although certain carbon-absorbing activities will count against emission reduction commitments in the budget period. This decision with respect to the accounting method makes the U.S. target 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.
- 22

INTERNATIONAL EMISSIONS TRADING

- The United States prevailed in securing acceptance of emissions trading among nations with emissions targets. This free market approach, pioneered in the U.S., will allow countries to seek out the most cost-effective emissions reductions.

**Carbon Sinks:
Analysis of the Kyoto Protocol**

U.S. Sink Source	Annual MMTCE Carbon Sequestration or Emissions during the budget period (BAU Case)		
	2008-2012	2013-2017	2018-2022
Alternative 1: Harvest uptake only: Include carbon absorbed from regrowth of harvested forests, exclude carbon emitted when those forests are cut down.			
Afforestation (Established since 1990)	31	33	33
Reforestation (Forests replanted since 1990)	59	97	137
Deforestation	-40	-40	-33
Alternative 1 Total	50	90	137
Alternative 2: Harvest uptake and emissions: Include carbon absorbed from regrowth of harvested forest and carbon emitted when those forests are cut down.			
Afforestation (Established since 1990)	31	33	33
Reforestation, includes harvest (Forests replanted since 1990)	-50	-14	26
Deforestation	-40	-40	-33
Alternative 2 Total	-59	-21	26
Alternative 3: New forests only: Exclude all forests existing as of 1990. Count only carbon absorbed by forests added or emitted by forest land converted to other uses after that date.			
Afforestation and reforestation (New forests established since 1990)	31	33	33
Deforestation	-40	-40	-33
Alternative 3 Total	-9	-7	0
Alternative 4: Define "activities" as new and additional projects (BAU impact = 0)			

50 of
Kyoto's
required
600 is
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climate change initiatives, this is only a small increase above the 0.9 percent number in the Energy Information Administration's Annual Energy Outlook. That assumption is not the most optimistic outcome that might occur. Some authorities in the field of energy policy forecast more rapid technological progress. Experts at five national laboratories managed by the Department of Energy, using an engineering approach rather than an economic paradigm, found that a third of the emissions reductions necessary to return to 1990 levels by 2010 could be achieved through the adoption of existing energy-efficient technologies at no net resource cost, or even some savings. The National Academy of Sciences reached qualitatively similar conclusions in a 1992 report.

The President's FY 1999 budget, as I have noted, includes a \$6.3 billion package of tax cuts and R&D intended to spur the discovery and adoption of new technologies. If the Administration is successful in this effort, the rate of improvement in energy efficiency could rise and such improvements would lower the cost of meeting our Kyoto target. For example, published results based on SGM model simulations with different assumed rates of AEEI suggest that an increase in the AEEI of 25 percentage points would lead to declines in the permit price of approximately 40 percent.

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

There are many other reasons for faith in the ability of American ingenuity to offer solutions to the challenge of climate change. At the recent automobile show in Detroit, General Motors announced that it has developed a hybrid-based vehicle that can achieve fuel efficiency of 80 miles per gallon, and that this car could be in commercial production within a few years. Ford also exhibited a prototype of a light-weight highly fuel efficient sedan that could be in commercial production by the middle of the next decade. These announcements followed an earlier breakthrough announced by DOE and its partners of a fuel cell that would run on gasoline and double current fuel economy while reducing conventional air pollution emissions by 90 percent. These technological advances have been made possible through the efforts of the Partnership for New Generation Vehicles between the Administration and the U.S. auto companies and their suppliers.

Such progress may be replicated in other sectors. VCRs and TVs (even when off) consume about \$1 billion worth of electricity annually. EPA has established a partnership with major manufacturers that has a goal of achieving a 70% reduction in energy use without sacrificing product quality, usefulness, or increasing costs. This partnership offers promise of substantial improvements in energy efficiency.

CHANGE!

up to

when powered off

unclear +
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while powered
TV/VCR.

AE028

SLABS

NAS

TAT vs.
Bottle paper

NF

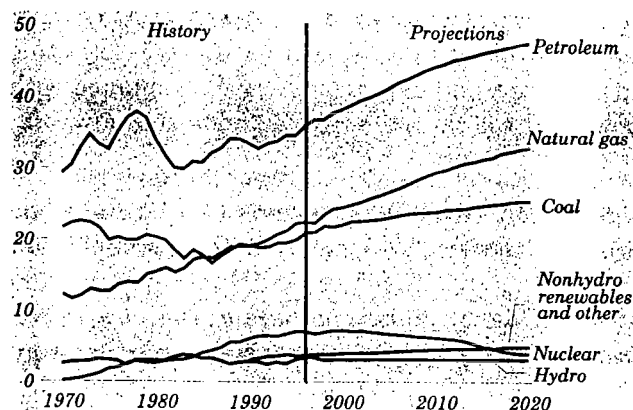
CA up

unclear +
not quite right
while powered
TV/VCR.

Overview

Natural gas consumption increases by an average of 1.6 percent a year (Figure 3), with increased demand in all sectors. The most rapid growth is in consumption by electricity generators (excluding cogenerators), which is projected to increase from 3.0 to 10.1 quadrillion Btu between 1996 and 2020. Total gas consumption in 2015 is 0.5 quadrillion Btu (2 percent) higher than in *AEO97*, due to higher projected consumption in the residential, commercial, and industrial sectors.

Figure 3. Energy consumption by fuel, 1970–2020 (quadrillion Btu)



Although coal-fired generation loses market share over the projection period, it accounts for more than one-half of electricity generation (excluding cogeneration). Total coal consumption increases from 20.9 to 25.6 quadrillion Btu between 1996 and 2020, an average annual rate of 0.9 percent. About 90 percent of U.S. coal consumption is used for electricity generation. Coal consumption is 5 percent (1.2 quadrillion Btu) higher than in *AEO97* in 2015, due to an increase in projected consumption for generation.

Demand for petroleum products is projected to grow by an average of 1.2 percent a year through 2020. In 2020, 72 percent of petroleum use is in the transportation sector, up from 66 percent in 1996. Increases in light-duty vehicle miles traveled more than offset the increases in vehicle efficiency throughout the projection period. Continued economic growth also increases petroleum use for air and freight travel and shipping over the forecast horizon. In 2015, total petroleum demand is 7 percent higher than in *AEO97*, due primarily to higher travel and slower efficiency increases in the transportation sector.

