THE WHITE HOUSE
WASHINGTON

Box 2:

Domestic - Studies
Domestic - Industry by Industry
Incoming Correspondence to Todd Stern

THE WHITE HOUSE

WASHINGTON

29 December 1998

MEMORANDUM FOR Records Management

FROM Jonathan Adashek

SUBJECT Files for Archives

Below are the indexes for the two boxes of files being submitted for archiving.

Box 1: ENCLOSURES FILED OVERSIZE ATTACHMENTS 13243

NARA 10672

Schedules for Todd Stern while Deputy Staff Secretary and Staff Secretary

Box 2:

Domestic - Studies
Domestic - Industry by Industry
Incoming Correspondence to Todd Stern

ENCLOSURES FILED OVERSIZE ATTACHMENTS 13244

2 boxes filed 1/14/99 TT

NARA 10673

2 boxes received in 75 from Lee Johnson 1/13/99 TT

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 6

To Jonathan | From Amy

Dept./Agency | Phone # 395-2319

456-2315 | Fax #

Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

White House Climate Change Task Force

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

Industry 2

Gas

June 17, 1998

FACSIMILE TO KATHLEEN HOGAN
SKIP LAITNER
DENISE SWINK

CC: Todd Stern
David Gardiner
Dan Reicher

FROM: Dirk Forrister, Chair

SUBJECT: Draft Proposal from Interstate Natural Gas Association

TOTAL PAGES: 6

Attached is a preliminary draft submitted to the White House Climate Change Task Force which outlines six possible areas of cooperation to reduce greenhouse gas emissions for natural gas pipelines. I would like to ask for three steps to follow up on this draft.

(1) Please review the draft and provide Beth Arner with comments by June 30th via fax at (202) 395-2311 or email at [d_forrister@btgcinema.com]. Obviously, this draft includes very general areas which we should consider as starting points for more specific consultation.

(2) EPA/Hogan will take the lead on drafting an industry scoping paper for review and comment by the group by July 2, 1998.

(3) Meet to discuss scoping paper, INGAA proposal and next steps to engage the natural gas industry in the consultation process. Please provide options for meeting times during the week of July 6 to Beth Arner via fax at (202) 395-2311. Also, please let her know if we need to add other people to our team.

If you have any questions or comments, please call Beth Arner at 586-1803.

Thank you.

INGAA Global Climate Change 6 Point Plan

Draft 6/16/98

The Administration has asked the natural gas pipeline industry consider developing a "plan" that would provide incentives for INGAA member companies and their customers to implement voluntary emissions reductions. The industry has been encouraged to look at all of the Kyoto protocol provisions and use them as tools to craft a strategy. If successful, the Administration may consider announcing the commitments of INGAA and other industries during a well-publicized press event at the White House in late September.

Following discussions with the Administration, INGAA was able to identify 6 general areas where the natural gas pipeline industry could possibly play a role in helping the Administration achieve its climate change goals:

1. Transport Additional Gas to Expanding Natural Gas Markets

Fuel switching is often advocated as the most cost-effective means of reducing the emission of greenhouse gases. The natural gas transmission industry can act as a climate change problem solver by providing gas to sources currently fueled by less environmentally friendly sources such as coal or oil. Extensive savings of carbon emissions occur by the use of natural gas combined cycle turbines to generate electricity and the direct use of natural gas in residential, commercial and industrial applications. INGAA member companies can assist in expanding the pipeline capacity to gas supply basins that will provide competitively priced gas that will facilitate the nation's conversion to gas.

In order to provide this increased capacity, the industry must be assured that the administration will address the impediments that prevent the market from growing to satisfy this need. Examples of these impediments include duplicative and conflicting regulations, economic disincentives, a slow and convoluted permitting process, and limited interagency cooperation.

Additionally, early domestic emissions reduction credits will be necessary to provide the economic benefits to support the costs involved in converting these sources to natural gas. These significant reductions in greenhouse gas

INTERSTATE NATURAL GAS ASSOCIATION OF AMERICA
10 G STREET, N.E., SUITE 700 • WASHINGTON, D.C. 20002 • 202/216-5900 FAX 202/216-0877

emissions may not occur if pipeline companies are penalized for new emissions resulting from fuel switching.

