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Environment: Climate Change Vol. III [4]

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MEMORANDUM FOR DISTRIBUTION

FROM: Sally Katzen

SUBJECT: EPA's Ozone and Particulate Matter Standard

DATE: November 18, 1996

Background

The Environmental Protection Agency (EPA) submitted to the Office of Management & Budget (OMB) for Executive Order 12866 review the draft proposed ozone and particulate matter National Ambient Air Quality Standards (NAAQS), and accompanying material, on November 4, 1996. EPA has a court deadline of November 29 for the particulate matter (PM) proposal; there is no court deadline for the ozone proposal. These two draft proposals would establish: (1) primary NAAQS standards to protect human health, with an adequate margin of safety; and (2) secondary standards to protect welfare (visibility, materials damage, ecosystem effects, etc.). The courts have interpreted the Clean Air Act to preclude consideration of cost by EPA in setting the primary standard. EPA, through an advisory committee, is currently developing a set of proposals to implement these new standards, which it expects to propose separately later this Spring. Costs may be considered in the development of new implementation procedures. Based on EPA estimates, these two proposals are "significant" or "major" by any measure.

In a separate exercise from its standard setting process, EPA has estimated that these proposed standards would result in additional costs of \$600 million to \$2.5 billion per year for the ozone standard and \$6 billion per year for the PM standard. For both ozone and PM, these cost estimates do not include the costs of meeting the proposed standards in the 10 to 15 "worst" areas that are having the greatest difficulty in meeting the current ozone and PM standards. For ozone, in particular, EPA's cost estimates exclude any costs of emissions reductions in New York, Los Angeles, San Diego, and Bakersfield, California, because known emission control measures are insufficient to attain even the current ozone standard.

EPA estimates that the proposed PM standard could reduce mortality risk by approximately 3,000 to 20,000 premature deaths per year from respiratory causes. It would also prevent a variety of other adverse respiratory effects. The most important of these are chronic bronchitis and hospital admissions for respiratory ailments. EPA studies have been able to

Alicia
We weren't
going to distribute
this at the 10:30 a.m.
mtg until an announce
EPA memo came in the
door this morning.
So thus, we will hand
this out. ~~that's the~~
~~EPA mtg memo~~, This
was an attempt to
lay out both sides of
the issue (Sally & Dan
were the primary drafts-
people).

Mike
Fitzpatrick

quantify certain health benefits from the proposed ozone standard, including declines in the number of episodes or incidents involving reduced lung function among children who are active outdoors by tens of thousands per year across the country, and in hospital admissions in New York City by about 100 per year.

OIRA has held several staff level meetings and two meetings at the Assistant Secretary level to discuss these proposals.

Questions and Issues

There has been only a limited amount of time to review almost a foot of materials. EPA has, however, provided briefings to all who have requested them. Based on the information presented, several agencies have raised questions with the proposed rules. These include:

- Level and Form of the Ozone Standard: The current standard for ozone requires that the hourly average not exceed 0.12 parts per million (ppm) more than three times over three years. EPA is proposing to change the standard: the average, over three years, of the third-highest eight-hour concentration within any year can not exceed 0.08 ppm. EPA is requesting comments on alternative options, standards in the range of 0.07 ppm to 0.09 ppm, including: (1) whether the average should be based on the first or fifth, rather than the third, highest reading within any year; and (2) whether the traditional rounding convention should be replaced by a rounding procedure at the next digit.

EPA's science advisory panel (CASAC) endorsed a standard based on an eight-hour concentration, and endorsed the range of standards identified by EPA (0.07 to 0.09 ppm) as appropriate. It noted, however, that there is no threshold (even at background) at which there are zero risks and that the selection of a specific standard within the recommended range is a policy, not scientific, judgment.

Several of the agencies are interested in the scientific and health basis for the policy judgment and EPA's evaluation of the risk assessment information underlying that judgment. Note: EPA has not completed a risk assessment of the 0.08 ppm/third highest eight-hour standard that it is proposing, although it has completed risk assessments for standards that it believes are more and less stringent. The risk assessment for the proposed standard is expected to be completed by the end of December.

- Level of the Particulate Matter Standard: The current standard for PM requires that the annual average concentration of PM of a diameter no greater than 10 millionths of a meter (microns) not exceed 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), and that the second highest 24-hour concentration not exceed 150 $\mu\text{g}/\text{m}^3$. EPA would retain the PM_{10} standard and is proposing a new standard for fine PM of a diameter no greater than 2.5 microns -- annual average no greater than 15 $\mu\text{g}/\text{m}^3$ and a 24-hour standard of 50 $\mu\text{g}/\text{m}^3$. EPA also requests comments on alternative options, including: (1) an annual standard of 20 $\mu\text{g}/\text{m}^3$ and a 24-hour standard of 65 $\mu\text{g}/\text{m}^3$; and (2) an annual standard of 12 $\mu\text{g}/\text{m}^3$ and a 24-hour standard of up to 50 $\mu\text{g}/\text{m}^3$. The proposed option is at or below (more stringent

than) the levels preferred by most of the individual members of CASAC. CASAC noted that, unlike for ozone where there is a scientific consensus on the causal link between ozone exposure and health effects, for PM there is no accepted mechanism that would explain the substantially greater health effects observed in epidemiological studies.

Several of the agencies are interested in the health basis and the risk assessment information underlying EPA's evaluation of its proposed standard, both as to the stringency and the basis for selecting either the annual average or the 24-hour average as generally controlling.

- Interaction Between Ozone and Particulate Matter: Several agencies have raised questions about the interaction between these two proposals, including the extent to which controlling PM concentrations would lead to reduced ozone, and reductions in health risks associated with ozone (or vice versa).
- Analysis of the Benefits and Costs: During the course of its review, OIRA has identified several concerns with the Economic Analysis for these two proposals. The most important is the lack of cost estimates for either of the proposed standards in those areas projected to be unable to meet the current standard using known technology, as well as those that would be unable to meet a standard less stringent than the proposal.
- Small Business Regulatory Enforcement Fairness Act (SBREFA): Under SBREFA, EPA is required to convene a small business panel to obtain comments on any proposed rule where a regulatory flexibility analysis is required. EPA determined that because these are health-based standards and not the proposals to implement them, it need not conduct regulatory flexibility analyses and thus need not convene small business panels. Although SBA originally concurred with EPA's conclusion, it is considering changing its mind. Moreover, the American Trucking Association has threatened to take EPA to court on this issue. To the extent that the published package contains any implementation components, the fact that EPA did not convene panels prior to November 29 will be more problematic.
- Unfunded Mandates Act: Each of these proposals clearly trigger the Act's threshold of \$100 million in expenditures by the private sector. As a result, EPA will have to discuss in the preamble whether it proposed the alternative that was least costly, least burdensome, or most cost-effective, or explain why it proposed some other alternative. Another issue is whether State and local governments alone will incur expenditures over \$100 million in any given year, and thus whether EPA has satisfied the Act's requirement that it engage in consultations with these governments before issuing its proposal.

Interested Stakeholders

- Environmental and Public Health Groups: The environmental and public health interest groups have been attentively following the EPA development of these proposals. They expect both proposals to be published on November 29, and some will be very

disappointed if that does not happen. They may view the Administration's actions on these two proposals as an early "litmus" test of the Administration's environmental agenda and its willingness to propose health-based standards without regard to cost considerations.

- State and Local: State and local groups have expressed concern about EPA's proposals, especially in light of their efforts and progress in meeting the current ozone and PM standards. EPA believes that these concerns arise over the uncertainty associated with the change in standards and that proceeding quickly with these proposals will allow EPA to address this uncertainty by initiating a better informed dialogue with State and local groups. Some State and local environmental officials are supportive of the proposals.
- Industry: A number of industry groups have formed a well-financed organization to oppose any revision to the current standards for ozone and PM. The automobile and oil industries suspect that a major part of the burden of these standards will fall on mobile sources and fuels. Utilities and many other manufacturers are also very agitated, and they are arguing, at a minimum, that EPA should co-propose the existing standards.
- Congress: Various Members of Congress have written or called about these proposed standards. Some oppose them on the merits (to the extent they understand the merits); others are concerned that these standards (both the truncated review process and the product) will become a "poster child" for further regulatory reform legislation.

Next Steps

The questions set out above need to be addressed. Any disagreement on the best way to address these questions must be resolved through an interagency process. Finally, changes agreed to through this process need to be incorporated in these packages.

Options

The agencies' representatives discussed several options for next steps.

- Option 1: Publish the ozone and PM proposals on November 29 according to the court schedule for PM. EPA strongly supports this option on the ground that the two proposals should be linked and that the court deadline cannot be changed.
- Option 2: Delay the court deadline for the PM standard until the interagency review of both proposals is complete. Department of Transportation preferred this option. EPA advises that it is highly unlikely that an extension of the court deadline could be obtained.
- Option 3: Split the package and publish the PM standard/monitoring packages by November 29; delay the ozone and interim implementation packages until

the interagency review is complete. Treasury, HHS (CDC), OSTP, CEA, and OMB (NRES and OIRA) preferred this option.

DOE and DoD need to consult further with their senior officials before expressing a preference. DOC, DOL, USDA, and DOI were not present at the last meeting. OVP, NEC, DPC, CEQ, IGA, and WH Counsel were either not present at the last meeting or requested more time.

CC: AM
SF
MT
PT



UNITED STATES SENATOR • CONNECTICUT

Joseph I. Lieberman

Fax to: Dr. Stiglitz Date 11/4/96
Fax# 395 6958 Pages 3
From: Tamara Nameroff
224 9849

Message: Here is the information about an upcoming
roundtable on the local and regional impacts
of climate change. We have invited six scientists
from around the US to talk about projected
consequences of climate change in different
parts of the country. We hope a representative
from your organization will be able to attend.
If you have any questions or need additional
information don't hesitate to call.

Science Roundtable:

Regional Local Impacts of Climate Change

10 - 12 AM, November 20, 1996

S-207, The Mansfield Room

Moderator: Senator Joe Lieberman

Presenters:

Dr. Tom Karl, National Climatic Research Center,
Asheville, NC

- Overview of US regional climate changes in the past 100 years from local weather station data, and implications for future temperature and precipitation projections and impact assessments.

Dr. Ron Neilson, Oregon State University/USDA Forest
Service Pacific Northwest Research Station, Corvallis,
Oregon

- Regional and local changes in forests and native vegetation expected from future climate changes.

Dr. Garry North, Center for Climate Research,
Department of Meteorology, Texas A&M University,
College Station, TX

- Integrated assessment of climate change impacts on Texas agriculture, water resources, ecology, industry and urban systems from the 1993 Texas Climate Conference.

Dr. Robert Shope, Professor of Pathology, Center for Tropical Diseases, Medical Branch of the University of Texas at Galveston

- Infectious disease impacts of climate changes in selected regions of the US, including the South and Southwest.

Dr. Stanley Chagnon, former Director of the Illinois Water Survey, Champaign, Illinois

- Water resource, agriculture and metropolitan impacts of climate change in the Great Lakes region.

Dr. Steve Leatherman, Professor of Geology, Coastal Research Lab, University of Maryland at College Park

- Sea level rise, coastal erosion and other Chesapeake Bay region impacts of climate changes.

*Re: Climate
Change**cc: PP
mm*

FAX TRANSMISSION

U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF POLICY, PLANNING AND
EVALUATION

401 M STREET SW
WASHINGTON, DC 20460
202-260-4332
FAX: 202-260-0275

To: Alicia Munnell **Date:** November 13, 1996
Fax #: 395-6947 **Pages:** 5, including this cover sheet.
From: Dan Abbasi
Subject: model summaries of CO2 stabilization runs

COMMENTS:

Ev Ehrlich called me from Philadelphia to ask that I fax to you the attached model summaries of carbon stabilization runs. I believe he will be calling you to discuss.

In the meantime, if you have technical questions about the attached, please call EPA's Al McGartland at 260-3354.

Thank you.

Stabilization of Carbon Dioxide emissions from energy use at 1990 levels through 2025
Results from Stanford Energy Modeling Forum (EMF-12)

Model	1990 Emissions (MMTCE)	2000				2010				2020			
		GDP Losses (\$Bil. 1990)	Implied Carbon Tax (90 \$)	Emissions Reduction (MMTC)	Percent Emission Reduction from 1990	GDP Losses (\$Bil. 1990)	Implied Carbon Tax (90 \$)	Emissions Reduction (MMTC)	Percent Emission Reduction from 1990	GDP Losses (\$Bil. 1990)	Implied Carbon Tax (90 \$)	Emissions Reduction (MMTC)	Percent Emission Reduction from 1990
ER	1,383	17	\$31.00	122	9%	38	\$61.00	247	18%	64	\$88.00	377	27%
GI-M	1,370		\$12.50	122.1	9%		\$25.00	250.5	18%		\$20.00	304	22%
GI2100	1,431	37	\$105.06	219	15%	60	\$83.21	491	34%	112	\$135.82	579	40%
OECD-G	1,339	5	\$38.00	158	12%	16	\$54.00	345	26%	24	\$59.00	513	38%
IEA	1,524		\$131.00	241.5	16%								
TGas	1,431		\$225.00	276	19%		\$450.00	500.5	35%				
DGEM	1,384	24	\$10.39	134	10%	46	\$18.76	238	17%	49	\$20.61	266	19%
US Markal	1,178			0	0%			21	2%			258	22%
Fossil2	1,275	39	\$76.76	137.4	11%	7	\$61.41	343.6	27%	-30	\$76.76	658	52%
Gemini	1,394		\$119.00	112	8%		\$156.00	334	24%		\$89.00	613	44%
Goulder	1,470	8	\$5.99	110	7%	27	\$15.92	278	19%	62	\$32.51	533	36%
MWC	1,431	29	\$24.00	164	11%	84		426	30%	118	\$72.00	555	39%
CRTM-RD	1,430	-3	\$107.57	235	16%	22	\$91.66	316	22%	67	\$212.00	636	44%

2000 Implied Carbon Taxes -- Household Costs

Model	2000 Implied Carbon Tax	Cost per Kw h	Cost per month (Electricity)	Cost per MBtu Nat.Gas	Cost per Month (Natural Gas)	Cost per MBtu fuel oil	Cost per month (Fuel oil)	Cost per Gal Gasoline	Cost per month (Gasoline)	Average Monthly Cost per Household	Average Annual Cost per Household
ER	\$31.00	\$0.0052)	\$4.30	\$0.45	\$3.36	\$0.67	\$5.25	\$0.07	\$4	\$17.12	\$205
GI-M	\$12.50	\$0.0021)	\$1.73	\$0.18	\$1.36	\$0.27	\$2.12	\$0.03	\$2	\$6.90	\$83
GI2100	\$105.06	\$0.0175)	\$14.57	\$1.52	\$11.40	\$2.26	\$17.81	\$0.24	\$14	\$58.02	\$696
OECD-G	\$38.00	\$0.0063)	\$5.27	\$0.55	\$4.12	\$0.82	\$6.44	\$0.09	\$5	\$20.99	\$252
IEA	\$131.00	\$0.0219)	\$18.17	\$1.90	\$14.21	\$2.81	\$22.20	\$0.30	\$18	\$72.35	\$868
TGas	\$225.00	\$0.0376)	\$31.20	\$3.26	\$24.41	\$4.83	\$38.14	\$0.51	\$31	\$124.26	\$1,491
DGEM	\$10.39	\$0.0017)	\$1.44	\$0.15	\$1.13	\$0.22	\$1.76	\$0.02	\$1	\$5.74	\$69
US Markal											
Fossil2	\$76.76	\$0.0128)	\$10.65	\$1.11	\$8.33	\$1.65	\$13.01	\$0.17	\$10	\$42.39	\$509
Gemini	\$119.00	\$0.0199)	\$16.50	\$1.72	\$12.91	\$2.56	\$20.17	\$0.27	\$16	\$65.72	\$789
Goulder	\$5.99	\$0.0010)	\$0.83	\$0.09	\$0.65	\$0.13	\$1.02	\$0.01	\$1	\$3.31	\$40
MWC	\$24.00	\$0.0040)	\$3.33	\$0.35	\$2.60	\$0.52	\$4.07	\$0.05	\$3	\$13.25	\$159
CRTM-RD	\$107.57	\$0.0180)	\$14.92	\$1.56	\$11.67	\$2.31	\$18.23	\$0.24	\$15	\$59.41	\$713