Renewable fuel use increases by an average of 0.5 percent a year. In 2020, 59 percent of the total is for

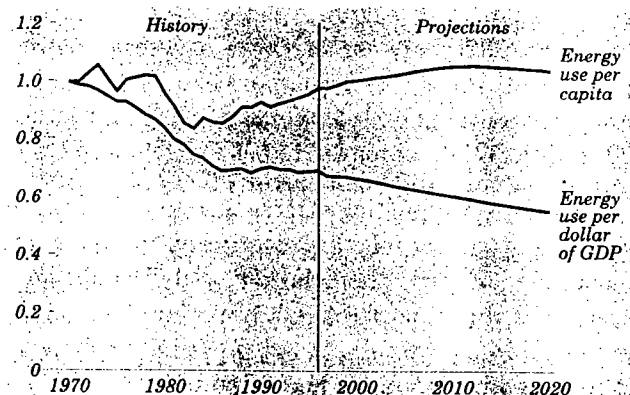
electricity generation and the rest for dispersed heating and cooling, industrial uses, and blending in vehicle fuels. In 2015, renewables consumption is lower than in *AEO97* by 0.2 quadrillion Btu (3 percent) due to lower demand for renewables for electricity generation and for industrial sector cogeneration, as indicated by recent data.

Electricity consumption is projected to grow by 1.4 percent a year through 2020. Efficiency gains in electricity use partially offset the continued trend of electrification and the penetration of new electricity-using equipment. Compared to *AEO97*, electricity demand is 0.2 quadrillion Btu (2 percent) higher in 2015, due to slower efficiency improvements in the residential and commercial sectors and a more disaggregated treatment of residential end uses.

Energy Efficiency

Energy intensity, measured as energy use per dollar of GDP, has generally declined since 1970, particularly during periods of rapid increases in energy prices (Figure 4). From 1970 to 1986, it declined on average by 2.3 percent a year, as the economy shifted to less energy-intensive industries and more efficient technologies. Energy intensity was relatively stable from 1986 to 1996 due to moderate price increases and the growth of more energy-intensive industries. From 1996 to 2020, intensity is projected to decline at an average annual rate of 0.9 percent.

Figure 4. Energy use per capita and per dollar of gross domestic product, 1970–2020 (index, 1970 = 1)



Energy use per capita, which also declined from 1970 through the early 1980s, rose in the mid-1980s as energy prices declined. Per capita energy use is expected to remain relatively stable through 2020 and below the high in the early 1970s, as efficiency gains offset higher demand for energy services.

JA

**Return to 1990:
The Cost of Mitigating United States
Carbon Emissions in the Post-2000 Period**

JA Edmonds
SH Kim
CN MacCracken
RD Sands
MA Wise

October 1997

Prepared for
U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest National Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

 **Battelle**

that the difference decreases over time as emissions in Eastern Europe and the Former Soviet Union approach the policy goal.

**Table 4. United States Carbon Taxes Required to Meet Policy Goal
Eastern Europe & FSU Allocated Policy-level Permits
(1992 US\$ per Metric Ton of Carbon)**

	Independent Mitigation		Annex I Joint Mitigation		Annex I Mitigation with Global Trade	
	2010	2020	2010	2020	2010	2020
M1990	108	170	39	73	15	22
M1990+10%	60	110	6	35	2	11
M1990-10%	173	260	88	124	31	36
M1995	61	112	70	106	26	32

[Figure 10. Permit Prices under Alternative Permit Allocation Methods for EE & FSU – M1990 Annex I Trading Case]

The lower permit prices under the policy-level approach result in lower total costs of emissions mitigation to the United States. In the M1990 Annex I trading case, costs as a percentage of GDP are reduced from 0.18 percent under the reference-level allocation approach to 0.12 percent under the policy-level approach in 2010. Figure 11 shows costs as a percentage of GDP for the M1990 Annex I trading case for both allocation methods.

[Figure 11. Cost of Emissions Mitigation under Alternative Permit Allocation Methods for EE & FSU – M1990 Annex I Trading Case]

DISCUSSION

In this section, we summarize some of the insights gained from our modeling activities using the SGM. First, economic costs depend a great deal on our assumptions about future carbon emissions. Second, several measures of cost are available from the SGM. Third, the distribution of costs among countries in a system of global permit trading is sensitive to assumptions on exchange rates as well as the initial allocation of permits. Fourth, any system of global trade in carbon permits implies potentially large transfers of wealth from one region to another. Finally, we discuss how some of our assumptions affect the results on costs.

Role of Reference Emissions in Shaping Marginal Mitigation Costs

All of the results in this study depend on assumptions used to create a reference emissions scenario from the present to 2020. The amount of mitigation required to return to 1990 levels depends

DRAFT--May 19, 1997

Call Rosina about
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Economic Effects of
Global Climate Change Policies

1. 1995-2000
What is this?

2. When does
effect occur?
2000 or 1995?
Results of the Research Efforts of the
Interagency Analytical Team
June 1997

3. 2000 +
Ramp up
What exactly does this mean?

0.1 -> 1.5

Introduction

In June 1996, the Department of Energy (DOE) and the Environmental Protection Agency (EPA) sponsored a joint workshop where more than 50 people from inside and outside the government made presentations on technical issues associated with future emission trends and capability to reduce emissions trends in the next century. As a part of that workshop, the Interagency Analytical Team (IAT) released what were their preliminary results on the economic effects of emissions reduction proposals.

Since that June 1996 workshop, the IAT has reviewed new work, selected new modeling instruments, improved its approach to old ones, and developed a new set of modeling runs that lead to a better understanding of the economic dimensions of the climate change policy problem. This paper describes those efforts. It first summarizes the IAT model selection process. Second, it discusses the (base policy) base case used to measure the effects of various policy options. Third, it discusses the IAT's core emissions reduction scenario. Finally, the bulk of this paper discusses the results of the IAT's analysis.

The modeling work performed in this analysis was done by economists at DOE and EPA. The IAT also included members from the Departments of Commerce, Treasury, Labor, and State, as well as members of the White House staff. The majority of the IAT members are still primarily from DOE and EPA - the agencies that have the primary responsibility for the Administration's energy and environmental policies.