Also needed are joint government and gas industry RD&D programs to develop advanced technology such as fuel efficiency and system performance.

The reductions in emissions will be substantial because of the efficiency improvements of natural gas technology and the lower carbon emissions. Based on GRI analysis, the economically available carbon emission savings due to fuel switching and repowering can be up to 135 Million Metric Tons Carbon Equivalent (MMTCE) reduction from current emissions by electric utilities.

2. Promote the Establishment of Early Domestic Emission Reduction Credits and Baseline Protection for greenhouse gases and Align Emissions Reduction Programs.

The natural gas pipeline industry strongly believes that credit should be given to companies that voluntarily reduce their greenhouse gas emissions prior to a specified budget period. INGAA members support the administration's goals to obtain early reductions and will lobby for practical solutions. A U.S. Global Climate Change policy should create market-based incentives for early and past voluntary reductions, such as emission reduction credits and provide the ability to bank the credits, including retroactive credits for voluntary programs. Emission reductions resulting from conversions to natural gas from other fossil fuels should be fully credited.

A critical issue in assessing the natural gas industry's willingness to voluntarily reduce greenhouse gas emissions is the determination and protection of a beginning period in which to count emission reductions from. This concept is also known as baseline protection. The gas natural gas industry has already taken significant steps to reduce greenhouse gas emissions. Without baseline protection, there is a disincentive for these sources to further reduce greenhouse gases emissions prior to 2008.

The economically obtained emission reductions will increase significantly because of the smoother transition of these emission reductions into the economy. The environment will gain significantly because of the early reduction of greenhouse gases that persist in the atmosphere for a long period of time.

The Natural gas industry is a strong advocate of market based emissions reduction programs that address overall emission, including NO_x, SO_x, and greenhouse gases. INGAA members believe that any domestic greenhouse gas reduction initiative will be significantly strengthened through alignment with other emission reduction programs. By aligning emissions reduction

initiatives, companies will have an incentive to solve multiple issues simultaneously. A phased-in approach can result in significantly more capitol spent to resolve these issues, but more importantly, may result in significantly less emissions reductions.

An example would be that converting a coal power plant to a combined cycle turbine power plant might be the lowest cost and highest emission reduction option if you can address all emissions at once. Customers will be required to pay for multiple solutions if the coal plant is modified to meet SO_x reduction regulations, then modified to meet NO_x reduction regulations, and then replaced with combined cycle gas turbines. This will be economically inefficient to replace equipment before its useful life is completed.

3. Assist in Emission Trade Tracking and Accounting.

Any domestic or international greenhouse gas emission trading system will eventually require a system to track emission credits. The natural gas pipeline industry can account for natural gas flows and the attached carbon equivalents which form the basis of emission credits in an emission trading program. This information can be the basis for tracking emissions for approximately 25% of the nation's energy use. INGAA members and their marketing affiliates are well acquainted with financial based trading mechanisms (i.e. futures, hedging). The ability of the gas transmission companies to efficiently track this information will lower the costs of an emission trading system increasing the liquidity and participation in the trading system.

The reductions in emissions will be significant because of the inclusion of traders that may have cost effective emission reduction technologies. The economically obtainable emission savings can be up to 2 % of the nation's emissions by the addition of lower cost emission reduction sources to the emission trading pool.

4. Expand INGAA Member Company Emission Reduction Programs.

Although there are other sources of methane release that exceed releases by natural gas transmission systems, interstate pipelines have for many years, had programs in place to reduce losses of natural gas to the atmosphere. In addition, many companies participate in voluntary energy saving programs (i.e. Natural Gas Star and EPA Green Lights) or have adopted equivalent measures.

The intent of this effort is to be sure that all INGAA members are involved in these voluntary programs and realize a tangible benefit as a result of

participation. Each natural gas pipeline company can assess what it can do internally to address methane and energy losses and implement internal programs further reduce operational emissions. Currently, without baseline protection, there is a disincentive for natural gas transmission companies to reduce greenhouse gases prior to 2008. Additionally, the establishment of early domestic emissions reduction credits would provide incentives to further reduce greenhouse gases. The administration should promote and acknowledge voluntary efforts, specifically by providing baseline protection and the establishment of early domestic emissions reduction credits.