Assumptions:

830.42 kw-h/mth	0.000167 MTCE/kw-h
7.4917 MBtu Natural Gas/mth	0.0144827 MTCE/MBtu natural gas
7.89 MBtu Fuel Oil/Mth	0.0214829 MTCE/MBtu fuel oil
60 Gal Gasoline/mth	0.00226 MTCE/gal gasoline

2010 Implied Carbon Taxes -- Household Costs

Model	2010 Implied Carbon Tax	Cost per Kw h	Cost per month (Electricity)	Cost per MBtu Nat.Gas	Cost per Month (Natural Gas)	Cost per MBtu fuel oil	Cost per month (Fuel oil)	Cost per Gal Gasoline	Cost per month (Gasoline)	Average Monthly Cost per Household	Average Annual Cost per Household
ER	\$61.00	\$0.0102)	\$8.46	\$0.88	\$6.62	\$1.31	\$10.34	\$0.14	\$8	\$33.69	\$404
GI-M	\$25.00	\$0.0042)	\$3.47	\$0.36	\$2.71	\$0.54	\$4.24	\$0.06	\$3	\$13.81	\$166
GI2100	\$83.21	\$0.0139)	\$11.54	\$1.21	\$9.03	\$1.79	\$14.10	\$0.19	\$11	\$45.96	\$551
OECD-G	\$54.00	\$0.0090)	\$7.49	\$0.78	\$5.86	\$1.16	\$9.15	\$0.12	\$7	\$29.82	\$358
IEA											
TGas	\$450.00	\$0.0752)	\$62.41	\$6.52	\$48.83	\$9.67	\$76.28	\$1.02	\$61	\$248.53	\$2,982
DGEM	\$18.76	\$0.0031)	\$2.60	\$0.27	\$2.04	\$0.40	\$3.18	\$0.04	\$3	\$10.36	\$124
US Markal											
Fossil2	\$61.41	\$0.0103)	\$8.52	\$0.89	\$6.66	\$1.32	\$10.41	\$0.14	\$8	\$33.92	\$407
Gemini	\$156.00	\$0.0261)	\$21.63	\$2.26	\$16.93	\$3.35	\$26.44	\$0.35	\$21	\$86.16	\$1,034
Goulder	\$15.92	\$0.0027)	\$2.21	\$0.23	\$1.73	\$0.34	\$2.70	\$0.04	\$2	\$8.79	\$106
MWC											
CRTM-RD	\$91.66	\$0.0153)	\$12.71	\$1.33	\$9.95	\$1.97	\$15.54	\$0.21	\$12	\$50.62	\$607

Assumptions:

830.42 kw-h/mth	0.000167 MTCE/kw-h
7.4917 MBtu Natural Gas/mth	0.0144827 MTCE/MBtu natural gas
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60 Gal Gasoline/mth	0.00226 MTCE/gal gasoline

2020 Implied Carbon Taxes -- Household Costs

Model	2020 Implied Carbon Tax	Cost per Kw h	Cost per month (Electricity)	Cost per MBtu Nat.Gas	Cost per Month (Natural Gas)	Cost per MBtu fuel oil	Cost per month (Fuel oil)	Cost per Gal Gasoline	Cost per month (Gasoline)	Average Monthly Cost per Household	Average Annual Cost per Household
ER	\$88.00	\$0.0147)	\$12.20	\$1.27	\$9.55	\$1.89	\$14.92	\$0.20	\$12	\$48.60	\$583
GI-M	\$20.00	\$0.0033)	\$2.77	\$0.29	\$2.17	\$0.43	\$3.39	\$0.05	\$3	\$11.05	\$133
GI2100	\$135.82	\$0.0227)	\$18.84	\$1.97	\$14.74	\$2.92	\$23.02	\$0.31	\$18	\$75.01	\$900
OECD-GR	\$59.00	\$0.0099)	\$8.18	\$0.85	\$6.40	\$1.27	\$10.00	\$0.13	\$8	\$32.58	\$391
IEA											
TGas											
DGEM	\$20.61	\$0.0034)	\$2.86	\$0.30	\$2.24	\$0.44	\$3.49	\$0.05	\$3	\$11.38	\$137
US Markal											
Fossil2	\$76.76	\$0.0128)	\$10.65	\$1.11	\$8.33	\$1.65	\$13.01	\$0.17	\$10	\$42.39	\$509
Gemini	\$89.00	\$0.0149)	\$12.34	\$1.29	\$9.66	\$1.91	\$15.09	\$0.20	\$12	\$49.15	\$590
Goulder	\$32.51	\$0.0054)	\$4.51	\$0.47	\$3.53	\$0.70	\$5.51	\$0.07	\$4	\$17.95	\$215
MWC	\$72.00	\$0.0120)	\$9.98	\$1.04	\$7.81	\$1.55	\$12.20	\$0.16	\$10	\$39.76	\$477
CRTM-RD	\$212.00	\$0.0354)	\$29.40	\$3.07	\$23.00	\$4.55	\$35.93	\$0.48	\$29	\$117.08	\$1,405

Assumptions:

830.42 kw-h/mth

7.4917 MBtu Natural Gas/mth

7.89 MBtu Fuel Oil/Mth

60 Gal Gasoline/mth

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0.0144827 MTCE/MBtu natural gas

0.0214829 MTCE/MBtu fuel oil

0.00226 MTCE/gal gasoline

2010 Implied Carbon Taxes -- Household Costs

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G1-M	\$25.00	\$0.0042)	\$3.47	\$0.36	\$2.71	\$0.54	\$4.24	\$0.06	\$3	\$13.81	\$166
G12100	\$83.21	\$0.0139)	\$11.54	\$1.21	\$9.03	\$1.79	\$14.10	\$0.19	\$11	\$45.96	\$551
OECD-G	\$54.00	\$0.0090)	\$7.49	\$0.78	\$5.86	\$1.16	\$9.15	\$0.12	\$7	\$29.82	\$358
IEA											
TGas	\$450.00	\$0.0752)	\$62.41	\$6.52	\$48.83	\$9.67	\$76.28	\$1.02	\$61	\$248.53	\$2,982
DGEM	\$18.76	\$0.0031)	\$2.60	\$0.27	\$2.04	\$0.40	\$3.18	\$0.04	\$3	\$10.36	\$124
US Markal											
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Goulder	\$15.92	\$0.0027)	\$2.21	\$0.23	\$1.73	\$0.34	\$2.70	\$0.04	\$2	\$8.79	\$106
MWC											
CRTM-RD	\$91.66	\$0.0153)	\$12.71	\$1.33	\$9.95	\$1.97	\$15.54	\$0.21	\$12	\$50.62	\$607

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60 Gal Gasoline/mth	0.00226 MTCE/gal gasoline



EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON, D.C. 20500

Alc 19

SENIOR ECONOMIST

November 7, 1996

MEMORANDUM FOR RAFE POMERANCE, DEPUTY ASSISTANT SECRETARY FOR
ENVIRONMENT AND DEVELOPMENT

FROM: RAYMOND PRINCE

RP

SUBJECT: COMMENTS ON DRAFT STAFF-LEVEL CLIMATE CHANGE PAPERS

Our understanding is that the papers are to provide background to the deputies so that they may evaluate the characteristics of a treaty that commits the U.S. to a legally binding target. The major characteristics are the target itself, whether to allow permit trading (either domestic and/or international), compliance problems, and what countries should be included in the treaty.

As useful as they are, the papers would be more helpful if they were organized in terms of options (a target; description of the trading program, if any; compliance costs; and what countries would be included) rather than by characteristics as they are now. A discussion of pros and cons should also accompany each option. It would also be helpful if the targets were to range from modest to ambitious in terms of their impact on concentrations. Organizing by options would be more instructive because as the material is now presented it is difficult to gauge how important any the characteristics are for achieving a particular target.

Finally, these papers can be used as an input into the demarche statement, but the statement should not be based solely on these papers. The demarche statement needs to include some instructions to U.S. negotiators concerning specific proposals that have been made, or are likely to be made by the December meetings, which the U.S. would not find acceptable.

c: A. Munnell

E X E C U T I V E O F F I C E O F T H E P R E S I D E N T

26-Nov-1996 01:54pm

TO: Alicia H. Munnell
TO: Jeffrey A. Frankel
TO: Michele M. Jolin
TO: Mark J. Mazur

FROM: Raymond Prince
 Council of Economic Advisers

CC: Lisa D. Branch

SUBJECT: Revised draft of Demarche

The statement on a timeline for non-Annex I country participation (p. 10, first paragraph under "Next Steps") is an improvement as is the statement on banking and borrowing (p.4). The statement on p. 10 indicates that non-annex I countries must adopting caps at some specific point in the future if climate policy is to be effective. It is important that the U.S. Demarche include some statement to this effect because non-annex I participation will be an important issue in any ratification. The statement on p. 4 removes the earlier comments that only served to weaken our bargaining position on banking and borrowing. Banking and borrowing our the sole means of capturing inter-temporal efficiencies (when flexibility) discussed in the Demarche.

Two issues are not addressed: whether the Demarche should redline any outstanding proposals and whether it should make a statement about the allocation of permits under an international trading program. Of the two, the issue of an allocation formula is likely to be the more important in any ratification.

It is, therefore, important that the U.S. state in its Demarche that, as a principal, an allocation formula should not penalize a nation for growth and should reward a country for energy efficiency. Something to that effect could be added at the end of the next-to-last paragraph on p. 6.

Fri, 11/13/96, msg w/ EU Shlich
2:30pm
Re: Climate change

INTRODUCTION

Restate 4 part position with rationale.

- o realistic binding, medium-term target
- o flexibility, including trading and joint implementation -
- o need for long-term concentration goal
- o need for developing country participation

I. DEFINING THE FORM OF THE TARGET

I. Background

- target involves four elements; baseline, form, level and timing
- lay out ideas on first two, but not the third and fourth at this time
- at COP-2 we said that we rejected short-term targets, but wanted realistic, legally-binding medium term target and emphasized the need for flexibility
- further differentiation should not be ruled out but may be unpractical in next step

*Imx-1
want to find
down here*

II. Baseline Issues

- Existing non-binding aim and proposals to date have used 1990 as baseline
- Yet some countries in their national plans use alternative baselines (e.g., due to weather or economic conditions)
- Useful to examine a broader range of options for defining the baseline including:
 - o a year later than 1990
 - o an average of several years
 - o 1990 adjusted for weather or economic conditions

delete

III. Form of Target

- Existing non-binding aim based on a single year (i.e. 1990 levels in 2000)
- Proposals to date have also focused on a single year.
- This approach is unnecessarily inflexible; it ignores factors like weather, energy prices and economic conditions that fluctuate and may substantially influence emissions in any year.
- Useful to examine a broader range of options including
 - o a multi-year average ranging from a few years to a decade or more
 - o the potential for borrowing and banking to carry over from one period to another
- In addition, we also think it is useful to consider working toward a longer term concentration objective.

5 to 15 years

II. EMISSIONS TRADING AND JOINT IMPLEMENTATION

I. Background

- Both ET and JI offer significant opportunities to reduce costs and to spur technology transfer
- We view JI, and emissions trading as distinct elements; both provide important flexibility

II. Joint Implementation

- Build on experience under AIJ
- Time now to authorize credit for activities in post-2000 period to allow JI activities to blossom worldwide.

III. Emissions Trading

- U.S. experience with emissions trading domestically has been very positive
- All countries with binding national targets could participate in emissions trading on a voluntary basis
- Countries would maintain flexibility in deciding how to implement nationally any international agreed target
- Simple guidelines could be established in context of reporting requirements under national communications in such areas as monitoring and verification.

Low cost to
gov't?
Low cost to
bus. to
low.

.. JI & ET - only w/ known w/ targets -

Do you want to make it greater
attractive to do JI in countries w/
targets as unbound targets?

We want some play & ask
no difference

III. COMPLIANCE

I. Background

- Why we rejected non-binding rhetorical goals in our COP-2 statement
- Why we believe a realistic medium-term target is preferred

II. Compliance will be facilitated by

- describing any target and other actions in as clear and objective a manner as possible
- providing for appropriate review mechanisms
 - o regular meetings of the Parties where compliance can be raised and discussed
 - o enhanced current reporting and review requirements including fact-finding by third-party experts
 - o reports by parties on implementation are made publicly available
 - o multilateral consultative processes could be made available to parties
 - o more formal bilateral dispute settlement processes could be utilized
- providing for consequences for non-compliance, including such options as
 - o discussions among the Parties aimed at facilitating compliance
 - o recommendations by the parties to promote compliance
 - o sanctions (e.g., monetary, trade or reduced rights of a party)

We don't want people to think
we don't want to subject to sanctions
by ourselves

Manual
Protocol

Binding does not necessarily mean
sanctions - we have examples where
NAFTA side agreement has been utilized without sanctions.

IV. ADVANCING THE IMPLEMENTATION OF DEVELOPING COUNTRIES

I. Background

- Important role of developing countries
- Believe a wide range of possible actions exist fully consistent with BM and GD
- Recognize efforts to date by developing countries in developing inventories and action plans, implementing actions and participating in JI activities
- Continue to support these activities

II. Range of Actions to Advance Implementation

- Expand review of national communications to assist countries in identifying cost effective reductions opportunities
- Development of a common menu of "no regrets" actions and urge developing countries to review their plans in light of this menu
- Condition future GEF funding on submission of national communications
- Rank and fund GEF projects in order of cost-effectiveness
- Promote changes in lending practices of MDB and loan agencies to require consideration of GHG emissions
- Agree now that agreement will be reached on binding actions for all parties by a specified date in the future
- Establish a mechanism for graduating from developing to developed country status.
- Establish the "Club of Large Emitters" and set up distinct rules that apply to them with differentiation.

global
environment
fund

Taken -

• Voluntary opt-in may be possible

Pushing developing countries
too hard has implications

For US - They consume 3,
W2 5 1/2 - they'll say O.K.
you drawn down

←
overhead immediate
group - will be
clarified

teagies -

Policies & measures }

What should non-annex 1 countries do -

Who is he?

Florian Krause, Lawyer - L. V. Krause

Strong advocate for Bottoms up models

DT: Mauro -

• Larry Myers

• DRI -

Only use those models for 18 months out

CGE -

• textbooks - Shawn & Wallace -

• Binetti 1980 models - focuses on relative

• story, but no believable story about LR

• pure long-run growth model -

• Newbery & Kolm -

Three families of problems -

Big picture - Hardwares - 13 equations

• Sufficiently simple to understand as textbook

• Behavioral savings story -

• She doesn't treat uncertainty!

② Regional issues -

beyond US, China, to Japan
Globe

RICE - regionalize version of Nordhaus

MERGE - merge regions -

What is the cheapest place to reduce carbon
Japan is the most expensive
• very high energy prices

③ What is impact on energy agreement on a US?