Model Selection

The first task that the IAT confronted was to review the analytic "toolbox" to assure that it had all the tools necessary to specify the economic effects of a broad range of climate change proposals. At the time, the IAT relied primarily on the Data Resources, Inc. (DRI) macro model

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DRAFT--May 19, 1997

Table 8: Implicit Price of Carbon (1995\$) Under Annex I Trading and Joint Implementation--SGM 1990 Level Case

	2010					2020				
	No Trading	Annex I Trading		Joint Implementation		No Trading	Annex I Trading		Joint Implementation	
		with CR	without CR	with CR	without CR		with CR	without CR	with CR	without CR
Australia	132	56	23	20	9	126	50	35	16	12
Canada	222	56	23	20	9	257	50	35	16	12
China	*	n/a	n/a	20	9	*	n/a	n/a	16	12
Former Soviet Union	0	56	23	20	9	0	50	35	16	12
Eastern Europe	0	56	23	20	9	0	50	35	16	12
India	*	n/a	n/a	20	9	0	50	35	16	12
Japan	268	56	23	20	9	257	n/a	n/a	16	12
Korea	*	n/a	n/a	20	9	*	n/a	n/a	16	12
Mexico	*	n/a	n/a	20	9	*	n/a	n/a	16	12
Western Europe	130	56	23	20	9	139	50	35	16	12
United States	82	56	23	20	9	107	50	35	16	12
Rest of World	*	n/a	n/a	20	9	*	n/a	n/a	16	12

Note: Emissions stabilized at 1990 levels in 2010 with a 10 year phase-in. Revenues recycled into the economy through deficit reduction and assuming a 1.25 percent annual decrease in C/GDP. * indicates the cell is blank because the country is a non-Annex I country
CR=corresponding reductions.

The United States shows smaller output losses than Japan or Western Europe predominantly because it has more "cheap" carbon abating opportunities. Its energy prices are lower than these regions' and it has more steps to promote energy conservation and reduced fossil fuels use than are commonplace elsewhere. Thus, it is somewhat easier for the United States to reach emission targets than other regions, which have already "picked the low fruit."

Under Annex I trading with "corresponding reductions," the implicit price of carbon falls dramatically--to \$56 in 2010 and \$50 in 2020. All countries gain through these lower permit prices, because as a whole they achieve stabilization at 1990 levels more cheaply. The source of these cheap emissions is the FSU and the Eastern European nations. The implicit price of carbon falls because it is cheaper for all of the industrialized nations to pay for carbon abatements in those nations (due to lax environmental standards and slow economic growth) than to pursue domestic options only. These nations gain as they become emissions permit sellers under Annex I trading. If "corresponding reductions" are not required, the FSU would be allowed to sell permits up to its 1990 level further depressing the price to \$23 per ton in 2010 and \$35 in 2020.

Under Annex I trading with corresponding reductions, the U.S. purchases 72 million metric tons of permits from the FSU and Eastern Europe in 2010 at a cost of \$4 billion (\$95), which offsets \$5 billion of abatement expenditures. U.S. purchases of permits abroad increases to 157 million



GENERAL MOTORS CORPORATION

General Motors Building, Detroit, Michigan 48202

NEWS

For Immediate Release: January 4, 1998

etc. (plus see p.2 for confirmation of hybrid cite in 1st para. as hybrid cite in 2nd para)
 Contact: Greg Elliott (313) 556-3214
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GENERAL MOTORS REVEALS FAMILY OF EARTH-FRIENDLY VEHICLES

DETROIT (North American International Auto Show) — General Motors leaders opened the doors of the company's research and development operations today and drove out a family of advanced-technology cars, including an extended-range EV1 and an 80-mile-per-gallon, all-wheel-drive hybrid performance car.

"Our family of clean-car options is growing fast," said John F. Smith, Jr., General Motors chairman, chief executive officer and president. "This year, we're phasing in nickel-metal-hydrate batteries to our pioneering electric vehicles, the EV1 and S-10 Electric truck, and we plan to have a production-ready hybrid electric vehicle by 2001 and fuel cell electric vehicle by 2004, or sooner."

General Motors' advanced-technology vehicles include:

- EV1 with nickel-metal-hydrate (NiMH) batteries that increase range to 160 miles, setting the electric-vehicle benchmark for range and performance
- S-10 Electric truck with double-range NiMH batteries
- Series Hybrid using an electric motor charged by the world's most efficient gas-turbine generator system
- Parallel Hybrid, an environmentally conscious performance car, powered by an electric motor and direct injection turbo diesel
- Fuel Cell vehicle that runs on electrical energy created from a hydrogen-oxygen chemical reaction
- Compressed Natural Gas vehicle with a 1.0L, 3 cylinder, turbo-charged engine

"These cars are clean, safe and fun to drive," Smith said. "General Motors will continue to leverage its size, expertise and global resources to build on the valuable lessons we've learned from launching the first designed-from-the-ground-up electric vehicle, EV1."

The EV1's lightweight structure with the world's most advanced electric drive system and regenerative braking system laid the foundation for a portfolio of electric, hybrid and fuel-cell products.

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- 2 -

Smith said GM's marketing plans for the advanced-technology vehicles would depend on the global transportation infrastructure, affordability and customer acceptance of new technology. He underscored the imperative of balancing sound science with sound economics. "General Motors is committed to developing long-term sustainable market solutions that balance the interests of environmental stakeholders and corporate stockholders, and most importantly, customers."

In light of the recent Kyoto global climate agreement, Smith noted that General Motors' strategy of pursuing a family of options provides the most promise of increasing fuel economy and lowering emissions. However, Smith cautioned that mandating target emissions levels and dates is risky. "Innovation, not regulation, is the answer to reducing emissions. Regulation can divert an automaker's resources and attention from fully exploring the range of technologies, like those we are showing today."