It is anticipated that the emissions savings associated with expanded company reduction programs could be up to 5 MMTCE.

5. Invest in Clean Development Mechanism (CDM) and other International Opportunities

The natural gas transmission industry can act as an international vehicle for trade and development of clean energy sources. Increased global use of natural gas will foster international agreements and business transactions between domestic companies and those abroad. INGAA's members are extensively involved in the development of international natural gas transmission systems and power generation systems. These projects can develop extensive international credits.

The economically obtainable emission savings will be limited by the international contracts and treaty limitations. Typical natural gas development projects can result in 50% emission reductions compared to alternative fossil fuel solutions. The credits to the developed country will be dependent on contract negotiations and the size of the project.

The economically obtainable emission savings can be up the treaty limits (being negotiated) depending on the ability of national companies to economically compete in the international marketplace.

6. Assist in Technology Transfer to Developing Nations

The U.S. natural gas industry can cooperate with developing nations and international organizations to develop and promote technology that reduces greenhouse emissions, such as efficient natural gas-fired combined-cycle electric generation (NGCC) supplied by high efficiency natural gas transmission systems. Our members have participated in information exchange and international research cooperatives in the past and are willing to explore other practical mechanisms to transfer and implement technology. Important to this

effort will be joint government and gas industry RD&D programs to develop advanced technology.

The economically obtained international emission reduction savings will be significant, but the credits to the developed nation partner will be minimal unless international credit is given for technology transfer.

~~Outreach~~ Dom Industry by Industry

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FAX COVER SHEET

To : Todd Stern # of pages : 4
Attn: Jonathan Attached
From : Denise Swink Room # : 4293
Fax : (202 456-2215
Re. :

L3

MESSAGE:

EPA invitation & Agenda 4/5
mtg with Steel industry

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

May 12, 1998

received
5-15-98

Bruce Steiner
AISI
1101 17th Street, N.W. ste. 1300
Washington DC 20036-4700

Dear Mr. Steiner,

As part of our efforts to identify cost effective opportunities to reduce greenhouse gas emissions while enhancing the U.S. economy, the Environmental Protection Agency has been working with other branches of the U.S. government, and has gathered data and conducted an analysis of potential investments in the iron and steel industry which, if implemented, not only modernize and improve production, but also improve energy efficiency. The analyses include cost curves which characterize a wide range of technologies and an economic model which links technology, cost and emission information with macroeconomic factors such as the price of fuel. The model may prove a useful tool to evaluate investment opportunities under a variety of economic conditions. It also provides information on the net effect on air emissions from changed conditions or investment decisions.

We would like to invite you to review this work and exchange information regarding opportunities for improved energy efficiency in the iron and steel industry. I hope you will be able to attend a 1 ½ day workshop on June 4-5 at the Hyatt Regency Capital Hill, 400 New Jersey Avenue, NW, Washington, D.C. Executives and senior managers involved in purchasing fuel and determining future corporate investments in technology will benefit from participating in detailed presentations and discussions with developers of the analyses and the model. Members of the steel industry will discuss the potential for additional adoption of combined heat and power (CHP), the potential for increased recycling to reduce the energy intensity of steel, and use of steel by-products such as steel slag and blast furnace slag. There will be ample opportunity to interact with the presenters and to provide comments, suggestions and data to improve the analyses. A detailed draft agenda is enclosed. As a result of the comments and information exchanged during the conference, EPA will refine the analyses and share the updated models with all participants. We expect that the report and model will be useful tools for evaluating and supporting investment decisions that enhance corporate profitability and performance, improve the economy and reduce greenhouse gas emissions.

To receive additional information and to register for the workshop, please call Bob Trent at ICF Kaiser. He can be reached at (703) 934-3728 tel, (703) 934-3968 fax, or via e-mail at btrent@icfkaiser.com.

If you have any questions about the agenda, please contact Jeanne Briskin at (202) 564-9135 or Skip Laitner at (202) 564-9833.

I look forward to seeing you in June.