Start w/ Nordhaus

move to RICE

How to US -

- assumes reduction from energy tax is flexible permits
- CO₂ tax is a tax on coal

① Carbon tax

② BTU

③ Energy ad. uniform
= 11% as efficient

Why wouldn't a simple CGE model work?

1. Intertemporal links -

12 Capital accumulation

2.

3. Intertemporal allocation of C

If we can't care about 2000, detail not necessary

(3)

DT's model is small.

Kaput is fixed in the SR.

but I see big difference between
SR & LR classiers

No one has pretty-clear $\Rightarrow$

DT has had - back from Δ in relative
prices -

Berkley is about to expand.

we are far away from optimal environmental
policy -

NOx, Sulphur, Particulates

\$10 - \$100 tax on coal fired
Price of coal = \$20

DRAFT**DRAFT**DRAFT

10/31/96

Stabilizing 2010 Carbon Emissions at the 1995/1996 Average Level: A Quick Turnaround Analysis

This note responds for your request for a quick-turnaround analysis of reducing carbon emissions in 2010 at the current emissions level. For purposes of this analysis the target emissions level for 2010 was assumed to be 1425 million metric tons (MMT), approximately the average of 1995 and 1996 emissions of carbon from the energy sector. The 1996 Annual Energy Outlook reference case projects an emissions level of 1660 MMT in 2010 absent new policies directed at reducing emissions. 2158 m

Two models (MARKAL-MACRO and IDEAS) were used to develop some preliminary insights into the imputed carbon value required to reach the assumed goal. Table 1a reports the imputed carbon tax values from the MARKAL-MACRO and IDEAS models. The required implicit or explicit carbon value would increase delivered (including imputed carbon values) fossil fuel prices significantly from the reference case projections for the year 2010, which are reported in Table 1b. Note that prices paid to suppliers would fall for coal and oil, but increase for natural gas due to rising demand.

Table 1a Imputed Carbon Values in 2010

	<u>Effect of</u>	
	MARKAL-MACRO	IDEAS
Imputed Carbon Value ^{infl - cost} (\$94/ton) price	66.00	140.00
Increment to Demand-Side Fossil Fuel Prices		
Coal (\$94/short ton)	35.71	75.56
Petroleum (\$94/barrel)	7.87	16.65
Natural Gas (\$94/mcf)	0.96	2.09

Table 1b: Reference Case Fuel price projections

Base Case Fossil Fuel Prices

Coal ^{prices in 94} (\$94/short ton)	17.43
at Minemouth	25.88
Delivered to Utilities	
Petroleum: World Crude (\$94/barrel)	23.70
Natural Gas (\$94/mcf)	
Wellhead	2.15
Residential	6.08
Industrial	2.84
Electric	2.49

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10/31/96

The different approaches of the two models used should be recognized. The MARKAL-MACRO model assumes perfect foresight and full knowledge of cost information on fuel and technologies. The whole energy system is optimized simultaneously, considering technologies on both the demand and supply sides to meet energy service needs. Energy savings and carbon emission reductions opportunities are evaluated within each sector, across sectors, and over the whole time horizon under consideration.

The IDEAS model relies on behavioral relationships between energy savings from energy conservation investment, fuel prices, and technology choices. IDEAS treats each sector independently, with decisions in most sectors based on economic information available for the current time period only. For the electricity sector, the model has the capability to look ahead and optimize based on assumptions on future technology and fuel prices.

In the time available for this quick turnaround analysis, only the DRI macroeconomic model was used to simulate effects of higher demand-side energy prices on the US economy. This model was used as the primary basis of the Administration presentation at the June Analysis Workshop, notwithstanding the concerns of the Department that results from a broader variety of models should be presented. We continue to believe that other types of models may provide additional relevant insights.

Table 2 summarizes the GDP losses for three scenarios -- stabilization at the 1990 level .

Table 2 GDP Losses (Billions in \$1994) Resulted from Carbon Taxes

	NPV 7%, 2000-2015	2010 Loss
Stabilization to 1990 Level (using IDEAS Tax Level)	\$517	\$98
Stabilization to 1995/1996 Average Level (using IDEAS Tax Level)	\$417	\$69
Stabilization to 1995/1996 Average Level (using MARKAL-MACRO Tax Level)	\$196	\$33

We would close by reemphasizing the preliminary nature of the results presented above, which are outlined here only in response to your urgent request. We could provide additional sectoral detail upon request if you let us know what you need.

DEFINING THE FORM OF THE TARGET

Note: This paper is a draft for internal discussion purposes only. It is intended to outline issues rather than positions or options, and does not reflect the views of any agency of the U.S. government.

In July of this year, at the Second Meeting of the Parties (COP-2) to the Framework Convention on Climate Change (FCCC), the United States rejected calls by some nations for short-term emissions targets that would disrupt our economy by coming on too quickly and inflexibly (e.g., a 20% carbon dioxide reduction from 1990 levels by 2005). Instead, the U.S. proposed that the Parties negotiate a legally-binding medium-term emissions target, incorporating flexibility in time and place of implementation, including the use of reliable activities implemented jointly (AIJ) and trading flexibility around the world. The U.S. also expressed interest in working towards a longer-term concentration goal, as set out in the FCCC objective, recognizing that scientific understanding and technology will improve over time.

This paper provides an overview of issues and options related to the design or form of a target. It also identifies a number of issues for further analysis by the interagency analytic effort. The following key issues are addressed in this paper:

- * Should targets be defined relative to 1990 emission levels (like the current non-binding aim), to emission levels in a later year, or to indicators of future population growth or economic activity?
- * Should the "medium-term" target be set on a single-year basis? As average over a multi-year period (e.g., 3 to 10 years)? As a cumulative amount of emissions over long-term period (e.g., 30 years or more)? In terms of contributions to atmospheric concentrations?
- * Should the U.S. maintain its current position in favor of a comprehensive target (i.e., all gases, sources, and sinks) or handle different gases in different ways?

In addition, the paper considers the interaction between the form of the target and several other issues:

- * Conditions or options that might be built into the form or design of the target if the current negotiation does not come to full agreement on the role of trading and AIJ as envisioned in our COP-2 statement.
- * How negotiation and ratification considerations, as well as consideration of longer-term concentration goals, relate to the choice of a target form.
- * Frequency of commitment reviews.

- * Possible incentives to encourage early reductions.

I. Target Forms and Periods

a. Baseline Issues

The existing non-binding aim of the FCCC calls for developed countries to return their emissions to their 1990 levels by 2000. Most proposals to date for post-2000 commitments have been stated in terms of changes from 1990 levels in a future year (e.g., 20% reduction from 1990 levels in 2005; 1990 levels in 2010). Other baseline alternatives could be considered:

A later year than 1990. Changing the base year affects the relative position of countries that have had different emissions growth rates in the 1990s. A base year later than 1990 (e.g., 1995) would favor countries such as the U.S. that have had relatively fast emissions growth since then. It would disadvantage countries such as the U.K. and Germany that have reduced emissions since 1990, and especially disadvantage Russia and other countries with economies in transition (EITs) that have had sharply declining emissions due to reductions in economic activity (hopefully temporary) and energy market reforms (hopefully permanent). Raising this issue could complicate and slow the negotiating process.

1990 "adjusted" for weather or economic cycles. In national reports submitted under the FCCC, a few countries unilaterally adjusted their baselines to reflect weather, economic, or energy market conditions in 1990, altering the relative position of different countries. The current Convention, which includes only a non-binding "aim" for 2000, gives no guidelines or limitations for such adjustments. In the context of a legally binding target, any adjustment methods would have to be internationally negotiated and agreed upon.

An average of several years. If there were concerns that unrepresentative weather or economic conditions in the base year unfairly affected the Parties relative position, they could agree to use the average of several years (e.g., the average of the 3 or 5 years surrounding 1990).

Change from a projection of future emissions. Another approach could be to reduce emissions by a specified percentage from what they would otherwise have been under "business as usual" in a future year (e.g., 20% reduction from projected 2010 emissions). This raises difficult questions concerning the choice and validity of any underlying model to project the "business as usual" reference case.

b. Target Form Proposals

(1) Single-Year Targets. Proposals for future commitments made to date by other Parties define both the target level and the base in terms of single-year emissions levels. For example, one proposal would have each Party meet its 1990 level of greenhouse gas emissions in 2010, and presumably in each year thereafter.

A single-year target has the disadvantage of being sensitive to short-term variation in the weather, energy prices, and business cycles. Unusually hot or cold years, for example, can cause U.S. emissions to swing by + or - 25 million metric tons of carbon (MMTC) -- about 2% of total U.S. emissions and about 40% of the reduction sought by 2000 in the U.S. Climate Change Action Plan. Because swings in weather, energy prices, or economic cycles cannot be predicted with confidence, a single-year target would require each country to build in an extra margin of GHG reductions to ensure compliance, raising both cost and environmental effectiveness.

(2) Multi-Year Average Targets. A short-term (3 to 10 year) multi-year average target would be less sensitive to short-term variation in weather, energy prices, or business cycles, reducing the need for an extra margin of emission reductions to assure compliance. This, in turn, might enable the Parties to agree on a more stringent target.

Form. Either "block" or "rolling" averages could be used. With "block" averages, each defined time period lies end to end (e.g., 2010-14, 2015-19). Compliance would be determined at the end of each block of time, looking at average emissions over the period (e.g., every five years). With "rolling" averages, each year begins a new time period that overlaps the prior and following periods (e.g., 2010-14, 2011-15, 2012-16). Compliance would be determined at the end of each year, looking back to the average emissions of the preceding period (e.g., the preceding five years). Both block and rolling averages smooth out year-to-year variation associated with weather, energy prices, and economic conditions. Block averaging offers additional flexibility for a Party to determine the pace at which the emissions "budget" for the period will be expended (evenly, front-loaded, or back-loaded) in accordance with its national circumstances. (This issue is explored further with regard to longer-term cumulative emissions targets, below).

How long? A multi-year average target could be set for periods of various lengths (e.g., 3 to 10 years). Analysis of weather variation, energy price fluctuations, and business cycles is needed to illuminate how much smoothing of weather and business cycles is provided by rolling average targets of various lengths.

Role of banking and borrowing. Multi-year averages inherently incorporate some degree of banking and borrowing. If emissions are below the target in any one calendar year, that amount automatically can be carried over to offset higher-than-target emissions in other years within the same five-year periods.

Banking or borrowing could also take place *between* multi-year average periods. For example, in a "block" average system, emissions amounts "unused" during one period could be banked and carried over to a later period. Such an approach rewards efforts to make early reductions. Borrowing from a later period in order to emit more in a current period raises more complex issues, however. (These issues are treated more fully in discussion of long-period cumulative targets, below.)

(3) *Longer-Period, Cumulative Targets.* A cumulative target for longer periods (e.g., 20 or 30 years or more) could give parties flexibility over longer periods than the shorter-term multi-year average target concept already discussed.

Form. Each party would be assigned a cumulative emissions budget for a longer-term period (e.g., 2010-2040, 2000-2050). Each party would then be free to determine how fast to consume its cumulative emissions budget over the period, in accordance with its national circumstances. For example, one country may choose to defer emission reductions to later in the period, and to let emissions continue at or even above current rates in the early years. Another may choose to set a tighter budget for the early years, with less steep reductions in later years.

A variant of this approach would add consideration of the role of sink processes that remove carbon from the atmosphere. Targets would be set in terms of a Party's *allowed incremental contribution to atmospheric concentrations* at a given future date. Reductions late in the period may be more valuable in meeting such a commitment than early ones, since the impact of early emissions on atmospheric concentrations would be reduced in any event by the operation of sink processes. Substantial scientific uncertainty about the operation of current sink processes, as well as the possibility that sink processes themselves would be affected by climate change, would complicate application of this variant.

"Flight plans" and banking/borrowing. Each Party would be required to file a "flight plan" committing to the rate at which it will consume its emissions budget over the whole period. An intermediate reporting and review process would be necessary to assure that each Party was staying on its "flight plan." For example, the longer-term period could be divided into sub-periods, with each Party indicating how much of its budget will be used in each sub-period. Deviations from "flight plans" could be treated in two distinct ways: as a form of non-compliance that subjects the deviant to whatever enforcement mechanisms are available, or as a trigger that requires a deviant Party to file an updated plan that puts it on a path to meet its original obligation. With respect to both original and updated flight plans, consideration would have to be given to how much borrowing should be allowed from later in the period (i.e., the consequences of "falling behind"). A limit might be needed to prevent a Party from using up its entire budget before the multi-decade period ended.

How long? A longer-term cumulative target of 30 years or longer is suggested by the desire to avoid prematurely retiring long-lived energy-related capital stock, and by reliance on technological progress to bring forth cleaner and lower cost technology.

- For example, the United States might want to take account of the replacement cycle for its existing coal-fired power plants, which are responsible for roughly 30 percent of current U.S. carbon dioxide emissions. Most energy analysts project significant rates of replacement of current coal-fired plants in the 2015 to 2025 period and beyond, although replacement rate predictions are uncertain given the option of refurbishing plants to extend their lifetimes. A cumulative budget that allowed reductions to be deferred to late in the period would conserve this capital stock and require less capital to be used for emissions abatement early in the period. Further cost reductions would accrue from back-loading the mitigation profile if time improves the efficiency of replacement sources and brings down their costs.
- One study of both capital stock turnover and replacement cost issues in the U.S. concluded that, assuming agreement at this time on a 50-year cumulative emissions budget for developed countries, no changes in the budget over the 50-year period, and perfect foresight among firms, flexibility to allocate emission reductions over the 50-year time span could reduce overall costs by 40 percent. The savings would be less if the budget period is shorter.
- The potential savings would also be affected if (as is almost certain to be the case) the 50-year cumulative target cannot be guaranteed and is subject to periodic review and adjustment based on developments in science, technology, and economics. Since scientific understanding of the rate and severity of warming is likely to continue improving, targets are likely to be repeatedly reviewed and reconsidered over the next 50 years. If commitments were tightened before the end of a cumulative budget period, the potential savings would be reduced; if they were loosened, savings would increase.
- The rate of technological improvement and cost reduction is also uncertain and subject to policy influence. A target that requires relatively early, but non-Draconian, reduction efforts will send a signal to the private sector that can be expected to accelerate the rate at which current technology is applied and improved technology developed. As an example, while it first appeared that eliminating ozone-depleting chloroflourocarbons from building "chillers" would force costly early retirements of existing units with 30-year expected lives, redesigns stimulated by the phase-out improved energy-efficiency beyond historical or expected rates of improvement; reduced operating costs now make it profitable to replace existing units early. An important question is whether policy-driven acceleration of technological progress in one sector of the economy can be achieved only by diverting resources from technological progress in other sectors, slowing overall labor and capital productivity growth. The Interagency Analysis Team is further considering these issues.

c. Differentiation

Some developed countries are now calling for "differentiation" in their new commitments, rather than a common commitment related to a common base year. For example, Japan has proposed setting the target in terms of a percentage change in base-year *per-capita* emissions, which would be easier for Japan to meet than the same percentage reduction in national aggregate emissions. Australia has suggested a formula based on various economic indicators, intended to compensate for competitive disadvantages that Australia asserts flow from common targets. A formula including adjustments for population growth would benefit the U.S. relative to Europe and Japan (which have stagnant population trends), but if this approach were used in future rounds of negotiations, it would disadvantage all developed countries relative to countries such as India and China, which have very low per-capita emissions and higher population growth.