Highlights of GM's family of advanced-technology vehicles:

Advanced Battery

- Ovonic nickel-metal-hydride batteries to be phased into GM's current production EV1 and S-10 Electric truck
- Doubles the range of electric vehicles to 160 highway miles per charge (140 city)
- Better in colder climates
- Applies a more powerful version of batteries currently used in laptop computers, cellular phones and camcorders

Series Hybrid

- Electric motor drives front wheels
- Gas turbine generator system charges battery pack
- Regenerative braking also charges battery pack
- 60 mpg highway using reformulated gasoline
- Accelerates 0-60 in 9 seconds
- 40-mile zero-emission range; 350-mile hybrid range
- Turbine engine utilizes aerospace technology to provide increased efficiency and very low emissions

Parallel Hybrid

- World's first eco-friendly hybrid sports car
- 80 mpg highway using diesel fuel
- 550-mile range
- Accelerates 0-60 mph in 7 seconds (faster than BMW Z3)
- Electric motor drives front wheels
- Isuzu direct-injection turbo diesel drives rear wheels
- Opel automatically shifted manual transmission
- All-wheel drive with 4-wheel regenerative braking, providing improved traction
- "21st Century Hot Rod" – clean and green, fast and fun

- more -

- 3 -

Fuel Cell Electric

- Hydrogen-fueled electric car: Hydrogen-oxygen chemical reaction creates electrical energy
- Near zero emissions of oxides of nitrogen and half the carbon dioxide (CO₂) of gasoline engines
- 80 mpg highway (gasoline equivalent)
- 300-mile range
- Accelerates 0-60 in 9 seconds
- Clean and efficient: strong potential to be the best long-term solution
- Applies same kind of propulsion system used in the Space Shuttle

Compressed Natural Gas

- 1.0L, 3 cylinder turbo-charged engine
- 60 mpg highway (gasoline equivalent)
- 400-mile range
- Continuously variable transmission for smoother ride
- Meets Ultra Low Emission Vehicle Standard (ULEV)
- Natural gas is a cleaner, plentiful, low-priced alternative to gasoline

"Combining advanced propulsion systems with EV1's high-efficiency vehicle architecture allows us to investigate the full potential of these emerging technologies," said Ken Baker, vice president, Global Research and Development Operations. "These new technologies not only must be environmentally friendly, but must deliver customer value. Clean cars such as the EV1 may be niche vehicles now, but in the future they'll be produced for mass markets."

Baker acknowledged, "We need to partner with the petroleum industry to make our family of advanced-technology vehicles even more viable. In particular, we need low sulfur, cleaner-burning gasoline and a new formulation of diesel fuels which reduce particulate and nitrous oxide emissions. Amoco has already agreed to work with us."

In the spirit of the Partnership for a New Generation of Vehicles (PNGV), GM is pioneering these options to develop a new class of vehicle with up to 80 miles-per-gallon performance without sacrificing the affordability, utility, safety and comfort of today's midsize cars. Collaborative work with the U.S. government contributed to the technologies unveiled today.

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**Photos, schematics and technical descriptions available at <http://media.gm.com>
(If you need website password, call 1-800-875-7562)**

Video News Release and B-Roll available upon request

The Washington Times

JUN 13 1997

Circ: 90.126

Ford's P2000 seen tripling fuel efficiency of Taurus

By Michelle Krebs
SPECIAL TO THE WASHINGTON TIMES

E13

Ford plans to produce and test the first members of a new family of high-tech, midsize vehicles this fall. This motoring family named P2000 is built to obtain better fuel economy and emit fewer pollutants than vehicles in its current fleet.

The P2000 vehicles will get three times the fuel efficiency of a current Ford Taurus, with a mileage rating of 20 miles per gallon city and 27 miles per gallon highway. Yet, the P2000 models maintain the size, five-passenger seating, luggage capacity, driving range, performance and safety of the Taurus, said Bob Moll, who, as Ford's director of a Partnership for a New Generation of Vehicles Program, spearheaded the P2000 project.

Significant weight reduction combined with highly efficient propulsion systems drive the P2000 models. At 2,000 pounds, the P2000 weighs 40 percent less than the Taurus. Weight savings comes from lightweight materials and smaller components. The body and engine block are mainly aluminum. Some components are made from magnesium, carbon fiber and titanium.

The P2000 uses only about 300 pounds of steel and other ferrous metals, about a quarter used in the Taurus. The fuel tank is smaller because the propulsion systems are more efficient, and the springs and shocks are smaller because of the vehicle's lighter weight.

The P2000 family includes a base powertrain and two different hybrid configurations. Hybrid vehicles are equipped with two or more power sources, usually a

internal-combustion engine or fuel cell and an electric-drive system that draws power from an energy storage device such as a battery. They offer the advantage of a range not dependent solely on batteries for longer distances between recharging, and reduced emissions because the combustion engine can be smaller than a conventional engine as it is supplemented by another power source.

The base powertrain, the Direct Injection Aluminum Through-bolt Assembly engine, combines the efficiency of a diesel engine and the lightweight of aluminum. It is designed to pack a lot of performance into a small package. Ford officials say the 1.2-liter, four-cylinder engine has performance comparable to the Taurus' much larger 3-liter V-6 engine.

One P2000 hybrid model, the Low Storage Requirement version, adds a small, high-power battery to store energy and a starter-alternator combination to replace the conventional starter and alternator. The starter-alternator provides the ability to quickly re-start the engine after it has shut down during idling and deceleration to save fuel. The starter-alternator also captures some energy typically lost in braking to improve fuel efficiency further.

Ford officials say the P2000 with the LSR engine should have a fuel economy rating of 59 miles per gallon in the city and 70 miles per gallon on the highway.

The Post-Transmission Hybrid adds an electric drive motor to the base powertrain. The motor has about 10 times more electrical energy storage than the LSR and greater ability to vary the mixture

of engine and electric-motor power to optimize efficiency depending on driving conditions. The hybrid captures even more braking energy than the LSR hybrid, storing the energy in the larger battery for use later. Fuel economy is likely to be 68 miles per gallon city and 71 miles per gallon highway, Ford officials said.

Ford expects to begin assembly of 12 to 15 P2000 prototypes for testing by year's end, and to have all three powertrains fully developed to drive by the end of 1998. The early vehicles will be used to further development and refinement.

The cars, which would be produced in the same volumes as the Taurus, about 500,000 a year, won't be available to the public before the middle of the next decade. However, technology, as it is devel-



oped, could migrate into other production vehicles ahead of the P2000, Mr. Moll said.

In addition to technical challenges involving reliability, durability and manufacturing of the new materials, the primary obstacle standing in the way of P2000 production is cost. Ford officials refused to be specific, but said the P2000's cost is "many thousands over" the cost of the current Taurus, which sells for around \$20,000. Materials used in the P2000, including aluminum and magnesium, are significantly more expensive to purchase as a raw material and to process than steel, which makes up the majority of a current Taurus.