See next page

Sincerely,

K Hogan / vg

Kathleen Hogan, Director
Atmospheric Pollution Prevention Division

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Technology Strategy Workshop for the Iron and Steel Industry

A Working Proposal — Not to be Cited or Quoted

Objective: To continue on-going technical discussions between the Iron and Steel industry and the United States Government to examine the role of technology in reducing Greenhouse Gas emissions based on their net economic benefit to industry.

Suggested Dates: June 4-5, 1998

Suggested Location: Hyatt Regency, Washington, D.C.

Prospective Invitees: The invitations would be made to high-level agency and support staff (including EPA, DOE, and DOC) as well as industry representatives including trade association representatives, plant managers, and vice-presidents of environmental engineering or their equivalents.

Workshop Focus: The 1½ day workshop would include a comprehensive review of all greenhouse gas emissions. The review would be anchored by an in-depth discussion of broadly-available technologies that can reduce those emissions. The latter discussion will focus on cost-effective technologies and opportunities which enhance both productivity and competitiveness.

Among the questions that might be addressed are the following industry-specific issues:

1. What will the iron and steel industry look like over the next two decades? (i.e. production levels, energy use, products, etc.). Do industry representatives agree with the projections set forth in the models?

2. What thought has been given by the iron and steel industry with regards to climate change and energy efficiency? Has the 10 percent below 1990 level been modified by industry over the past year? Is there opportunity for stretch beyond this target and still provide a significant benefit to industry?

3. What are the key technologies that are now available to industry that might reduce greenhouse gas emissions in a cost-effective manner?

4. What are the significant barriers to the successful deployment of those technologies?

5. What are the potential incentives currently being discussed by the Administration (i.e. early credit, tax incentives and technology programs, regulatory flexibility, domestic and/or international emissions trading).

6. What constitutes the iron and steel industry? (Which SIC codes are considered part of the industry? Where does cokemaking fit into a prospective agreement? And what about offsite oxygen production?)

Possible Workshop Materials: A series of written documents might be provided to workshop participants: From the Department of Commerce, background information on international competitiveness; the Department of Energy, a review of its Vision 2020 opportunities; and the EPA, identification of near-term, cost-effective opportunities to reduce greenhouse gas emissions and a comparison of international energy intensities for this industry sector. In addition, participants would also receive business-as-usual and projections and alternative scenarios for the years 2010 and 2020 (based upon AEO98 and other models).

Note - DOE has not seen this letter or Agenda DOC was told the meeting was

Possible Workshop Agenda

Date	Time	Session	Content
June 4	*Morning*	*Plenary*	
	9:00 - 9:30	Welcome and Opening Remarks	Goal of workshop - what do we want to get out of this? Give background of activities at EPA re modeling/analyses of iron and steel industry and why it is important to get input from industry
	Morning	*Technical Sessions*	
	9:30 - 10:45	Industry Panel	(1) Overview and history of what steel industry has been doing with respect to energy efficiency and GHG reductions; (2) Case study integrated mill; and (3) Case study from secondary mill
	10:45 - 11:30	LBNL International Comparison	Compare energy intensities of the U.S. iron and steel industry with both industrialized and developing countries
	11:30 - 12:00	Q and A	Facilitate a discussion of key issues and concerns that might be evaluated or reviewed in more detail in later work sessions
	12:00 - 1:30	Lunch	Working Lunch?
June 4	*Afternoon*	*Technical Sessions*	
	1:30 - 2:45	Boston University Model	Presentation by Matthias Ruth of the BU industry model, including BAU and alternative projections for 2010 and 2020, followed by facilitated discussion
	2:45 - 3:15	Break	
	3:15 - 4:30	LBNL Cost Curves	LBNL Team to present technology cost curves, followed by facilitated discussion
	4:30 - 5:30	DOE vision for 2020 - actions beyond BAU	Joint industry and OIT presentation on vision technologies and roadmap
	5:30 - 6:00	Closing remarks for Day One	Recap of presentations and reiterate the need for industry's input
June 5	*Morning*	*Technical Sessions*	
	8:30 - 8:45	Opening Remarks and Day 1 Recap	Review of Day One Discussions with Overview of Next Steps
	8:45 - 10:00	Additional opportunities for GHG reductions	Discussion of CHP opportunities and DOE/EPA efforts to remove barriers to CHP (presentation panel to include Industry, DOE/OIT, OAP and OAQPS). Followed by opportunities for recycling, and the possible use of steel byproducts (i.e. slag in cement production) with industry, DOE and EPA panel
	10:00 - 10:20	Break	
	10:20 - 11:45	Working toward the Next Steps	Facilitated breakout groups to pull together key ideas, opportunities and concerns that might form the basis for actual industry agreements
	11:45 - 12:30	Recap and Closing	Report back from breakout sessions and discussions of the next steps