Another approach that could be advanced is a target adjusted for GDP growth rates. This would respond to concerns that a country experiencing unexpectedly high growth should not be "penalized" by having to live with a fixed emissions budget. On the other hand, it might be reasonable for that country to devote a portion of its increasing wealth to the added cost of living within the fixed emissions budget. Targets could also be based on changes in base-year energy intensity, or GHG emissions per unit GDP. These approaches would reward countries for becoming more efficient in the use of energy (and in the emission of other GHG's). These approaches all share the drawback of not limiting total emissions from the covered countries to a fixed level, since the amount of emissions allowed becomes a function of other variables. In addition, some such formulae could work to the disadvantage of developed countries if they are applied in later rounds addressing limits for emissions from developing countries.

Most differentiation proposals made thus far would disadvantage the United States. The U.S. could respond to these proposals with a differentiation proposal of our own constructed to work to our advantage. To date, however, the U.S. has opposed differentiation among Annex I countries altogether for two reasons. First, we have argued that differentiation would be a negotiating nightmare, because each proposal benefits some parties at the expense of others. Second, the U.S. has urged that the Parties make use of emissions trading and flexibility in the timing of emissions reductions to overcome differences in national emission reduction costs (e.g., cost per ton reduced).

Assuming that we maintain this position of basic opposition to differentiation among the current Annex 1 Parties, we should recognize that new OECD members, such as Mexico and South Korea (membership pending), are unlikely to accept the same target as other developed nations. These countries have graduated from developing country status, but they are still much less developed than the core OECD countries and have much lower per-capita emission rates.

A final issue relates to the differentiation in opportunities for trading rather than in the emissions mitigation commitments themselves. The European Union has used a collective reporting approach in evaluating its own progress towards meeting the existing, non-binding

emissions mitigation aim, implicitly trading off emissions increases in some countries against reductions in others. However, to date the U.S. has strongly opposed allowing the European Union to meet any new legally-binding mitigation commitments on a collective "bubbled" basis unless developed countries outside the European Union are afforded a similar opportunity for trading. Adherence to such a position advances both U.S. interests and makes it more likely that we will achieve our flexibility objectives.

II. Treatment of Various Gases

The current Climate Convention covers all GHGs except those controlled under the Montreal Protocol (the treaty that protects the ozone layer); the excepted gases are being phased out or limited for ozone protection reasons. The principal greenhouse gases other than carbon dioxide are methane, nitrous oxide, and a class of industrial gases containing fluorine, many of which are replacements for chloroflourocarbons. Globally, these gases represent about 30% of the added radiative forcing to the atmosphere since pre-industrial times. The FCCC also covers emissions "sinks" of carbon dioxide as well as "sources." Significant amounts of atmospheric carbon are released by deforestation and some agricultural and land management practices. Reforestation can also remove carbon from the atmosphere.

The U.S. supported inclusion of all GHGs and inclusion of both sources and sinks -- the so-called "comprehensive approach" -- during negotiation of the current FCCC, and we used this approach in constructing our Climate Change Action Plan (CCAP). Reductions in emissions of gases other than carbon dioxide constitute about 30 percent of the reductions counted on for meeting the CCAP's goal of returning U.S. greenhouse gas emissions to 1990 levels by the year 2000. Sink enhancement accounted for 10% of CCAP reductions. Many developed countries have eschewed the comprehensive approach, choosing instead to establish separate targets for each gas, focus only on policies and measures for non-CO₂ gases, or ignore these gases entirely in their national action plans. Proposals for emissions "targets and timetables" now on the table generally focus only on carbon dioxide emissions.

Different GHGs may present different strategic opportunities from the perspective of effects on the climate system. Methane reductions are especially important given concerns about the rate of warming over a decadal scale (see above). Methane has a short atmospheric lifetime, meaning that reductions in methane emissions produce lowered atmospheric concentrations more rapidly than reductions in emissions of carbon dioxide or other GHGs. If a priority goal is to limit the rate of warming over the next few decades, methane reduction is extremely valuable.

Looking to the period to be covered by the medium-term target, analysis could illuminate whether including all greenhouse gases increases or decreases the overall burden of a given target, as compared to the same target for carbon dioxide alone. For the U.S. (as well as other countries), methane currently may be more cost-effective to control than carbon dioxide when gases are compared on an equivalent basis (see below). Indeed, net reductions in methane, and net increases in the forest sink, were used in the U.S. CCAP to offset growth in carbon dioxide.

The fluorinated industrial gases, however, are growing rapidly from a baseline of near-zero and may be more expensive to limit. Including them in the CCAP made meeting the target of 1990 levels by 2000 more difficult to achieve.

It should be noted that CO₂ emissions from fossil fuels (85 percent of all U.S. greenhouse gas emissions) can be estimated with a high degree of certainty from readily available data on fossil fuel production, imports, and consumption. All other sources of emissions are more uncertain, with some sources (land use change, nitrous oxide emissions from agriculture, some methane sources) being highly uncertain. This suggests that a drawback of including all sources and all gases in a comprehensive target is that national compliance may be more difficult to assess.

Assuming continued pursuit of a "comprehensive" approach, each Party could be given flexibility (1) to decide the "shares" of the overall GHG target that it will assign to different gases and sectors, and (2) to allow trading among gases and sectors in order to encourage the greatest and most cost-effective reductions. Several issues are important to consider in regard to inter-gas trading.

Different levels of measurement certainty for various sources and sectors. Emissions from some source types are readily quantifiable, while emissions from others are subject to very large uncertainties. CO₂ emissions from individual power plants are easily monitored (indeed monitors are already in place in the U.S. as a by-product of the Clean Air Act's acid rain program). CO₂ emissions from individual cars are not known so precisely, but they are uniform enough for use of emission factors and averaging. On the other end of the spectrum, carbon uptake by trees is uncertain for the U.S. as a whole and highly uncertain for specific tracts of forest. Similarly, methane reductions from improved cow nutrition can be estimated on a national basis, but estimates at the level of a particular dairy may be subject to great uncertainty. Trading among different gases and sources might be limited by the need for information on emissions and emission reductions to meet a reliability threshold.

Gas equivalence ratios. GHGs can be compared using indexes of "global warming potential" (GWP). The relative strength of the gases varies, however, depending on the time scale being considered. Methane, for example, is considered 22 times more potent, pound-for-pound, than carbon dioxide on a 100-year basis. Its relative importance is even higher on a short-term timescale (e.g., 20 years). The Parties could agree to allow inter-gas trading based on the 100-year GWPs. Alternatively, if slowing the rate of warming in the next few decades is given priority, then a shorter-term GWP might be preferred for inter-gas trading.

III. Interactions With Other Key Issues

(a) The Form of the Commitment and Emissions Trading

An appropriate emissions trading regime is important to serve three important U.S. objectives. The first is cost-effectiveness: analysis shows that emissions trading involving both developed and developing countries has substantial potential to reduce the costs of achieving a given change in greenhouse gas emissions (or to reduce emissions within a given resource constraint). As discussed in other papers, emissions trading can also promote two other key U.S. objectives -- encouraging developing country "opt-ins" to emissions mitigation commitments and encouraging all parties to comply with their commitments.

At COP-2 the U.S. stated that its support for a binding medium-term target was premised on the availability of emissions trading around the world and reliable AIJ. It is possible, however, that agreement on trading provisions of appropriate scope may not be agreed upon by COP-3 in 1997. The pilot phase on "activities implemented jointly" (during which the transfer of emissions credits is excluded) will not be completed before COP-3, and some developing countries could attempt to block discussion of trading or joint implementation in this round on that basis. There are several ways that this situation might be addressed:

- Conservative approach: Set a target the U.S. would be willing to meet without trading, recognizing that trading may not materialize. The possibility that trading might not be available could put added value on flexibility over time.
- Conditional approach: Develop a commitment that explicitly conditions the developed countries' target on a future determination regarding access to emissions trading on a global scale.
- Financial option approach: Include an option for parties to make contributions to an "Emissions Reduction Fund" (ERF) in lieu of making emissions reductions. The fund's resources would be used to secure additional emissions reductions beyond those required by any FCCC obligations. If desired, the ERF could be structured to serve as a supplement to, as well as a substitute for, emissions trading, providing an assured market of last resort through which Parties could buy reductions required to meet their commitments. Depending on the intended purpose, the charge for meeting emissions reduction obligations through the fund could reflect the estimated cost of available low-cost mitigation opportunities plus some administrative premium, or a higher charge to penalize those who resort to the ERF. Use of the fund mechanism could be limited to some fraction of an overall emissions limitation obligation.

(b) Consequences of Form and Timing for Negotiation and Ratification

The form and timing of the target can have interrelated consequences for the dynamics of the international negotiating process and subsequent prospects for domestic ratification and implementation.

The U.S. is on record as supporting a "medium-term" target. Many believe that medium-term translates into a date somewhere between 2010 and 2020 (dates reflected in the Berlin Mandate and the Geneva Declaration), but there has been no definitive decision. For an averaged target of a decade or less, a date identified as being "medium-term" could refer to the start, the mid-point, or the end of the period. For a longer-term cumulative target, the "medium term" could refer to either the start date or the date of the first "flight plan" review.

In terms of the negotiations, commitments that incorporate flexibility could provide an attractive alternative to the briar patch of explicitly differentiated commitments. However, some might interpret an effort to either maximize trading or timing flexibility or delay the start date of new commitments as an indicator of a lack of seriousness or purpose about the climate issue. This could create obstacles for efforts to negotiate further commitments for developing countries, which will be necessary in view of their projected emissions growth.

The form of the target also has implications for ratification and implementation prospects. Given a determination regarding the meaning of "medium-term," the form of the target can directly affect the length of the window for ratification and implementation. Because greenhouse gas emissions have a strong underlying trend and momentum (independent projections suggest that U.S. CO₂ emissions in 2000 will be more than 10 percent above their 1990 level, and trending up) there is a risk that an inflexibly structured agreement could quickly become a dead letter unless it achieves immediate ratification and implementation (R&I). Absent immediate R&I, the outcome could mirror our experience with current efforts to return to the 1990 emissions level by 2000, which we no longer seriously consider pursuing only three years after undertaking them.

Provision of flexibility need not conflict with environmental performance -- the Chairman and Chairman-elect of the Intergovernmental Panel on Climate Change have publicly stated their belief that delayed reduction profiles to a given concentration level are likely to be environmentally indistinguishable from more accelerated profiles. Since flexibility raises the probability of ultimate R&I success by building in the opportunity for multiple attempts should initial efforts be unsuccessful, it could be argued that flexible approaches are preferable on environmental as well as cost grounds once R&I risks inherent in the process are taken into account.

Policymakers should also recognize that, for a given target form, adoption of a later "start date" can provide another means of increasing the length of the window for ratification and implementation. For this reason, the choices of a start date and the choice of a target form may

be seen as interrelated with respect to any desire on the part of policymakers to provide for multiple opportunities for R&I.

(c) Relationship of Target Form and Concentration Goals

As mentioned at the beginning of this paper, the U.S. statement at COP-2 in July suggested the need to continue working towards a longer-term *concentration* goal (e.g., for 2050 or 2100), as set out in the FCCC's "ultimate objective" of stabilizing greenhouse gas concentrations at a level that avoids "dangerous" interference with the climate system. Working towards such longer-term goals would respond to requests from some U.S. business interests for a signal as to our long-term trajectory, and also provide a strong message to all governments that limitations will be needed over the long-term on emissions from both developed and developing countries.

The prospect of longer-term concentration goals bears directly on both the *level* of the medium term target (not discussed in this paper) and its *form*. Analysis can describe a large set of emissions paths consistent with any future atmospheric concentration level that might be of interest (e.g. a doubling or tripling, or equivalent doubling or tripling, of pre-industrial carbon dioxide levels). Emissions to date have already rendered some concentrations unreachable. The lower the concentration level of interest, the more restricted are options for future emissions paths.

Policymakers will also need to consider the relationship between medium-term targets and the longer-term concentration goals they might ultimately want to pursue. Analysis can help to determine the extent to which the desire to keep particular longer-term concentration objectives open would impact on the choice of both a target form and target level in the medium term. (As noted above, a medium-term target using a cumulative emissions approach would always be subject to revision. Should very low concentration levels ultimately be targeted, a medium-term target set in the form of cumulative emissions over an extended period might need to be revised to reduce emissions budgets prior to the end of the originally contemplated period. This prospect will have to be considered by Parties, and emitters located within their borders, as they seek to exploit any timing flexibility that may be provided. Parties or firms who are "surprised" by such changes may *ex post* incur greater than anticipated costs, reducing or eliminating any cost savings from the initial adoption of timing flexibility.

An additional factor to consider is scientific concern over the *rate of warming* on a decadal scale, in addition to cumulative warming over a longer period. High-speed warming could exceed the adaptation capabilities of ecosystems and individual species. Our principal point of leverage on the rate of warming may be control of methane, which has a concentrated impact on warming during an atmospheric lifetime that is shorter by a factor of 10 or more than that of other important greenhouse gases.

(d) How Often Is the Commitment Reviewed?

The FCCC contemplates a periodic review of commitments, based on up-to-date scientific, technological, and economic assessments. The first review will be completed in 1997, five years after the Convention was adopted. The next major scientific assessment report is scheduled for 2000 or 2001, but no decision has yet been made on when the next review of commitments will be completed. Five years seems to represent a minimum interval for the accumulation of significant new information and for conducting a diplomatic endeavor of this magnitude, but longer intervals might also be considered.

Given emissions trends in the developed and developing worlds, it is clear that meeting the ultimate objective of the Convention (stabilization of atmospheric concentrations of greenhouse gases at a level that prevents dangerous human interference with the climate system) will require limitations on emissions from both developed and developing countries. Since it is a negotiating reality (reflected in the terms of the Berlin Mandate) that new commitments for developing countries will not be agreed to in this round, questions need to be asked as to when should be the deadline for completing the next round of negotiations, and what should the scope of that negotiation include.

One approach would be for the U.S. to seek a next round focussed on developing country commitments, in order to avoid pressure for further action by developed countries before developing countries take on emissions targets. Realistically, however, we may be unable to definitively rule out review of developed country commitments. How quickly to expect a more forthcoming attitude from developing countries may depend on how successful we are in this round in creating an emissions trading/joint implementation framework in which developing countries, as well as developed ones, see benefits of participation.

(e) Incentives for Early Reductions

Most proposals already tabled or likely to be advanced in the future contemplate a 10- to 20-year period before the first "medium-term" target takes effect. It would be desirable to create incentives to encourage early reductions during this period. One approach would be to define a baseline emissions path for this interval. While Parties would not be required to stay within that baseline during that interim period, they could bank any reductions below that path, for use against later commitments. Another approach, in connection with a long-term cumulative emissions target, would be to begin the long-term period immediately (e.g., 2000-2050).



United States Department of State

*Assistant Secretary of State for Oceans and
International Environmental and Scientific Affairs*

Washington, D.C. 20520

cc: AM
JAF
RP

November 13, 1996

NOTE FOR CLIMATE CHANGE GROUP

Attached are redrafts of the papers to be discussed on Friday, November 15th. Please use these papers as the basis for the discussion. (The trading paper is now being revised and I will send out a redraft tomorrow).

If possible I would like to come out of Friday's meeting with some consensus on what kind of paper we would like to present at the international meeting the week of December 9. We would then rewrite the papers based on the discussion and circulate different, probably shorter, and hopefully more focussed efforts on the 19th. In an ideal world these papers would be cleared on November 21st, and then sent to the Deputies for a meeting on either the week of November 25th or December 3.

Thanks,

A handwritten signature in black ink, appearing to be 'EBC' followed by a flourish.