MOTOR MASTERS

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Los Angeles Times

Circ: 1,104,651

OCT 22 1997

Energy Dept. Says Fuel Cell System Is a Breakthrough

By DONALD W. NAUSS
Times Staff Writer

DETROIT—As President Clinton prepared to reveal his strategy to curb global warming today, the Energy Department touted an emerging automobile fuel cell technology Tuesday as a way to sharply reduce emissions and gasoline consumption.

Energy Secretary Federico Pena said the new technology—a two-step system that converts gasoline to hydrogen and uses a fuel cell to generate electricity—is a major breakthrough that could revolutionize the auto industry by 2005.

Auto industry officials, however, cautioned that the fuel cell development was announced 10 months ago and that commercialization remains problematic. Chrysler Corp. said earlier this year that it would build a prototype gasoline fuel cell vehicle using similar technology by early 1999.

"It's a validation of our approach," company spokesman Scott Foragard said of the Energy Department's comments.

The timing of Pena's remarks appeared to be linked to Clinton's strategy to reduce so-called greenhouse gases, emissions believed to contribute to global warming. The issue has split administration advisors and could rankle environmental and industry groups.

In a news briefing to reporters in Washington, Pena repeatedly said that new technology, including the fuel cell system, could help reduce greenhouse gases such as carbon dioxide without hurting the economy. The Energy Department is underwriting a portion of the fuel cell research.

"Technology is increasingly important as the nation focuses on environmental protection and climate changes," he said.

Pena's comments came as the auto industry, under regulatory pressure to reduce tailpipe emissions, is gearing up research into alternative-fuel technology.

The auto industry is also concerned that a pending global climate-change treaty could result in new requirements for more fuel-efficient cars. In December, 160 nations will meet in Kyoto, Japan, to hammer out a deal to reduce greenhouse gas emissions.

Fuel cells are electrochemical devices that combine hydrogen and oxygen to produce electricity and water vapor. But hydrogen is difficult to store and no infrastructure exists to distribute it.

The new technology highlighted by the Energy Department eliminates the need for distributing hydrogen because it uses gasoline instead. The system would break down gasoline into its constituent parts, including hydrogen, with a device known as a reformer.

The system was developed by Arthur D. Little Inc., a research and consulting firm based in Cambridge, Mass. The company demonstrated the system for the first time two weeks ago in a test that lasted two days.

"We've proved in the laboratory that this concept is technically feasible," said Jeffrey Bentley, vice president of transportation technology for A.D. Little.

It is estimated that the fuel cell system is twice as efficient as an internal combustion engine and could provide a driving distance of 80 miles per gallon. It also reduces emissions by 90%.

Most important, the new system is refueled quickly using existing gas stations. One of the biggest drawbacks to electric vehicles that use batteries is their long recharging time and short range. Alternative-fuel vehicles are hampered by the lack of refueling stations.

Environmentalists are enthusiastic backers of fuel cells, but some object to the use of gasoline to

produce hydrogen. The critics would prefer the use of cleaner fuels such as methanol or ethanol.

"We think it's the right technology but the wrong fuel," said Jason Mark, transportation analyst for the Union of Concerned Scientists.

Cost is another hurdle for the technology. Pena said a vehicle with such a fuel cell system would cost six times as much as a conventionally powered car does today. Also, the manufacturers must figure out how such a system can be properly packaged in a vehicle.

Pena said he hopes his remarks will spur other U.S. auto makers to explore development of a gas-based fuel cell vehicle. General Motors Corp., Daimler Corp. and Atlantic Richfield Co. are helping Chrysler with its system. GM and Ford have separate fuel cell programs as well.

Some industry experts believe the Big Three lag some of their foreign competitors in fuel cell development. Both Mercedes-Benz and Toyota are developing fuel cell vehicles with methanol processors. Mercedes has said it will produce 100,000 fuel cell vehicles by 2004.

Bentley, however, said Little's gas reformer is superior because it is fuel flexible—it can use gas as well as ethanol, methanol and natural gas. Mercedes' and Toyota's systems can use only methanol.

Little recently received a \$15-million grant from the Energy Department to continue developing the system.

**Statement of Kathleen A. McGinty, Chair
Council on Environmental Quality
Executive Office of the President
Before the
House Science Committee
February 4, 1998**

Mr. Chairman, and Members of the Committee:

I am pleased to be here today to describe the agreement reached in Kyoto and our activities, both at home and abroad, to follow-up on the substantial progress achieved in these negotiations. The Kyoto Protocol is an enormous step forward in what will undoubtedly be a long term global effort to safeguard our earth's climate system from unprecedented human-induced harm and to protect our children and grandchildren from the dangerous consequences that could unfold if we fail to heed the warnings from the world's leading scientific experts.

I am very pleased to report that we made tremendous progress in putting into place most of the key building blocks for a sustainable, market-based system for achieving reductions in greenhouse gases. All Americans can be proud of our achievement: U.S. leadership made the difference; the power and integrity of U.S. ideas won the day. On behalf of the President and Vice-President, I would like to commend the skills, perseverance, and dedication of the United States delegation at Kyoto. Nine agencies were represented in Kyoto. Led by our very able State Department team and Under Secretary Eizenstat, the U.S. delegation served our country well and honorably.

Our efforts following up on Kyoto are directed at achieving further progress in obtaining meaningful participation by developing countries and in implementing the President's plan to harness market forces at home and abroad to enhance energy efficiency, environmental quality, and economic prosperity.