DOE has yet to be notified of or requested to make this presentation

Domestic
Federal Energy

DISTRIBUTION:

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	Linda Lance	456-6546	456-2710
OSTP	Rosina Bierbaum	456-6202	456-6025
EPA	David Doniger	260-2865	260-5155
	David Gardner	260-4332	260-0275
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	Sherri Goodman	703-695-6639	703-695-7011
DOE	Elgie Holstein	586-6210	586-7644
	Dan Reicher	586-9220	586-9260
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DOS	Melinda Kimble	647-1554	647-0217
HUD	Paul Leonard	708-3896	708-0309
USDA	Linda Delgado	720-6158	720-5437

May 15, 1998

MEMORANDUM FOR DISTRIBUTION LIST

FROM: T.J. GLAUTHIER, OMB
SHELLEY FIDLER, CEQ

SUBJECT Federal Energy Savings

There will be a meeting on Monday, May 18 from 3:00 to 4:20 in Room 472 of the Old Executive Office Building to discuss Federal Energy Savings and a number of proposed initiatives included in the attached items.

Please call David Bernell, OMB, 395-4561 to be cleared into the building.

Summary of Proposed Federal Energy Management Initiatives

1.Support Reduction of Emissions through Federal Energy Efficiency

Background - there are several Executive Orders and directives that together have resulted in significant improvements in energy use in the federal government. (See atached OMB chart). Some existing EO's may be duplicative or not observed.

Actions - Review Executive Orders for consolidation and coordination, clarify directives and remove barriers to effective agency actions. Revise existing order to require reporting of greenhouse gas emissions. Renew commitment of Administration through Cabinet meeting. Update EO's to reflect new federal programs. Reinvigorate agency audits.

2. Extend and Expand Authority for Energy Savings Performance Contracts and Stimulate their Use

Background - The Federal government has existing tools to help facilities make investments that substantially reduce energy use, result in pollution prevention and carbon reductions. There are $6 billion authorized for implementing ESPC's to utilize shared savings programs at federal facilities for dramatic energy efficiency improvements and cost savings. Similar potential also exists under utility area-wide agreements.

Actions - Issue Executive Order to strengthen and enhance use of these tools. Extend and expand legislative authority. Host a high visibility conference to bring facility managers, vendors and products together to boost Federal energy savings and renewables procurement.

3. Reinvest Federal Energy Savings in Additional Energy Saving and Clean Energy Projects

Background - Despite very large cost savings available through investments in energy efficiency, a disincentive exists because, in practice, facility managers get no rewards for cost cutting.

Action - Develop a proposal for either executive action or legislation to allow a percentage of savings to remain at a Federal facility or be utilized to invest in other energy saving options such as "green power", alternative fuel vehicle purchases or other environmental projects where up front capital costs may be a deterrent.

4. Accelerate Investments in Energy Savings by Lowering Financing Costs for Federal Energy Saving Projects

Background - Market rates for Federal energy saving investments are well above Treasury rates as finance companies charge a risk premium to protect against default.

Action - Evaluate options to lower financing costs. An effective mechanism to lower costs could spur energy efficient construction and renovation both inside and outside the Federal sector.

5. Establish Standards for Federal Purchase of Renewable Energy

Background - The restructured electric marketplace gives customers, including the Federal government, the opportunity to develop renewable energy projects and purchase green power to meet part of their energy needs. A concerted effort to maximize Federal government action in this quarter could have very positive market consequences.

Action - Develop a protocol for such purchases through review of Federal procurement regulations and practices, coordination with ESPC's or area-wide agreements and with effort to allow retention of energy savings. In areas of the country where GSA already lists such supply options, inform and promote these opportunities to Federal facilities managers.