Eileen B. Claussen

Note: This paper is a draft for internal discussion purposes only. It is intended to outline issues rather than positions or options, and does not reflect the view of any agency of the U.S. government.

Achieving A Flexible Cost-Effective Climate Convention: Initial Considerations On International Emissions Trading and Joint Implementation

I. Why Is Flexibility Important?

The U.S. has already stated the high priority we give to allowing flexibility to nations in how they achieve their emission commitments in the new agreement. By this, we are seeking to:

- achieve GHG reductions where they are least costly, including in other nations, through international "greenhouse gas (GHG) trading" and/or "joint implementation" (JI);
- reduce GHG reductions by an equivalent amount over some specified period of time, allowing trade-offs over time that can accommodate capital stock turn-over and technological advance.

International GHG trading and JI allow meeting a given commitment at lower cost because at the margin, the costs of an increment of reduction will be lower in countries with no GHG commitment or with lower required effort, than by the marginal costs of the same reduction in a limited set of countries. The U.S. may also seek to build incentives for early reductions of emissions into the rules for trading and/or JI, to slow the rate of climate change, and to stimulate development of effective trading institutions and technological advance.

II. How Much Priority Should The U.S. Put On Achieving Flexibility In The Negotiations?

The priority and urgency the U.S. gives to trading and/or JI in the negotiations will depend on decisions regarding the stringency and timing of emission reduction commitments:

- If the targets are not very constraining, trading or JI may not occur because the differences in marginal costs across countries will be lower and may not be worth the transaction costs of participating in the international regime.
- If the targets do not begin for many years (say, 2020), then the need to fully elaborate the rules and procedure for trading by December 1997 may be reduced, allowing efforts to be re-directed in 1997 to more immediate need, provided that the 1997 protocol or amendment creates a process to follow up.

III. Global Emissions Trading -- The Ideal & Why It Is Not Yet Possible

The "ideal" international GHG emissions trading system arguably would be one that capped overall greenhouse gas emissions, country by country, allowed banking, borrowing, and interpollutant trading, and which included all parties to the Convention. This is the "ideal" because the interim environmental goal -- expressed in terms of emissions -- is ensured by the

binding nature of the targets, while the theoretical efficiency gains from *flexibility* are most closely approximated in a relative "hands off" "cap and trade" program. Unfortunately, the ideal is unlikely, at this time, because for trading to be global, all *countries* would need to accept a quantitative target or cap on emissions; this is probable for developed countries but unlikely for most developing countries

IV. What Is Possible -- AIJ, JI With Credits, & Emissions Trading Among Countries With Commitments

Given that the ideal is not possible, we have to think about three distinct flexibility systems which may be possible. They are 1) the existing provisions for "activities implemented jointly" (AIJ) 2); "joint implementation" with credit; and 3) an emission trading regime for countries with quantitative national emission targets (currently "Annex I" countries plus others who may choose to "opt-in"). The features of each of these systems is discussed further below. A discussion of how we ensure movement from the least desirable option to the most desirable options (emissions trading) is presented in Section V, "Next Steps"

The distinctions between the three systems can briefly be summarized as follows:

Activities Implemented Jointly --	voluntary national emission caps for Annex-I participants, no emission limits for non-Annex I participants, no credits allowed against voluntary national emission caps
Joint Implementation With Credits--	binding national emission caps for some (developed country) participants, no emission limits for other participants, credits allowed towards national emission caps
Emissions Trading --	All participants have binding national emission caps; credit allowed against national caps

A. Activities Implemented Jointly

The current AIJ is in a pilot phase under the FCCC. It can end at any time but will be reviewed for decision on its continuation no later than 2000. Current AIJ is a "no national caps/no credit" program to demonstrate the potential and possible mechanisms of two or more countries working together to reduce, avoid, or sequester greenhouse gas emissions. However, AIJ are required to achieve GHG reductions additional to what would have otherwise occurred (an "additionality" requirement). The U.S. launched its own Initiative on JI in October 1993. By the summer of 1996, 51 project proposals had been submitted of which 15 projects had been accepted and 18 more remain under development. The projects involve six different countries outside the U.S. and includes activities related to fuel switching, solar, biomass, hydro, and forest management. A coalition of electric utilities in the U.S. has also initiated their own program aimed at identifying and promoting JI. Other participants include environmental and business

NGOs, technology companies, brokers and financiers, and other diverse organizations. Even though it is still at an early stage, the U.S. JI has had a substantial influence so far in setting national project approval criteria, determining rigorous international reporting requirements and developing methods for estimating project baselines and related greenhouse gas reductions.

The advantages of AIJ are that:

- It begins to develop necessary institutions and processes in developing countries that in the near future that will not agree to any national target for GHG. AIJ helps many developing countries to develop effective environmental protection regimes. It assists countries to develop and apply methods for estimating source-level emissions and projections, and to estimate emission reductions from specific projects and actions. It helps them to develop collaboration with the private sector in reducing emissions, appropriate institutions, and monitoring and verification regimes. It is also helping move many of these countries towards more effective markets, including in emission reductions. The AIJ pilot begins to develop an infrastructure that would be useful to JI with credits (e.g. project level monitoring, operationalizing "additionality") and to emissions trading (e.g. international reporting guidelines, measurement, monitoring and verification protocols, consistency across national programs)
- AIJ begins to engage some developing countries politically as well on reducing GHG. Many countries who are leery of commitments and crediting for joint implementation or trading (China and India for instance) have shown support (not always openly) for AIJ, and at least a willingness to discuss participation. This category of countries is likely to include the Big Emerging Markets who are undergoing rapid economic expansion and which have vast potential for greenhouse gas friendly investments that would avoid or mitigate some of the projected rapid increase in GHG emissions. The U.S. private sector sets a high priority on increasing the level of commitment in these countries for several reasons. First, they are worried about the competitiveness effect on industries where these countries are global players. Second, these countries present a potentially vast market for U.S. technology. Third, the contribution these countries make to global GHG emissions is increasing rapidly, and eventually they will overtake and defeat the value of developed country emissions reductions. Finally, because of the emission growth rates projected in developing countries, these countries offer a large pool of relatively low cost greenhouse gas reductions, compared to the private sector's estimates of controlling GHG emissions strictly within domestic boundaries. AIJ may help set the stage for bringing developing countries into quantified GHG commitments.
- AIJ should also help accelerate the diffusion of cleaner technologies and practices in developing countries as well. The incubation period for new, cleaner technologies can be fairly long, and the movement from initial commercialization to substantial market penetration depends on real application of the technology in appropriate markets, and the receptors to gain the know-how to procure and operate them effectively. Although the

incentives for such private sector-to-private sector projects are low in AIJ, due to the lack of credits, there is evidence that the impact of AIJ on technology diffusion could be significant. Moreover, there is also evidence that this process is assisted by the political attention that clean technology AIJ projects receive in developing and transition countries, helping to improve country receptivity and to expedite project approval processes.

The disadvantages of the AIJ, especially in its pilot phase, are that:

- Incentives for private sector investors to participate are low because no credits are allowed for AIJ. Consequently, projects are limited and relatively small compared to what might occur if credits were allowed, and financing is difficult. Hence, AIJ currently does not produce large quantities of near term GHG emission reductions.
- There remains poor definition of AIJ internationally, resulting in some confusion and slowness in getting programs and activities going, and in exchanging useful information among parties.
- Estimating the real, incremental emission reductions associated with many activities is challenging. The relatively few number of projects and the lack of credits for them (making the "additionality" requirement onerous to some) slows progress in resolving the issues.

B. Joint Implementation With Credit

JI with credit expands the current AIJ pilot program to allow "credit" for emissions reductions relative to a project baseline.

All the advantages of AIJ, described above, hold also for JI with credit. Also:

- Allowing credits for projects against national emission caps, or against domestic emission limitation requirements provides a concrete, and possibly substantial, incentive for private entities to invest in JI, to the extent that GHG reductions can be found abroad that are less expensive and as reliable as domestic reductions.
- The likely larger volume of interest and projects in a system of JI with credits would accelerate development of infrastructure (institutional and market) needed in non-OECD countries for both domestic and international emission control purposes. This would also assist their eventual participation in an international GHG emissions trading regime (e.g. development and awareness of GHG emission reduction opportunities)

The disadvantages of pursuing joint implementation with credit are that:

- Successful negotiation of JI with credit is not at all certain. Many developing countries have opposed the concept of joint implementation with credits arguing along several fronts, i) that it would represent a new form of eco-imperialism with developing countries seeking to avoid solving a problem they largely created, ii) it would be used as a substitute for needed development assistance, iii) inexpensive reductions would be bought up by developed countries leaving only expensive reductions behind for developing countries when faced with their own commitments; iv) it would threaten their sovereignty by providing an incentive for private companies to circumvent their governments in ways potentially inconsistent with the nations' development objectives. It should be noted, however, that through the efforts of USJI and the Country Studies Program, some developing countries, particularly in Central America, have begun to take a more active role in JI and to view them as an opportunity to encourage investment and technology transfer and to channel development in a more sustainable direction.
- The transaction costs of a project by project JI system are relatively high (compared to the lower rigor needed if credits are not allowed, and to the relative administrative ease of an allowance-based trading system). Designing and implementing a workable system of project by project emission reduction credit for investments made in countries without any overall emission limits may be difficult, complicated, and administratively expensive, and may not attract many investors -- especially if a substantial volume of low-costs trades are available in countries with national commitments.
- Alternatively, parties and participants with less concern for the environmental risks or consequences of an unrigorous crediting program may pressure the system to reduce administrative costs -- "red tape" -- and nullify the potential environmental benefits of the program, and reducing the overall effectiveness of the Convention.
- There are substantial technical difficulties which need to be overcome, primarily the definition and operationalization of additionality and the development of accepted protocols for measuring project by project baselines, as described above for AIJ.

C International Emissions Trading

Assuming that national governments will continue to be the *Parties* to the international Framework Convention on Climate Change and its protocols or amendments, *Parties'* principle obligations will be to ensure that their total national emissions do not exceed the target they will have committed to, for each compliance period. Under an international emissions trading regime, the Parties would allow initial national commitments to be modified, taking into account any emissions allowances purchased from other Parties, sold to other Parties, or brought forward through "banking" of extra reductions in an earlier period. For more discussion of how emissions trading might work see below.

V How An International GHG Emissions Trading Regime Might Work

A Key Questions

There are multiple questions which must be answered in order to develop an international emissions trading regime, such as who would participate, where and when trades would occur and how appropriate mechanisms would function. Only "who" and "how" are discussed below

Who would trade?

As discussed above, only Parties to the FCCC that have committed to binding, quantified national emission caps would trade emission reductions and requirements as the Convention would view it. As other entities are not bound by the FCCC and subsequent subsidiary agreements, only activities directly involving Parties are within the purview of the agreement. Thus, it is highly likely that only Parties to the FCCC -- almost entirely national governments -- would be the actors officially responsible for reporting net national emissions to the Convention, and may be the only actors able to officially register allowance transactions under the FCCC, although requires further consideration. This also protects national sovereignty in such a system, assuring that only activities approved by the government are allowed to modify its obligations

However, there remains the more pragmatic issues of how emission trades would be generated and implemented. That is, who would identify the opportunities for emission trades, who would find appropriate buyers or sellers, who would plan, develop and operate the emission reduction activities are far more open questions. Emissions trading could involve government to government transactions or include the private sector, or NGOs, or state, regional or provincial governments (as has occurred in AIJ projects already). Private sector and other participation in emissions trading is much more likely to promote more, and more cost effective, emissions reductions and may create the greatest incentives for development and diffusion of new, lower polluting technologies. The U.S. currently supports and actively encourages private sector and other participation in AIJ and its own domestic trading regimes. Other countries taking on national emission obligations, however, may choose to trade internationally as governments, rather than allowing their subnational entities to participate directly in international trades. The international emissions trading regime should be flexible to accommodate varying national approaches to meeting their emission obligations

What would be traded?

As noted above, as the conference of the parties to the new agreement will likely view emissions trading, the "commodity" that would be traded would be units of emission reductions that modify the commitments to Parties' quantified emission caps. (This corresponds most closely to the definition of "allowances", as described below.) However, how the commodity is defined at the domestic levels will likely vary across Parties, at least in the near term.

The U.S. currently has several emission trading programs, which allow two different types of commodities to be traded: "allowances" or "credits." Note that the U.S. has advocated

flexibility in national approaches to implementation and, it is unlikely that the new agreement or subsequent rules for an international GHG emissions trading regime would require any country to adopt either an allowance or credit system domestically. It is likely therefore that the answer to this question is that both allowances and credits will be traded. It is possible that over time, national implementation strategies may converge on a single definition of the commodity, but this is unlikely in the near term.)

Allowances

- Sources within a country would receive a budget over some period of time of allowable emissions, or "allowances." Sources' allowances would have to be defined and allocated by national governments, presumably in their national implementation plans or related regulations
- Sources' strategies to stay within their allotted allowances (or "compliance strategies") would not need approval by the national government, although some countries may choose to require it.
- Within the trading system, allowances are fungible and fully acceptable for compliance without further approval (although some countries may require it)
- Sources are required to hold allowances equal to emissions during a compliance period
- There must be some sort of "true up" by authorities, i.e., a reconciliation of emissions and allowances for compliance purposes
- The "cap and trade" system can be the emissions control regime, although it may co-exist with other emission control regimes (i.e. including regulations or fiscal measures)
- Examples: US acid rain control program, Southern California RECLAIM

Credit

- Emission reduction "credits" can be created when sources within a country make reductions beyond a some determined and agreed level, which may be a conventional regulatory standard (such as a power plant emission rate), or a projected baseline for the source. Trading may augment a system of policies and measures or regulations (or fiscal measures) which are the emissions control regime. However, credits could be generated even where there is no other control regime in place -- this latter eventuality raise integrity and reliability questions.
- Other sources (or countries) may purchase emission reduction credits to meet regulatory or other requirements instead of undertaking pollution control measures.
- Regulators certify reductions and credits towards other requirements, and approve trades
- Generally, credit systems provide flexibility and cost savings, but they are not the fundamental regulatory mechanism under which emissions reductions are made. Rather, it is the conventional regulatory standards or other measures that are the fundamental emissions reduction mechanism
- Examples: EPA Emissions trading policy statement: bubbles, offsets, averaging, banking.

B Attributes of An International GHG Emissions Trading Regime

The following describes the attributes of a "good" international trading or JI regime, recognizing that not all possible system designs would achieve these to an equal extent, and that there are tradeoffs among them. In negotiating, the U.S. would seek to achieve agreement on a greenhouse gas trading and joint implementation system that would:

- motivate Parties to achieve and strengthen national commitments to reduce or limit GHG;
- ensure that for the system as a whole, trading or JI activities reduce GHG in the atmosphere at least as much, or beyond, that which would occur without trading or JI -- i.e., that the system safeguards environmental benefits;
- be flexible to accommodate differing national approaches to achieving their national GHG commitments;
- be as inclusive of Parties, sub-national entities, gases and sectors as possible, subject to meeting the other conditions;
- minimize costs, especially transaction and administrative costs;
- motivate economic actors to continually find and implement cost-effective GHG emission reductions;
- ensure transparency through accurate and reliable monitoring, record-keeping and reporting;
- provide incentives for compliance and certainty that non-compliers will not benefit or undermine environmental progress.