Because this committee's jurisdiction focuses on science, I thought it would be useful, before discussing the outcome in Kyoto, to focus briefly on two noteworthy scientific developments that occurred at the end of last year. Based on extensive ground-based measurements, the National Oceanic and Atmospheric Administration (NOAA)—our lead national agency for collecting weather statistics—reported that 1997 was the warmest year based on records that date back over a century. While the temperature in any one year cannot prove or disprove anything about global warming, this year's statistics, further confirmed by two other sources of information about global surface temperatures (the Goddard Institute for Space Studies/NASA and the researchers at East Anglia University in the U.K.), follow a clearly emerging pattern. The nine warmest years of the century have occurred in the past 11 years. This pattern of warm years led one of NOAA's leading climate scientists to issue a statement that reaffirms a key conclusion contained in the latest international scientific assessment prepared by

1. **Fuel Efficient Vehicles:** At the recent automobile show in Detroit, General Motors (GM) announced four passenger hybrid electric and fuel cell vehicles that can achieve fuel efficiency of up to 80 miles per gallon — production prototypes of which could be available in 2001 and 2004. Ford also unveiled a prototype of a mid-size high efficiency sedan that achieves 63 miles per gallon using an advanced diesel engine. Ford also plans to develop hybrid electric and fuel cell versions of this prototype. Chrysler unveiled its full-size experimental hybrid electric vehicle with a projected 70 miles per gallon fuel economy. These technological advances were made possible through the efforts of the Partnership for a New Generation of Vehicles between the Administration, U.S. auto companies, and their suppliers. (22)

2. **Compressed Air Challenge:** Air compressors represents about 3% of total industrial electricity use and 1% of total U.S. electricity consumption. In mid-January, DOE and major equipment manufacturers announced a new agreement aimed at significantly enhancing efficiency in this sector. Under the agreement, changes in equipment and operating practices are anticipated to reduce energy use in this category by 10% by 2010 at a cost savings of \$150 million per year while reducing greenhouse gases by 700,000 metric tons of carbon.

3. **BP Solar Opening:** Last Friday, BP Solar opened its first manufacturing plant in the United States. Located outside San Francisco, the Vice President flipped a switch to start the plant. This facility will produce a new generation of thin film photovoltaic cells. Spurred by DOE's recently announced Million Solar Roof Initiative, planned plant expansions and openings by other solar cell manufacturers, as well as the President's budget request for enhanced funding for renewable technologies, demonstrate that efforts to increase market penetration based on harnessing the sun's energy are now making significant advances. In fact, the Vice President was able to announce that the private partners in the Million Solar Roofs Initiative have already announced plans for well over half the solar panels needed to get to our goal—a full ten years early.

4. **VCR/TV Energy Star Program:** TV and VCRs represent one of the fastest growing sources of electricity demand. Consumers spend over \$1 billion annually to power VCRs and TVs that are switched off. In early January the Vice President announced a pathbreaking partnership between EPA and the major manufacturers of these electronic goods. The program is quite ambitious with a goal of achieving up to a 70% reduction in energy use when the equipment is turned off without sacrificing product quality, utility or increasing costs. The average household could cut its energy bills by 30% or \$400 per year by switching to the full line of Energy Star products.

These examples further underscore the potential for energy and cost saving opportunities to reduce our emissions of greenhouse gases. The Administration is working on a more detailed economic analysis of the impact of the targets reached in Kyoto. Council of Economic Advisers Chair Janet Yellen will be prepared to discuss the analysis at a hearing next week before the Senate Foreign Relations Committee.

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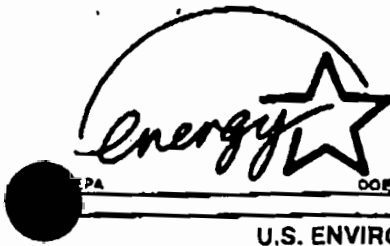
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NOTES:

Facts on Energy Star
& the recent TSI VCR program launch.
Also see McGinty's testimony - let me
know if you need a copy



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ENERGY STAR® Saving the Earth. Saving Your Money.

Efficient energy use and a healthy environment go hand in hand. Inefficient appliances and other products waste energy, which in turn, inflates utility bills and adds to air pollution. Most of the energy consumed in homes and offices is produced by burning fossil fuels like coal, oil, and natural gas. Pollution from these fuel sources can cause respiratory disease, smog, acid rain, and global climate change. In an effort to lessen the harmful side-effects of producing and consuming energy, the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) are working together to help consumers make energy-efficient purchasing decisions. The ENERGY STAR label, the symbol for energy efficiency, can help purchasers identify products that save energy, save money, and protect the environment.

In 1992, EPA and DOE began forging partnerships with manufacturers, retailers, utilities, businesses, and institutions to promote the labeling of energy-efficient technologies. ENERGY STAR manufacturing partners voluntarily join this effort by agreeing to label products that meet stringent efficiency criteria set by EPA and DOE. Many new products have been added to the list of labeled products. Now computers, office equipment, appliances, heating and cooling equipment, residential lighting fixtures, and even new homes can bear the ENERGY STAR label.

The potential for achieving energy bill savings and air pollution reduction through efficient energy use is substantial. Over a 15 year period, if people chose to invest in ENERGY STAR labeled products instead of standard new equipment, these products could save consumers and businesses nearly \$100 billion on energy bills. In addition to this dollar savings, those purchases could achieve a reduction of greenhouse gas emissions equivalent to removing 17 million cars each of those years. The actual impact on energy bills and pollution is likely to be even greater because in many cases, this equipment will replace older equipment that is both more polluting and more expensive to operate.

For an individual household the economic and environmental benefits can be equally dramatic. The typical U.S. household spends about \$1,300 on its home energy bill. Purchasing ENERGY STAR labeled appliances, home office equipment, and heating and cooling equipment can reduce that energy bill by about 30 percent—a potential savings of nearly \$400 dollars a year. In the United States, the greenhouse gas emissions from an average home are greater than from an average car. By buying ENERGY STAR labeled appliances, home office equipment and heating and cooling equipment, instead of standard new equipment can achieve a pollution savings equivalent to taking a car off the road for seven years.

Consumers can get additional information about ENERGY STAR labeled products and programs by calling the toll-free ENERGY STAR hotline at 1-888-STAR-YES (1-888-782-7937). ENERGY STAR information is also available on the World Wide Web at www.energystar.gov or www.epa.gov/energystar.

For More Information:

Elizabeth Agle, U.S. EPA, Telephone: (202) 233-9046 (Beginning 11/21: (202) 564-9046), Facsimile: (202) 233-9575
William Noel, U.S. DOE, Telephone: (202) 586-6149, Facsimile: (202) 586-5557

THE WHITE HOUSE
Office Of The Vice President

FOR IMMEDIATE RELEASE
THURSDAY, January 8, 1998

CONTACT: 202-456-7035

VICE PRESIDENT GORE ANNOUNCES NEW ENERGY STAR PARTNERSHIPS
Manufacturers To Promote Energy-Saving TVs, VCRs to Reduce Energy Costs, Emissions

WASHINGTON – Vice President Gore announced today (1/8) new partnerships with leading manufacturers to promote energy-saving TVs and VCRs with the potential to save Americans hundreds of millions of dollars in electricity bills and significantly curb greenhouse gas pollution.