6. Improve Federal Procurement of Energy Efficient Technologies: Looking Beyond First Cost

Background - Most Federal agencies buy products based on lowest first cost – wasting energy and taxpayer dollars over time. Life cycle costs are generally not reviewed for most agency purchases. Efforts to change this pattern have begun and must be encouraged.

In addition, Federal agencies can increase their use of equipment and materials identified through DOE's Federal Energy Management Program, EPA and DOE's ENERGY STAR program, HUD and DOE's PATH program and the National Institute of Building Sciences Building Products Pre-approval Program.

Action - Promote product and equipment manufacturers who produce top 25% products. Recognize Federal energy efficient procurement champions. Direct Federal agencies to increase top 25% purchases. Issue EO or directive to expedite development of product recommendation and model procurement guidelines. Enhance GSA catalogues to feature more qualifying efficient products. Coordinate ESCO purchases with ENERGY STAR, DOE, DOD and GSA recommended products. Brief procurement officials. Add these requirements to President's Performance Agreements with Agencies.

7. Launch a Fluorescent Bulb Campaign

Background - Compact Fluorescent lamps (CFLs), which replace normal incandescent lamps, and fluorescent bulbs, which replace commercial size ceiling fixtures, are a simple means of saving energy and money. Each CFL and fluorescent fixture replaced with an efficient bulb will save $30 over its useful life and approximately 700 lbs of CO2. "How Many Light Bulbs Does It Take to Save Money (and the Environment?) could feature a pledge to replace 300,000 bulbs by 2002.

Action - Issue directive to use efficient lighting in all Federal facilities. Publicize energy savings, carbon reductions and other pollution prevention statistics. Promote DOE initiative for bulk purchase of bulbs. Consider bulk purchases of dedicated fixtures and dedicated halogen replacement fixtures. Phase out current halogen torchieres purchases by Executive Order. Consider a quality control program to test CFLs.

8. Energy Efficient Windows: Helping Federal Agencies Stay Warm in Winter and Cool in Summer

Background - As with light bulbs, new window technologies offer very good energy savings.

Action - Adopt ENERGY STAR performance criteria for residential windows in DOE's Product Energy Efficiency Recommendations. Incorporate higher energy performance criteria for windows in the Government Product Guide Specifications. Emphasize window opportunities in Federal publications.

9. Expand Federal Use of Combined Heat and Power Technologies

Background - Combined heat and power systems generate multiple types of power including electricity, steam, chilled water and mechanized energy using the same fuel source. These systems can provide significant energy savings as well as environmental benefits, compared with traditional power systems.

Actions - Highlight energy savings and greenhouse gas reductions at Federal agencies. Demonstrate new applications and provide better technical information to promote their use. Expand use through ESPC's and area-wide contracts.

10. Electrify the Postal Fleet

Background - The Postal Service has more than 140,000 Long Life Vehicles (LLV) that will undergo repowering of their drive system over the next decade. There is a pending proposal to convert 6,000 of those vehicles to electric vehicles.

Action- Support Postal Service with supplementary DOE funds to accept this proposal.

Joint Presidential, Postmaster General, Secretary of Energy announcement.

11. Provide Cabinet-Level Focus on Meeting Federal Million Solar Roofs Commitment

Background - The Federal government will install 20,000 solar systems on U.S. roofs by 2010. 2000 roofs are expected by the year 2000.

Action - Announce progress. Direct agencies to issue final plans for compliance. Create solar specific ESPC's. Work with GSA to include more technologies on GSA schedule. Provide increased training and assistance.

12. It's Green at the Top

Background - Use agency headquarters buildings as models wherever possible to showcase techniques, technologies and innovative purchasing options for Federal agencies. The Greening of the White House, DOE and DOD could be particularly effective showcases for this initiative.

Action - Presidential directive to agencies to develop their own plans. Pilot projects would be encouraged. DOE, DOD, GSA and EPA could provide tactical support. Encourage ENERGY STAR enrollment to put these buildings in the top 25% of performers nationally.