By definition, then, a trading system will allow parties to trade or exchange credits toward and against national GHG commitments through actions that verifiably and reliably reduce accrued, net GHG emissions (or enhance net sequestration) beyond that which would occur without the system. In sum therefore, the system should promote and ensure:

verifiability	additionality
environmental reliability	efficiency
motivation	flexibility
inclusiveness	comprehensiveness

C Features or Procedures For An International Trading or Joint Implementation System

Certain common features for a party's domestic program would be [necessary for] [facilitate] an international trading or joint implementation. Many of these are desirable even without international trading, but become essential for integrity when trading is allowed.

- Compatible domestic mechanisms for determining whether credits or allowances to be traded internationally are surplus to baselines. This includes the capabilities to accurately track or project domestic emissions and to reconcile allowances or credits with emissions.

measurements or projections

- Compatible quality of emissions baselines information at the project level (for credit-based trading). Countries must be able to establish reasonably accurate baselines at the project-level if they are pursuing credit based trading. Standards (not necessarily regulatory) to assess quality of baseline information would have to be established for different types of sources
- Compatible methods for measurement of emissions. If the traded commodity is to be uniform, emissions must be measured comparably in all participating countries. Different methodologies would have to be developed for specific source types. Uncertainties in monitoring accuracy could be reflected by discounting credits/allowances. A system of discounting would allow participants to trade off credit received for measures versus monitoring stringency and cost.
- Compatible requirements for reporting emissions and allowance/credit data to other countries and to the public. Some mechanism for tracking international emissions and for matching these emissions against allowances or credits would be required for compliance purposes under the new international agreement. This mechanism could be a centralized clearinghouse for registering trades and reporting emissions, under the Secretariat or through another mechanism. This organization would not necessarily have any enforcement powers. Rather, it could reconcile emissions with allowances/credits internationally and would report on any discrepancies. Alternatively, each country could have its own tracking systems but would be required to make all information easily accessible to the public. The integrity of the system would be maintained by countries checking on each other, non-governmental organizations serving as observers or watchdogs, and market participants demanding integrity of participating countries or subnational entities. These participants might be reluctant to purchase credits/allowances from countries or sources where there were poor emissions accounting practices.

D How Does International Emissions Trading or Joint Implementation Relate To National Control Strategies?

A "budget-based" protocol (i.e., one in which each country has an emissions target or cap) easily accommodates a domestic allowance-based cap-and-trade system like the U.S. Acid Rain Control Program. It would also be compatible with a domestic credit-based system, if countries choose to adopt emissions standards in some sectors and generate credits through exceeding established regulatory standards or other regulatory baselines. Trading could also be compatible with other national approaches to implementation, including fiscal measures, although this needs further consideration.

Assuming there is a budget-based protocol, there are several ways that countries with national emission caps might structure implementation. Some are described below. All of these are workable, especially if certain common requirements, are met (see above). First, a party could issue allowances equal to the national target to national emitters. This approach makes emissions trading the fundamental underpinning of a domestic program and is most compatible

with a budget-based protocol. If emissions are less or are expected to be less than the allowances held at the end of a compliance period (either by a government or a subnational entity), then the extra allowances would be available for trading.

Second, a party could adopt conventional regulatory standards and national emitters could generate credits by exceeding these standards. This may be a more incremental introduction to emissions trading for inexperienced nations and may be more compatible with policies and measures under consideration in developed countries. On the other hand, it may be more complicated to reconcile credits with a national emissions budget because it must be determined whether credits are surplus to the national target.

In countries using a policies and measures approach alone or with credit-based trading, or where an allowance based system is used that does not cover all sources of emissions (see below), the country would have to, *in some cases*, project the future emissions impact of a group of policies and measures (similar to U.S. State Implementation Programs for air pollution) or of the source and perhaps the sector. It would be more difficult to show that trades are surplus to a national target because the assessment of national emissions is based upon projections of the baseline activities and impacts of policies and measures (e.g., emission standards). These projections are at the aggregate national level and they may be imprecise for determining whether a possible emission reduction credit from an individual source is truly above and beyond the national target.

Third, a party could issue allowances to emitters for some sectors and allow generation of credits for other sectors. This hybrid approach may be the most flexible, since it would allow trading to proceed in the maximum number of sectors.

Finally, a party could bubble or average emissions with other countries. This may be a relatively simple way to trade emission reduction obligations that would be attractive to some countries. However, it could put U.S. at a disadvantage if certain countries decide to average their emissions without including the U.S. (e.g., if the E.U. decides to bubble). Also, the current aspirational commitments of the FCCC have included a regional "bubble." However, no clear delineation of responsibilities and of an action plan that could meet the aggregate target has been made available. In a legally binding and enforceable agreement, such a situation could be problematic.

VI Next Steps

The U.S. will have to decide how much relative emphasis to put on the three main mechanisms available for flexibility discussed in this paper. We will have to consider the political and practical interactions among these three programs, and between these policy issues and the overall structure of the commitment, other developing country considerations, likely national strategies to meet their commitments, and compliance and enforcement.

A AJJ

- A process is just getting underway within the UNFCCC Secretariat to resolve some of the technical issues surrounding AIJ. The Secretariat will be developing a work plan for the next three years and deciding which issues should be solved, in what order and how. The U.S. could contribute significantly to the development and of this work plan and support it once it is developed.
- Through bilateral relations, the development of AIJ projects and the provision of financial assistance to developing countries and EITs, the U.S. could continue to develop stakeholders around the world who support the general flexibility concept underlying AIJ, Joint Implementation with credits, and GHG emissions trading.
- The U.S. could withdraw support for AIJ (without credit) and let it fade away.

B. Joint Implementation With Credit

- The U.S. could begin building support in other countries to end the pilot phase of AIJ and push for JI with credits under the next Protocol. If this step is taken, the U.S. could develop options to ensure that developing countries who participate in a system of JI with credits have an incentive to graduate to full participation in an emissions trading regime and the acceptance of a commitment and then advocate one of these options internationally.
- The U.S. could decide not to push for the end of the AIJ pilot phase but rather to wait to the end of the AIJ pilot phase (2000 or beyond if it is extended) to determine whether or not AIJ works and whether to move to Joint Implementation with credit.
- The U.S. could decide not to support JI with credit (i.e. no mechanisms involving countries without quantified national emission commitments).

C. International Emissions Trading

- The U.S. is currently researching how an emissions trading regime might work.
- The U.S. could frame the debate on international GHG emissions trading internationally -- The U.S. is the only country with broad experience in emissions trading and an increasing number of countries have suggested that we take responsibility for framing the debate and demonstrating that international emissions trading is workable.
- While there is broad support among developed countries for the concept of emissions trading, there is a widespread lack of understanding both in the general and detailed mechanisms of how it can work. The U.S. could support an intensive phase of education internationally, to equip other countries to participate constructively in designing and eventually carrying out a system.
- The U.S. could begin to answer some of the more detailed questions on how an international GHG emissions trading regime might work that are advanced in Section V.

Drafted 11/8/96 Kete/Carter/Kruger/Leggett-Emil
filename ETJ11.cpa

Revised Draft

November 12, 1996

NOTE: This paper is a draft for internal U.S. Government discussion purposes only. It is intended to outline issues and options and does not reflect the views of any agency of the U.S. Government.

Reaffirming and Continuing to Advance
the Implementation of Article 4.1 Commitments

Issue

What specific proposals should the United States advocate to "reaffirm and continue to advance the implementation of Article 4.1 commitments?"

Negotiating Objectives

To ensure that action by developing countries is part of a protocol/amendment to the U.N. Framework Convention on Climate Change.

To ensure appropriate balance between the actions taken by developed countries and actions taken by developing countries pursuant to the protocol/amendment.

Background

Greenhouse gas emissions in developing countries are growing rapidly. By the year 2020 they are projected to exceed the emissions of the developed world. China is now the world's second largest greenhouse gas emitter (after the United States).

Developing countries must be part of the protocol/amendment because:

- (1) action by the developed world alone cannot solve the problem of global climate change, and
- (2) it will be difficult to persuade stake holders in developed countries to take additional action if developing countries are not also seen to be taking some action;
- (3) developing countries may otherwise gain competitive advantage

In negotiations toward the Convention, participants largely acknowledged that the environmental benefits of developed country efforts to return their greenhouse gas emissions to 1990 levels by the year 2000 were not quantifiable; the "aim" of the Convention was largely political -- a small downpayment toward reaching the Convention's ultimate objective (the stabilization of atmospheric concentrations of greenhouse gases at a level that will prevent dangerous human interference with the climate system).

In this regard, little has changed since 1992. Whatever step developed countries are prepared to take in negotiations toward a new legal instrument will also largely be insusceptible to quantification in terms of its environmental benefits. It will likewise be difficult if not impossible to measure the environmental benefit of action by developing countries.

In the absence of an environmental metric, the benefits of action by developed countries and action by developing countries can be measured only relatively -- both on a political scale, and each largely in terms of the other.

Politically, it will be indispensable to include developing countries in the new legal instrument. Without developing country participation, it will be difficult for developed countries to summon domestic political support for additional action by them. For this reason, including developing countries in any next step has long been a sine qua non of U.S. policy.

Differentiation

The issue is how to include them. Article 3 of the Convention provides that, "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities [emphasis added]. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof." Article 4.1, which pertains to all Parties, also speaks of their "common but differentiated responsibilities."

Therefore, under the Convention there must be appropriate balance -- or differentiation -- between the actions of developed countries and those of developing countries. This "differentiation" is rooted in their "responsibilities" (historic emissions) -- the usual emphasis of developing countries. It is also rooted in their "respective capabilities" (resources available to respond) -- the preferred emphasis of developed countries.

The Convention differentiates between developed and developing countries by requiring all Parties to take the actions set forth in Article 4.1 and by requiring developed countries to take the additional actions set forth in Articles 4.2, 4.3, 4.4, and 4.5. Differentiation is also evident in Article 12's reporting requirements.

The Berlin Mandate further differentiates between developed and developing countries. It provides for strengthening the commitments of developed country (Annex I) Parties by elaborating policies and measures and setting quantified limitation and reduction objectives within specified timeframes. It also provides that the process will not introduce any new commitments for developing country Parties, but will reaffirm existing Article 4.1 commitments and continue to advance the implementation of these commitments.

"Differentiation" is thus central to the Convention and to the Berlin Mandate. It is also reflected in the Geneva Declaration (July 1996), which provides that the "outcome" [of the negotiations] should encompass commitments for Annex I Parties regarding policies and measures as well as "quantified legally-binding objectives for emission limitations and significant overall reductions within specified timeframe. The Geneva Declaration also specifies that the "outcome" should encompass "commitments for all Parties on continuing to advance the implementation of existing commitments in Article 4.1."

[Note: Arguably, the Geneva Declaration -- which speaks to the "outcome" of negotiations -- offers greater assurance that developing countries will be part of the next step than the Berlin Mandate itself, which speaks only to what the negotiating "process" should include.]

Developing Country Perspectives

In the negotiations that led to the Berlin Mandate, the Group of 77 (G-77) (the developing country caucus in the United Nations) strongly resisted undertaking any new commitments. Leaders of this effort included notably China and India. China, in particular, felt that there was no need to begin negotiations toward a new legal instrument in Berlin, that the Parties should first implement the Convention's existing commitments for an indeterminate period. They reacted very negatively to the German "Elements Paper" (an early effort to set forth basic elements of a protocol. The German paper called for new commitments from developing countries; the G-77

so soundly rejected the German paper that they allowed no reference to it in the Berlin Mandate. Even the protocol proposed by the Alliance of Small Island States (AoSIS) touched off a firestorm within the G-77 because it suggested that developing countries might take some, albeit minor, actions.

Ultimately, the G-77 relented and agreed that negotiations could begin -- but they were adamant that these negotiations involve no new commitments for developing countries. Developed countries, in particular the United States, insisted that developing countries must be involved in the negotiations and that the new legal instrument must include action by developing countries.

The compromise ultimately agreed provided that all Parties would "reaffirm" their existing commitments and "continue to advance the implementation" of those commitments. To some developing countries, this provision was hollow; their representatives have since asserted that developing countries will do nothing beyond what they are already doing. To most developed countries, this provision means that developing countries will be included in the new legal instrument, which will elaborate to some extent on their existing commitments.

Establishing the Continuum

Not yet established in the negotiations is the concept of a continuum with respect to "continuing to advance the implementation of Article 4.1 commitments." At one end, very little beyond existing implementation efforts might be expected; at the other end, the distinction between "continuing to advance the implementation of existing commitments" and "new commitments" might almost be lost.

Where precisely along the continuum of possible actions we would expect developing countries to end up will depend on how far developed countries are prepared ultimately to go in their own "next step." It will also depend on the political judgment developed countries reach about the concomitant action they will need from developing countries to achieve the kind of rough symmetry that their domestic constituencies will demand.

To settle at some future date on a point along a continuum, it will be critical soon to establish it conceptually and to suggest potential parameters. This could be done in U.S. interventions at the AGBM's Fifth Session in December. Waiting much beyond December will create several problems: 1) what to say in December, if not this; 2) when else to begin laying the ground for potentially significant action from developing countries; 3) how to begin rallying other developed countries, recognizing that unity among them will be important in the negotiations.

With three likely negotiating sessions (March, August and October) after the AGBM's next meeting and before Kyoto in December 1997, not much time remains in which to posit a conceptual approach, rally developed countries and persuade developing countries.

Options Along the Continuum

The continuum of approaches that could be proposed is extremely broad and includes actions both humble and grand. It may aid evaluation to consider them in several categories. They are labeled here simply by letter (categories A-E), which correspond, however, to increasing levels of action.

At the low end, actions proposed would entail little controversy, but neither would they achieve significant reductions in greenhouse gas emissions. At the high end, actions proposed could lead to meaningful greenhouse gas reductions but would be extremely controversial and difficult to negotiate; they could also give rise to developing country demands for substantial increases in development assistance, Global Environment Facility (GEF) funding, technology transfer, etc. Actions higher up along the continuum would also presuppose a higher level of action from developed countries.

Governments participating in the GEF will be engaged in a major replenishment effort in 1997. While this effort may not be concluded before 1998, developed country efforts to involve developing countries in the new legal instrument will likely give rise to calls from developing countries for higher levels of GEF funding -- the more significant the actions expected of developing countries, the stronger the chorus for increased GEF funding. U.S. contributions to date to the GEF (\$190 million appropriated) suggest that the United States will fall significantly short of its 1994 pledge of \$430 million. Thus, even if the United States were disposed to increase its future contributions to the GEF, we have a credibility problem both among other donors and recipients that will be difficult to overcome.

Note that implicit in the actions listed below is acceptance of the Berlin Mandate proscription against "new commitments" for developing countries. While the provisions of the Berlin Mandate might themselves be overturned, this would come at a very high price, including, most likely, a virtual meltdown of the negotiations. Although some have argued that developed countries should take no additional action unless that action is matched by developing countries, most developed

countries accept that the threat of global climate change is too serious to risk a stand-off in which global greenhouse gas emissions continue to grow unabated.

Also implicit in the actions listed is acceptance of the political imperative to show "progress" within the four corners of the new legal instrument. While it would be possible to pursue a strategy in which the United States or a somewhat broader segment of developed countries (e.g., the G-7) sought to change the development path of key developing countries through bilateral or multilateral efforts outside the Convention, it is questionable whether such progress outside the new legal instrument could be used to justify new developed country commitments in the instrument. Appearance and politics militate against this approach, whatever its practical advantages might be.

The categories here are obviously subjective. There is no systematic basis for including a particular action at the high end of one category or the low end of the next. Moreover, the categories and the possible actions within them are not mutually exclusive -- it would be possible to choose particular items from among the categories. Still, the categories listed may serve roughly to differentiate among various possible options, recognizing that there has as yet been little substantive discussion in the AGBM sessions of how to "continue to advance the implementation of Article 4.1 commitments."