"These agreements are a great example of government and business working together to improve energy efficiency, save consumers money, create new economic opportunities and protect the environment," the Vice President said from the White House via satellite to participants at the opening session of the International Consumer Electronics Show in Las Vegas, NV. "The American people want a clean environment and they want better, more energy-efficient products as well."

Under agreements with the U.S. Environmental Protection Agency (EPA), 11 consumer electronics companies will produce and market TVs and VCRs that use significantly less energy than products currently on the market, with no sacrifice in performance or change in price. Qualifying TVs and VCRs will bear an ENERGY STAR label (ENERGY STAR®), telling consumers that they have been certified as energy-efficient by the EPA.

The energy savings will help reduce the burning of fossil fuels and the related carbon dioxide pollution that contributes to global warming. If every American family replaced their TVs and VCRs with ENERGY STAR models, it would reduce carbon dioxide emissions by five million tons every year – equivalent to eliminating the pollution from more than one million cars.

Moreover, TVs and VCRs use energy both when they are on and when they are off. Americans spend more than \$1 billion a year on energy consumed by TVs and VCRs when they are not in use. The new ENERGY STAR models will reduce that energy "leakage" up to 75 percent. Ultimately, this will mean more than \$500 million a year in energy savings for consumers. (23)

"By using ENERGY STAR products, the American people will save money on their electric bills and use less energy," the Vice President said. "That makes good economic sense and it's good for our environment."

"The ENERGY STAR program proves that we can meet the challenges of global warming through the marketplace, through new technology and innovation, through good business sense. So here's the message for consumers: Taking action against global warming is as easy as looking for the ENERGY STAR logo," he said.

(MORE)

Manufacturers participating in the new ENERGY STAR agreements are Philips (Sylvania and Magnavox), Thomson (GE, RCA and ProScan), JVC, LG Electronics (Goldstar), Matsushita (Panasonic), Samsung, Sanyo Fisher, Sharp, Sony, Toshiba and Zenith. They have agreed to produce and market at least one TV or VCR meeting the ENERGY STAR standards beginning this month.

Since the ENERGY STAR program began in 1992, EPA and the Department of Energy have forged partnerships with hundreds of manufacturers. More than 2,000 products now bear the ENERGY STAR logo, including computers, refrigerators, dishwashers, air conditioners and new homes. The typical U.S. household could cut its energy bill by about 30 percent — saving nearly \$400 a year — by purchasing ENERGY STAR products.

If over the next 15 years Americans bought only ENERGY STAR products, their electric bills would shrink by more than \$100 billion and they would eliminate as much greenhouse gas pollution as is produced by 17 million cars.

Information about ENERGY STAR can be found via the World Wide Web at www.epa.gov/energystar or by calling toll-free 888-STAR-YES.

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ENERGY STAR[®] for Your Home and Office

ENERGY STAR[®] HOME ELECTRONICS PROGRAM FAST FACTS

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

*U.S. President Clinton, Remarks on Global
Climate Change, October 22, 1997*

- ENERGY STAR labeled TVs and VCRs are the newest addition to the ENERGY STAR Program. The symbol for energy efficiency, the ENERGY STAR label was created by the U.S. Environmental Protection Agency (EPA) to make it easy for consumers to identify and purchase products that save energy.
- Energy generation is a major cause of harmful air pollution contributing to smog, acid rain, and global warming. This pollution also causes respiratory disease.
- The energy used to power small household appliances and consumer electronics, including TVs and VCRs, is one of the largest and fastest growing energy costs in U.S. households. This energy category is currently responsible for about 30% of residential electricity use.
- Many people don't realize that TVs, VCRs, and other consumer electronics still use energy when turned off. The amount of energy consumed by consumer electronics when they're not in use is equivalent to the annual output of 6 U.S. power plants.
- While some small amount of energy is necessary to provide remote control and instant-on features for TVs and VCRs when switched off, most of it serves no useful purpose and is wasted. Some energy experts refer to this waste as "leaking electricity," although no electricity is actually escaping from the products.
- TVs and VCRs with the ENERGY STAR label typically have the same or better performance, features, reliability, and price as conventional models, but save money and the environment by using less energy.
- An ENERGY STAR labeled TV consumes up to 75% less energy than conventional models when switched off. An ENERGY STAR labeled VCR consumes up to 70% less energy than conventional models when switched off.

- more -

ENERGY STAR Fast Facts/Page Two

- Americans spend about \$3.5 billion each year to power their TVs and VCRs. Of this amount, over \$1 billion is used to power their TVs and VCRs when they are switched off.
- ENERGY STAR is a pocketbook issue. The average annual household energy bill in the U.S. is \$1,300. By choosing ENERGY STAR compliant equipment when purchasing appliances and electronics, the average household can cut its energy bill by as much as 30%.
- By choosing ENERGY STAR labeled TVs and VCRs when replacing old products, the average household can cut carbon dioxide emissions by 110 pounds a year, which is the equivalent of preserving 11 trees per household each year.
- The ENERGY STAR label will appear on TV and VCR models, product packaging, product literature, and advertising beginning in January 1998.

For more information:

Visit the ENERGY STAR TV/VCR Program booth (#PS 11 on Sands Avenue at the Sands Convention Center)

Call toll-free 1-888-STAR-YES (1-888-782-7937)

Visit the EPA website at www.epa.gov/energystar



ENERGY STAR[®] for Your Home and Office

ENERGY STAR[®] TV/VCR PROGRAM LAUNCH FACT SHEET

Program

Name: ENERGY STAR TV/VCR Program

Program

Launch Date: January 8, 1998 at the International Consumer Electronics Show[®] (CES)

Booth

Number: PS 11 on Sands Avenue, Sands Convention Center

Organizer:

The ENERGY STAR TV/VCR Program is a voluntary program designed and implemented by the United States Environmental Protection Agency (EPA)

Program

Headquarters: U.S. EPA, Mail Code 6202J, Washington, D.C. 20460

Toll-Free

Hotline: 1-888-STAR-YES (1-888-782-7937)

Web Site:

www.epa.gov/energystar

Program**Description:**

ENERGY STAR is a product label created by the U.S. Environmental Protection Agency (EPA) to help consumers identify products that save them money and protect the environment by saving energy. Manufacturers and retailers sign voluntary agreements with EPA allowing them to place the ENERGY STAR label on products that meet or exceed energy efficiency guidelines set by EPA. They can also use the label in product packaging, promotions, and advertising for qualified products.