Category A

This category of options may include some or all of the following:

- 1) Stressing the vulnerability of developing countries to the impacts of significant climate change, and systematically documenting the local (national) benefits to be gained from actions to respond to climate change
- 2) Developing guidelines for domestic processes to implement commitments under Article 4.1
- 3) Urging developing countries to implement "no regrets" measures to address (mitigate) greenhouse gas emissions that are make sense in their national circumstances

- 4) Proposing to expand the U.S. "Support for National Action Plans (SNAP) Program (the successor to "Country Studies") to help developing countries identify and implement such "country-driven" (nationally determined) "no regrets" measures, essentially seeking to replicate internationally U.S. voluntary programs under the Climate Change Action Plan of 1993
- 5) Using investment guarantees to encourage U.S. firms to support developing country efforts to implement such cost-effective measures

Options in this category would require little of developing countries beyond what they are already doing. Domestically, they could require some additional work (seeking to use investment guarantees, which could engender domestic opposition if pursued vigorously) or commitment (expanding the SNAP Program). They would not be controversial or provocative. It might be possible to implement them without significant expenditure (or calls for significant additional funding from developing countries). They could be reflected in the new legal instrument to demonstrate that developing countries were moving forward to some extent (e.g., a commitment to implement "country-driven", cost-effective measures).

Category B

Options in this category would constitute more of a departure from the status quo than those described above. They might include such items as:

- 1) Promoting an in-depth review process, similar to that of Annex I Parties, for the initial and subsequent national communications of developing countries (this could involve amending Article 10.2(b) of the Convention to specify clearly that the Subsidiary Body on Implementation, or a counterpart body under the new legal instrument, would be empowered to consider information submitted by each Party individually; it could also involve expanding the powers of such a body, e.g., by enabling the Conference of the Parties to 'elaborate' further the functions and terms of reference of the SBI or new legal instrument counterpart body)

- 2) Developing a common menu of "no regrets" actions (provision for doing so and for revising the menu from time to time could be included in the new legal instrument, although the menu itself would be established through decisions of the Conference of the Parties) and urging that developing countries periodically and systematically review the menu and "order" such items as could be justified in their national circumstances
- 3) Proposing new provisions to engage developing countries more effectively in technology cooperation and diffusion (this could be shaped in such a way that developing countries, as the primary beneficiaries, would have little objection -- that is, it need not include references to 'market reform' or 'removing barriers to technology diffusion', but could involve participation in a revitalized Climate Technology Initiative or various elements thereof)

To date the United States has tended to view the development and implementation of a review process for national communications of developing countries as a part of ongoing efforts to implement the Convention. In this sense, the United States has been unwilling to "count" such efforts as "continuing to advance the implementation of existing commitments" under the Berlin Mandate. Still, having just adopted guidelines for initial communications of developing countries at the Second Conference of the Parties in July 1996, the issue has yet to be joined. Experience in negotiating those guidelines has proven that a significant effort will likely be required to develop and implement a meaningful review process, particularly in view of developing country sensitivities and in view of language they successfully included in the Convention that presents obstacles to doing so.

In the context of a new legal instrument, clarifying that national communications of developing countries would be subject to individual, in-depth review (not merely review in the aggregate) would be a meaningful change.

Other options in this category could be structured in such a way as to avoid issues that would provoke developing countries while still advancing efforts to implement existing commitments. None should directly involve significant cost or fuel developing country demands for significantly enhanced funding commitments from developed countries.

Category C

Options in this category go beyond those in Category B. Because they would largely require developing country acquiescence, rather than active agreement, or because they could be accomplished in other fora (e.g., the GEF Council), they could perhaps be accomplished with persistence and determination. Such options largely focus on using "conditionality" with respect to existing funds to promote greater engagement in addressing climate change within developing countries. They might include:

- 1) Proposing that future GEF funding be conditioned on submission of an initial national communication (report)
- 2) Requiring that GEF project proposals from each developing country in the climate change focal area be ranked according to their effects on greenhouse gas emissions and that the GEF establish rigorous funding requirements linked with such rankings (either for individual countries or among proposals submitted by all eligible countries)
- 3) Promoting comprehensive changes in the lending practices of multilateral financial institutions to condition loans and grants on certain policy changes in key sectors (e.g., energy demand/supply, transportation, agriculture) designed to encourage greater attention to climate change concerns and greater participation in the global effort to address them

Options in this category would need to be pursued persistently over time, and could depend on making comparable changes with respect to domestic lending banks (e.g., OPIC). These options might not lend themselves to textual treatment in a new legal instrument, and therefore might not satisfy domestic political needs. They would likely strike a particularly sensitive nerve among developing countries, who have long railed against "new forms of conditionality" and fought hard at the Rio Conference in 1992 to establish an international policy decrying "conditionality" in international funding activities. Developing countries would flatly oppose further conditionality within the GEF. Ranking GEF projects might present problems in terms of short versus long-term reduction gains. Moreover, considerable "conditionality" already is associated with international funding efforts; it might be difficult to add new criteria and/or to avoid inconsistencies with existing criteria.

Category D

Options in this category include those that have already occasioned intense debate internationally, or those that could reasonably be expected to do so. Some may well be indispensable to any new legal instrument; still, negotiating them would likely be extremely difficult. Such options include:

- 1) Advocating joint implementation for credit under an "opt-in" approach in which developing countries, on a voluntary basis, would be allowed to participate (on a full or discounted basis) in the emissions trading regime among developed country Parties, provided they met certain criteria (e.g., agreement to begin developing a national baseline for greenhouse gas emissions); the criteria that might be adopted regarding developing country participation in such a program might best be implemented through "premiums" for countries that met higher standards in their national programs (e.g., all or most emissions reductions from eligible projects would count if the host country agreed to develop a national baseline within "x" years; less of the emissions reductions would count if lesser efforts were involved);

the "opt-in", voluntary basis orientation of such a program could serve to lessen the controversy that would otherwise attach to it; still, a number of developing countries will likely argue that "joint implementation," particularly "joint implementation for credit," cannot take place until the "Activities Implemented Jointly" international pilot phase has been concluded and there has been a "conclusive decision" of the COP to move to a successor regime

- 2) Seeking developing country agreement in a new legal instrument to begin negotiations toward "new commitments" for them by "x" date after the conclusion of COP-3 in Kyoto; this option is sometimes described as an "agreement to agree"; there are many variables and possibilities under this option (e.g., would the future negotiations with developing countries specify that the outcome should be binding targets and timetables, would the negotiations result in a non-binding "aim" for developing countries, would the date fixed for negotiations to begin be the same for all developing countries, might the date for beginning negotiations be triggered when a country met a

particular threshold (in terms of total emissions, as a percentage of global emissions, or based on national annual average emissions growth), might the agreement only involve a commitment to begin negotiating such a threshold by "x" date, etc.;

Options in this category may have some proponents within the ranks of the developing countries (e.g., on joint implementation). Some developing countries might even be willing to set a date for future negotiations that could involve new commitments for them, provided that the mandate for these negotiations was vague enough, that the date set to begin was sufficiently distant, and that the negotiations involved still further commitments from developed country Parties. Still, options in this category will be highly controversial and will, at a minimum, lead to accusations by some that their proponents have torn up the COP-1 decision on "Activities Implemented Jointly", the Berlin Mandate, or both.

Category E

Options within this category define the far end of the continuum of potential developing country actions. They would be the most far-reaching, would likely give rise to the strongest developing country opposition, but hold the potential for a clear advance under the Convention and would go some distance toward placating domestic critics. They might also require stronger commitments from developed countries to make proposing them credible. Possibilities include:

- 1) seeking to establish a threshold at which developing countries would "graduate" to a new status; this "new" status might not be equivalent to developed country status, but would clearly involve heightened commitments (for example, to energy efficiency "targets" or to a certain percentage increase in the renewables portion of the national fuel mix); the existing Convention "differentiates" between OECD countries (Annex II), OECD countries plus the so-called "economies in transition" (Annex I), developing countries and least developed countries, but it contains no mechanism by which to move from one category to another; the "economies in transition" are less likely in this round of negotiations to settle for the same commitment as OECD countries with only "a certain degree of flexibility" in meeting that commitment -- they are likely to want more "differentiation"; in addition, despite the accession of Mexico and Korea to the OECD, it is highly doubtful

that either would agree to take on the identical commitment as their OECD colleagues -- they are likely to argue for separate treatment within Annex I; the threshold might be triggered by total national greenhouse gas emissions that rise beyond a certain level or by a certain level per GDP and/or per capita, etc.

- 2) seeking to change the underlying approach in the Convention, which essentially equates Gabon with China, to one which clearly identifies the 25-30 largest greenhouse gas emitters that now account for, and will continue to account for, some 85 percent of the world's total emissions; if this group of countries, both developed and developing, could be segregated from the remaining 130-plus countries whose emissions only amount to about 15 percent of the global total, if a spotlight could be trained on them, and even if only the developed countries among them were to take on new commitments in this round of negotiations, it would be a matter of time before the key developing countries began to feel international pressure to deal with their own emissions; moreover, such an approach would deny the key developing country emitters their hiding place within the ranks of countries such as Antigua/Barbuda, Sri Lanka and Togo.

Proposing options in this category will occasion a strong opposition among developing countries, led by the chief emitters among them who, presumably, would spare no effort to cow their smaller cousins. They will be problematic to negotiate and may attract few supporters among the OECD countries, some of whom are quick to retreat when confronted by strong opposition from the G-77. Still, options in this category would likely win strong domestic support, would represent a significant and perhaps critical change in the Convention's approach to the problem, and achieve critical positioning for future negotiations.

APPENDIX A

BACKGROUND ON DEVELOPING COUNTRY COMMITMENTS UNDER THE U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE

The Berlin Mandate (April 1995) and the Geneva Declaration (July 1996) are the key documents providing guidance on the outcome anticipated with respect to developing countries from the current round of negotiations.

The Berlin Mandate provides that:

"2. The process will, inter alia:

"(b) Not introduce any new commitments for Parties not included in Annex I, but reaffirm existing commitments in Article 4.1 and continue to advance the implementation of these commitments in order to achieve sustainable development, taking into account Article 4.3, 4.5 and 4.7;"

The Geneva Declaration provides that:

The Ministers and other heads of delegations present at the second session of the Conference of the Parties to the United Nations Framework Convention on Climate Change,

"8. Instruct their representatives to accelerate negotiations on the text of a legally-binding protocol or another legal instrument to be completed in due time for adoption at the third session of the Conference of the Parties. The outcome should fully encompass the remit of the Berlin Mandate, in particular:

- commitments for all Parties on continuing to advance the implementation of existing commitments in Article 4.1;"

Status of Countries

The Convention creates four categories of Parties:

- 1) Annex II Parties (developed countries that were members of the OECD at the time the Convention was negotiated)

- 2) Annex I Parties (developed countries included in Annex II, plus 11 specifically named "economies in transition" including: Belarus, Bulgaria, Czechoslovakia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation and Ukraine)
- 3) Developing countries (all Parties not included in Annex I or Annex II)
- 4) Least developed countries (assumed to be those on the U.N. list of Least Developed Countries)

Current Commitments

In Article 4.1, all Parties, "taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances" are required to take the actions included in the 10 subparagraphs of the Article. Most significant among these is the requirement to:

"(b) Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change;"

Article 12 provides that "each Party shall communicate to the Conference of the Parties, through the secretariat, the following elements of information:

- "(a) A national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties;
- "(b) A general description of steps taken or envisaged by the Party to implement the Convention; and
- "(c) Any other information that the Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its communication, including, if feasible, material relevant for calculations of global emission trends.

On a voluntary basis, developing countries may propose projects for financing, along with, if possible, an estimate of all incremental costs, of the reductions of emissions and increments of removals of greenhouse gases, as well as an estimate of the consequent benefits.

Under Article 12.5, each developing country Party must make its initial communication within three years of entry into force of the Convention for that Party, or of the availability of financial resources under the Convention. Least developed countries are allowed to make their initial communications at their discretion.

Article 4.3 provides that developed country Parties will meet the agreed full cost to developing countries of meeting their reporting requirements under Article 12. Article 4.3 also provides that developed country Parties will meet the agreed full incremental costs [to developing country Parties] of implementing the measures contained in Article 4.1 that are agreed between the developing country Party and the entity operating the Convention's financial mechanism (currently, the Global Environment Facility).

When do we start on
binding dispute
settlement.

Issue Paper: "Compliance"

Introduction

- o In general, the United States views the subject of "compliance" with international environmental agreements broadly. We look at the range of techniques that can be used in the negotiating process, in the agreement itself, and outside the agreement to promote a particular environmental objective. Further, compliance should be viewed as a continuing process, not only as something that happens or fails to happen at an end-point.
- o It should be noted that there is a four-way (and sometimes inverse) relationship among: the stringency of commitments, the stringency of any compliance regime; the number and type of parties; and the ability to comply.
- o In the climate change context, the United States has substantial environmental, economic, and treaty-integrity interests in achieving an agreement that properly balances the right commitments, the right parties, and the right incentives to comply.
- o As seen below, many of the compliance-related options involve trade-offs and linkages and should be viewed as a package; in this regard, a preferred option may change if a condition for that option is not satisfied.
- o This paper will focus on the following issues:
 - 1) how can the commitments themselves be structured so as to promote their own implementation?
 - 2) what kind of review process(es) would be appropriate, including how to deal with parties that are not in compliance?
 - 3) how should the agreement deal with non-parties?

Commitments

- o The U.S. has taken the view that the new legal instrument should contain at least two key sets of commitments:
 - for so-called "Annex I" countries, a legally binding medium-term emissions target; and
 - for all countries, commitments that continue to advance implementation of Article 4.1 of the Convention.

(Revised 11/12/96)

- o In terms of the "Annex 1" target, there are at least three ways ~~in which~~ the structure of the commitment could promote compliance.

- First, as a matter of form, the target could be legally binding, as the U.S. has already suggested. We are seeking a legally binding target because, in the climate change context, countries tend to make rhetorical and unrealistic proposals when provisions are non-binding, and the existing "aim" has largely not been implemented. A protocol/amendment regime in which targets are legally binding will likely lead countries to seek more realistic and achievable targets at the front end and to implement their commitments more fully later on.
- Second, as a matter of drafting, the commitment could be articulated as clearly and quantitatively as possible. In 1992, demands by various parties for differentiation were met with vague qualifying phrases now found in Article 4.2(a) and (b). While the United States may not favor differentiation regarding the target, vague phrases to paper over differences on this point could negate the advantage of going to a binding regime.
- Third, as a matter of substance, the target could be structured so as to be as objectively measurable as possible. This would enhance the ability of the parties themselves, as well as third parties, to determine compliance.

- o In terms of commitments advancing Article 4.1 implementation, ~~given~~ the need to get the agreement of developing countries, ~~there may be a limit to~~ how much can be done in structuring these commitments to promote their implementation. In theory, it would be helpful to make the commitments as specific as possible (to make it harder to hide behind the very general language of existing 4.1) and to avoid provisos (such as references in the chapeau of 4.1 to "priorities," "circumstances," etc.). It may be possible to provide developing countries with necessary flexibility through choice of specific measures, rather than through vague, heavily qualified obligations.
- o In addition to appropriately structuring the above commitments to promote compliance, options for collateral commitments that could have the effect of promoting compliance with the key commitments would include, for example:

- As under the Convention, all Parties could be required to report on their implementation (although the specifics could vary for different categories of parties).
- All Parties could be required to systematically measure their implementation, as well as to pursue organizational arrangements to promote uniformity of measurement. Long-term measurements of atmospheric abundance and trends of greenhouse gases could also be useful scientific input into measuring global compliance.
- The Parties could agree to continued and more systematic support for efforts to develop national action plans (particularly for developing countries) following the revised Annex I Guidelines for National Communications and the newly adopted Non-Annex I Guidelines for Initial Communications.
- The Parties could agree to expanded programs aimed at developing, diffusing and deploying climate-friendly technologies (including through efforts to identify and remove barriers to technology transfer and to improve the performance of existing financial institutions).
- "Annex I" parties could be required to have in place domestically an emissions monitoring system (at a minimum for CO₂, at a minimum for specified sources).
- "Annex I" parties could also be obligated to effectively enforce their domestic laws related to implementation of the target. (The NAFTA environment side agreement contains such an obligation regarding environmental laws generally. Note that, as in the NAFTA agreement, such an obligation would need to be worded very carefully.)

Review Processes

- o As under the Convention, the U.S. should support appropriate review/dispute settlement mechanisms to ascertain whether parties are implementing their commitments under the new legal instrument.
- o Key questions include:
 - who should do the reviewing?
 - what should they review?
 - what is the status/consequences of their conclusions?

- o An additional cross-cutting question is whether we should support differentiated review processes for different categories of parties (for example, more stringent processes for the binding target than for the potentially more general commitments of developing country parties).
- o As to who reviews, options include, for example, the parties themselves (through the Conference of the Parties or other institution); experts nominated by parties; ad hoc panels; standing bodies outside the treaty; the public. What type of expert or panel member is involved depends on what is being reviewed (e.g., a scientist would not be appropriate for an issue involving treaty interpretation).
- o [As to what is reviewed, ^{involves} ~~there are~~ at least two basic issues:
 - First, it needs to be considered whether a review mechanism is to be aimed at alleged non-compliance (i.e., an actual treaty violation), implementation generally, or a particular aspect of implementation:
 - o Some mechanisms, such as traditional dispute settlement, only deal with situations of non-compliance with treaty obligations. (These are generally bilateral, but can also be multilateral.)
 - o Other mechanisms are conceived more broadly to review "implementation" issues, where it is not necessary for any allegation of non-compliance to be made in order to trigger a process; such mechanisms are seen as having the advantages of being less adversarial (and therefore more likely to be used) and capable of dealing with a wider range of issues. They are also useful where treaty obligations are so general or caveated that it would be difficult to make out a case of actual non-compliance. (It should be noted that, whereas the Montreal Protocol's friendly multilateral process involves "non-compliance," Article 13 of the Climate Change Convention calls for consideration of a process "for the resolution of questions regarding the implementation of the Convention.")
 - o Still other review processes are aimed at particular aspects of implementation, such as verifying facts related to a specific obligation (e.g., the SBI review process noted below).

- Second, it needs to be considered whether a particular review process is to review facts and/or law. For example, a dispute involving Article 4.2(b) of the Convention, if it were legally binding, could involve the factual question of actual emissions, the legal question of whether sinks can be counted, or both.

Traditional dispute settlement (such as conciliation or arbitration) is generally empowered to review disputed facts, disputed interpretation of a treaty provision, or the application of a treaty provision to facts. A review mechanism can, however, be limited to fact-finding. As noted above, what is being reviewed will dictate, to a certain extent, who should be doing the reviewing.

- o As to status of conclusions of a review process, a review process might have no formal conclusion (e.g., discussion, political pressure) or could yield, for example, a recommendatory report on possible steps to promote compliance (such as technical assistance, in the case of a developing country), a factual report, a recommendatory award, or a binding judgment concerning compliance.
- o As to consequences, the conclusion of a review process could form the basis for, for example, further discussions among the parties, action by the Conference of the Parties (in the case, for example, of a recommendation on promoting compliance); good faith consideration by a party (in the case, for example, of bilateral conciliation), or a sanction. Sanctions might include monetary penalties, trade sanctions, or other. (Agreement that trade sanctions could be imposed among Parties as a result of non-compliance would raise particular issues that would need to be addressed should that option be pursued.). Consequences of a conclusion are related to its status; for example, a sanction would not flow from a recommendatory (non-binding) award.

Review Processes under Framework Convention

- o By way of background, under the existing Convention:
 - The Conference of the Parties (COP) and the Subsidiary Body for Implementation (SBI) have roles with respect to reviewing reports of parties on emissions/implementation; with respect to Annex I communications, the SBI has established a review process, coordinated by the Secretariat, involving fact-finding by third-party experts nominated by Parties; review conclusions have political, not legal, status.

- Parties have the option of resorting to formal dispute settlement, in the event of a dispute concerning the interpretation or application of the Convention. If parties cannot resolve a dispute on their own within a year, the dispute is to be submitted, at the request of any one party to the dispute, to conciliation. The conciliation commission would be composed of members appointed by the parties to the dispute (and a chairman chosen by the members); the results of conciliation are recommendatory, not binding. (Parties may elect to send their disputes to binding arbitration or the International Court of Justice, but this is not required.)
- Article 13 calls for the COP to consider the establishment of a "multilateral consultative process...for the resolution of questions regarding the implementation of the Convention." As this issue is still being considered, the who, what, and status/ consequences of this process are not yet known.

Review Options

- o [With respect to the new legal instrument, ^{could accommodate} ~~there are~~ numerous compliance review options, many of which are not mutually exclusive. (Note, in this regard, that an amendment does not necessarily have to be subject to the same mechanisms as the current Convention, provided the amendment so specifies.) For example:
 - regular meetings of the parties as a means of keeping political pressure on parties to comply and providing a forum for raising questions about compliance (through a new Conference of the Parties, if the instrument is a protocol);
 - in addition to regular meetings of the parties, establishment of a subsidiary body focused on implementation issues;
 - requirement that reports prepared by parties on their implementation be made publicly available, thereby permitting public scrutiny and pressure;
 - regular factual review of parties' implementation (e.g., current SBI review process involves factual review of Annex I communications by experts nominated by the parties);
 - factual review of parties' implementation (generally or with respect to particular obligations), at the request of a party

- availability of "friendly," multilateral consultative process, designed to address either cases of non-compliance only or implementation more generally; should not overlap with the functions of any subsidiary body;
 - availability of traditional bilateral traditional dispute settlement, with (as in the Convention) non-binding conciliation as a minimum requirement;
 - availability of traditional bilateral dispute settlement, with binding arbitration or judicial settlement as a minimum requirement.
- o ~~on~~ the particular issue of whether the United States should support mandatory binding dispute settlement, ^{radio} ~~there~~ are several considerations. For example:
- Binding dispute settlement could have several advantages:
 - o The existence of mandatory, binding dispute settlement could create an incentive for parties to fully implement their treaty obligations.
 - o The prospect, during the negotiations, of ultimately including binding dispute settlement in the legal instrument could have the effect of causing countries to negotiate more realistic and achievable commitments.
 - o The existence of mandatory, binding dispute settlement could be the type of enforcement tool against other countries that some domestic constituents are looking for in terms of creating a level playing field.
 - o To the extent that we seek to pursue penalties against parties for non-compliance (such as a monetary penalty or trade sanction), binding dispute settlement would appear to be a precondition; it would be difficult to argue, or accept, that penalties could be triggered by a non-binding finding of non-compliance.
 - Potential disadvantages include:
 - o Binding dispute settlement is a double-edged sword. While some domestic constituents may view it positively as an enforcement tool, others might prefer to give up that tool rather than subject the United States to the prospect of binding dispute settlement as defendant.

- o Even those not generally wary of binding dispute settlement may not support it in this case. Specifically, it is probable that the ultimate target will not be crystal clear, but will be surrounded by some kind of ambiguity (akin to the way the Convention aim is unclear on whether JI, sinks can be counted). If so, a commitment to binding dispute settlement is a commitment to potentially have a third party interpret the ambiguities in a manner binding on the United States.
- o In the climate change context, developing countries have historically been opposed to binding dispute settlement. A decision to seek binding dispute settlement would likely lead to developing country calls for differentiated dispute settlement (which we have avoided so far) and/or weaker developing country obligations.
- o Binding dispute settlement could cause some countries to ~~to~~ push for weaker or more ambiguous obligations or ultimately decide not to become party to the new legal instrument.
- o In making decisions on which review process(es) to support (including, in the case where binding dispute settlement is supported, whether a penalty should attach to a party's non-compliance), the United States should be mindful of the relationship between these issues and the treaty commitments themselves, particularly the target. Relevant aspects of the target (which are not yet known, thereby complicating the task) include:
 - whether it is clear or clouded by ambiguity (either with respect to the target itself or as to whether, for example, JI or emissions trading can be counted);
 - whether it is objectively measurable (is assessing compliance a purely factual endeavor? or does it, for example, involve the application of a subjective standard to objective facts?).

Some hypothetical examples help demonstrate the relationship between a target and issues that might or might not be subjected to a review process:

- Taking the cleanest case first, assessing compliance with a target that clearly required a party to ensure that its emissions of a particular greenhouse gas in a given future year did not exceed some percentage of a past year's emissions would involve the factual issues of past emissions and emissions in the future year. Disputes could arise concerning the data collection method or other methodology used by a party in implementing the target.
- To the extent that a target related to emissions of greenhouse gases generally, issues could arise concerning the GWP assigned to various gases and corresponding calculations. There could be additional measurement issues if sinks were part of the calculation.
- To the extent that a target were based on a predicted future baseline, issues could arise concerning the facts/methodology used to predict that baseline.
- Any lack of clarity in the text would raise issues of legal interpretation (for example, with respect to whether JI/emissions trading could count (and, if so, how) toward achieving the target).
- Issues of legal interpretation and application of law to facts would also arise if an otherwise quantitative target were surrounded by one or more non-quantitative phrases (such as "appropriate," "taking into account," or any of the types of phrases currently found in Article 4(2)(a) of the Convention).

Non-Parties

- o An issue related to, but distinct from, the issue of how to deal with non-complying parties is how to deal with non-parties. Where a treaty addresses a global environmental issue, a non-party can potentially stand to benefit from the actions of other countries while taking no action of its own (to so-called "free rider") or affirmatively undermining the treaty's objective. Thus, a recurring question regarding such treaties is how to deal with the non-party issue.
- o There are numerous ways to seek to minimize the non-party problem:
 - through the negotiating process itself, i.e., figuring out which countries' participation in the regime is essential and ensuring that they are involved in the negotiation;

- through positive incentives for countries to join a regime (e.g., financial and technical assistance, differentiated obligations; allowing opt-outs from certain obligations; side payments; other participatory privileges);
 - through an entry into force clause that requires ratification by key countries (i.e., those that would be "free riders" if they did not join) (note that an amendment would require 3/4 of the parties to ratify for entry into force; a protocol would need to set its own entry into force requirement);
 - the use of trade measures against non-parties.
- o Were the trade measure option to be pursued in this case, several factors would need to be considered:
- It is not obvious what the subject of the trade measure would be. (In the Montreal Protocol, which is the only real precedent here -- given that Basel and CITES are all about restrictions on trade -- the trade restriction applies to certain ozone-depleting substances and products containing such substances; a further call to consider restricting trade in products made with certain such substances has deliberately not been implemented.)
 - In order to meet the GATT/WTO Article XX chapeau requirement that trade measures not constitute a means of unjustifiable or arbitrary discrimination among countries where the same conditions prevail, the trade measures should not apply where a non-party is in de facto compliance with the environmental requirements of the agreement. This raises the questions of who decides whether a country is in compliance and, particularly in the case of developing countries, what constitutes compliance, given the likely general language of any developing country obligation. (This is in contrast to the Montreal Protocol, where the obligations are specific and quantitative and therefore amenable to objective measurement.) These questions make the outcome of any possible WTO challenge by a non-party uncertain.
 - Also in order not to discriminate, the trade measure should apply equally to parties that are not in compliance. (See discussion above concerning dispute settlement and penalties for non-compliance.)
 - The United States may itself be a non-party to the treaty for an extended period.

MEMORANDUM

COUNCIL OF ECONOMIC ADVISERS

Alicia
Revised
11/12/96

Nov 12, 1996

TO: ALICIA MUNNELL, JEFF FRANKEL

FROM: RAY PRINCE

SUBJECT: COMPARISON OF STUDIES ON THE PRICE AND INCOME EFFECTS OF CARBON POLICIES

After looking over a large number of studies, I have to report that the vast majority of studies concern the impact of a target on the U.S. economy where there is no international trading of permits. These studies vary in terms of the model used and generally focus on distributive issues such as how revenues are recycled or permits are distributed. One shortcoming of most of these models which look at only the U.S. is that they assume no adverse trade effects. A recent paper by Rutherford, however, found that estimates of leakages range from 7-35% for most of the studies surveyed.

Studies which I have examined that do go beyond a no-adverse-trade-effects assumption include Walker, Bagnoli, and Whalley and Wigle. All three studies have cases where they assume that the U.S. has a target level which it must meet by domestic reductions in emissions (i.e. no international trading) but they do estimate trade and capital flows with countries that have a similar emissions target. These studies suggest a greater impact on U.S. energy prices and GDP than do they studies where trade effects are ignored. Whalley and Wigle also examine a case whose effects should be somewhat similar to an international permit trading scenario (a single global tax rather than heterogeneous national taxes). In this case the costs to the U.S. are somewhat lower than when no international permit trading is allowed.

I have ordered some additional studies which apparently examine some form of international trading but I have not yet received them. As you can see from the accompanying matrix, what is lacking so far is an estimate of the impacts of an Annex I only trading on the U.S. economy. This is an important void since this scenario is most like what will be adopted if international trading is endorsed at COP-III.

MATRIX SCENARIO

EMISSIONS TARGETS/EFFECTS

(Per ton carbon tax, changes in GDP and prices
of gasoline and electricity by 2010)

10% ABOVE
1990 LEVELS

1990
LEVELS

10% BELOW
1990 LEVELS

PERMIT TRADING

No Intl trading

US target only (no
adverse trade effects)

1- Gaskins

2- Gaskins, DRI
and Shakelton

3- Gaskins

Annex I targets only

4-

5- Walker

6- Walker

Targets for all nations

7-

8- Bagnoli

9- Whalley and Wigle

Annex I trading

Annex I targets only

10-

11-

12-

Targets for all nations

13-

14-

15-

World trading

Targets for all nations

16-

17-

18- Whalley and Wigle

RANGE OF ESTIMATES FOR SCENARIOS

- 1- \$15-125 carbon tax
0.075 - 0.25% decline in GDP
gasoline up 6-46 cents/gal*
electricity up 1-8 cents/kwh*
- 2- \$25-150 carbon tax
0.50 - 0.75% decline in GDP
gasoline up 9-56 cents/gal*
electricity up 2-10 cents/kwh*
- 3- \$40-200 carbon tax
0.60 - 1.20% decline in GDP
gasoline up 15-74 cents/gal*
electricity up 3-14 cents/kwh*
- 5- \$90 carbon tax
0.80% decline in GDP
gasoline up 20%
electricity up 6 cents/kwh*
- 6- \$225 carbon tax
0.1.1% decline in GDP
gasoline up 100%
electricity up 15 cents/kwh*
- 8- \$45 carbon tax
GDP growth 2.2% per annum
gasoline up 17 cents/gal*
electricity up 3 cents/kwh*
- 9- \$90 carbon tax
0.9% decline in GDP
gasoline up 33 cents/gal*
electricity up 6 cents/kwh*
- 18- \$88 carbon tax
0.4% decline in GDP
gasoline up 15 cents/gal*
electricity up 3 cents/kwh*

* CEA estimate