ENERGY STAR-labeled TVs and VCRs are the newest addition to the ENERGY STAR Program and consume up to 70% less energy when switched off. Moreover, these products typically cost the same as standard models and provide the same or better performance and features. (24)

Since the program's inception in 1992, EPA has established and maintained hundreds of partnerships with manufacturers, businesses, and organizations to promote the production and marketing of energy-efficient products. Products may carry the ENERGY STAR label if they meet energy efficiency specifications established by EPA.

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Non-Climate Benefits

A final factor that should be included in any comprehensive assessment of the economic implications of the Kyoto protocol are the benefits of the agreement. Obviously, the costs of undertaking greenhouse gas emission reductions must be compared to the benefits. As indicated, for various reasons it is difficult to quantify the benefits from averting climate change itself. But the literature has emphasized that any relative price shifts that prove necessary to reduce emissions should produce non-climate benefits in three areas: air pollution unrelated to climate change, traffic congestion, and highway accidents. These benefits are hard to quantify precisely but are potentially significant: our rough estimates suggest that these three benefits could offset 15-25% of any resource cost of the climate change policy.

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Synthesis

A comprehensive economic evaluation of the economic impact of the Kyoto Protocol must integrate all of the factors described above: reliance on flexible market based mechanisms domestically; international trading and Joint Implementation among Annex I countries; the Clean Development Mechanism; meaningful developing country participation; the potential cost-mitigating role of including six gases and carbon sinks; the benefits of electricity restructuring; and emissions reductions achieved as a consequence of other proposed Administration climate change initiatives. Assuming that effective mechanisms for international trading, Joint Implementation and the Clean Development Mechanism are established, and assuming also that the U.S. achieves meaningful developing country participation, our overall assessment is that the economic cost to the United States in aggregate and to typical households of attaining the targets and timetables specified in the Kyoto Protocol, will be modest relative to the value of the insurance against climate change we are purchasing.

NE

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

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A more tangible measure of costs is the estimated effects on energy prices. Excluding the impact of electricity restructuring and the ancillary benefits of mitigation and better forest management, the SGM-based estimate, corresponding to the gross resource cost estimate cited above, is an emissions price in the range of \$14 to \$23 per ton of carbon equivalent. This

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 translates into an increase in energy prices between 2008 and 2012 at the household level of between 3 and 5 percent, an increase in fuel oil prices of about 5 to 9 percent, natural gas prices of 3 to 5 percent, gasoline prices of 3 to 4 percent (or around 4 to 6 cents per gallon), and electricity prices of 3 to 4 percent. This increase in energy prices at the household level would raise the average family's energy bill by between \$75 and \$125 per year in 2010, although such predictions may not be observable because they would be small relative to other energy price changes, and likely offset by electricity price declines from Federal electricity restructuring. In particular, this increase in energy prices is small relative to the average of year to year real energy price changes experienced by U.S. consumers since 1960: such annual changes have averaged 3.8 percent. In addition, by 2008-2012, the projected 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda would fully offset an energy price increase of the magnitude suggested by the previous model calculation, translating into an overall net reduction in energy prices in the U.S., under the conditions we have discussed.

Energy spreadsheet

Ready

Summary Prime MACE
 As highlighted earlier, estimates like these are fraught with uncertainty. For example, the estimate just discussed is predicated, among other things, on the developing country participation that we are insisting upon as a condition for our ratifying the Kyoto Protocol, but which is not yet part of that Protocol, and on effective international trading. Moreover, other models will yield other answers and much work remains to be done by the modelling community to test the robustness of these results. Preliminary comparisons of the SGM model to the few other models that have been adapted to reflect features of the Kyoto accord, suggest that its predictions concerning the impact of the Kyoto Protocol on carbon permit prices are neither the most conservative nor the most optimistic of the models that have been developed. The predictions of the SGM model are robust in the sense that virtually all energy models reveal the potency of effective, flexible, domestic and international trading mechanisms to reduce substantially the cost and energy price impact of meeting the Kyoto targets.

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

WF

Effects on employment and aggregate output

So far we have said nothing about job losses resulting from climate change policy. Although there may be job gains in some sectors and job losses in others, we do not anticipate any significant aggregate effect if we achieve the conditions we have discussed. Some employment reduction could occur in energy-intensive sectors, although given the very small predicted change in energy prices, impacts in most such sectors are apt to be minimal. Furthermore, a large number of jobs will be created in other sectors -- many of them high-tech jobs paying high wages. The President is firmly committed to assisting any workers who are adversely affected during the transition to a climate-friendly economy.

WF

The situation might be different if a large energy shock were to hit the economy with no

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warning, as happened in the oil crisis of 1973-74, when the real money supply, output and employment all contracted sharply. In addition to hitting with no warning, the oil shocks of the 1970s also entailed large transfers from the U.S. and other oil-importing countries to OPEC, thus depressing real income and spending in the former. A self-imposed shift in the relative price of carbon-intensive energy to address global climate change, on the other hand, need not entail such a transfer of purchasing power. Thus there are critical differences between the oil price shocks and the effort to reduce carbon emissions. Our reassuring conclusion regarding aggregate output might also be different if the policy were to be implemented inefficiently (by command-and-control style regulations of the sort put in place in that oil crisis) rather than efficiently (by market-based mechanisms of the sort that the President has proposed to use).

VII. Conclusion

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

Our overall conclusion is that the economic impact of the Protocol will be modest relative to the value of the insurance against climate change that the Kyoto Protocol provides, under the conditions we have identified. The purpose of this testimony has been to explain the reasoning underlying this conclusion, which relies not only on the forecasts of individual models, any one of which has its own strengths and limitations, but also on a broad variety of additional analysis and assessment.

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

I welcome your questions.