13. ENERGY STAR Federal Buildings

Background - The ENERGY STAR building label is the mark of excellence in building energy performance. The government owns or manages over 3 billion square feet of building space. Improvements can save $.45 or more per square foot from lower energy bills - while enhancing overall building performance. ENERGY STAR improvements can deliver twice the savings in energy bills and twice the environmental benefit than routine equipment replacement practices. The President challenged the private sector to follow the lead of the World Trade Center, the Empire State Building, 4 Times Square and the Sears Tower during Earth Week this year. He can do the same for the Federal government.

Action - Presidential challenge or directive to Federal agencies to determine which of their buildings qualify for the ENERGY STAR label. Also in using ESPC's or area wide agreements, agencies can identify likely candidates for the label and nominate them as well.

PROJECTS SPECIFIC TO THE DEPARTMENT OF DEFENSE

1. **Complete Base-by-Base Energy Audits**
2. **Ensure that All New Buildings and Facilities Use "Sustainable Design"**
3. **Weapon Systems Technologies - Improve Efficiencies in Gas Turbine Engines**
4. **Weapon Systems Technologies - Improve Vehicle Fuel Efficiency**

FEDERAL ENERGY COSTS AND ENERGY EFFICIENCY

Agency	Energy Costs ($millions)			Direct Spending on Efficiency ($ millions)			FY97 Energy Intensity	
	FY97	FY98	FY99	FY97	FY98	FY99	BTU/GSF	Change from FY85
Defense	2,492.9	2,520.5	2,559.0	48.0	40.0	47.0	114,046	-15.7%
Energy	295.1	298.1	301.1	20.2	18.3	0	312,584	-30.3%
General Services Administration	235.9	215.2	240.1	20.0	0	20.0	72,940	-13.5%
Veterans Affairs	227.8	240.4	253.6	7.4	11.7	15.0	172,339	-13.2%
Transportation	121.1	125.6	122.0	1.4	5.2	0	125,454	-10.8%
NASA	113.3	119.3	124.5	17.3	22.6	23.8	191,816	-25.1%
Justice	85.4	87.2	89.4	NA	2.5	0.5	185,784	-36.9%
Health & Human Services	62.6	63.9	64.5	2.8	3.0	3.2	280,286	-4.1%
Interior	46.6	46.6	46.6	0.3	0.5	0	74,672	-15.1%
Agriculture	44.5	45.5	46.2	2.6	2.6	0.3	63,201	-12.6%
Treasury	39.3	38.5	38.5	0.6	5.3	0	131,623	+23.6%
Labor	23.1	22.4	22.4	0.5	0.5	0.5	116,349	-1.3%
Commerce	22.1	22.7	23.8	0.1	0.1	0.1	81,128	-32.1%
Environmental Protection Agency	9.7	10.0	10.3	0.3	0.3	0.4	355,112	-11.2%
State	8.2	8.5	8.7	0.1	0.1	0.1	75,208	-15.9%
Housing & Urban Development	2.2	2.5	2.5	0.2	0	0	76,340	-6.5%
Other	30.5	30.5	30.5	NA	NA	NA	106,458	NA
TOTAL	3,860.5	3,897.4	3,983.7	122.0	112.7	110.9	122,931	-12.0%

Notes: Energy costs represent totals for all facilities, but energy intensity (BTU/GSF) reflects only facilities covered by the Energy Policy Act of 1992 (i.e. "non-exempt" facilities). Energy costs and BTU/GSF are only reported for space where utilities are paid explicitly and not in a lease or GSA Standard Level User Charge (SLUC) payment. The "Other" category is an estimate based on DOE 1996 data and estimates for a variety of small agencies including the Social Security Administration the Central Intelligence Agency, Tennessee Valley Authority, Federal Emergency Management Agency, Office of Personnel Management, National Archives, Federal Trade Administration, etc.

Outreach
I 2

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FAX COVER SHEET

To : Todd Stern
Attn: Jonathan Attached
# of pages : 4

From : Denise Smith
Room # : 4293

Fax : (202 456-2215

Re. : _____

MESSAGE:

EPA invitation & Jun 4/5
mtg with Steel industry

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20480

May 12, 1998

received 5-15-98

OFFICE OF
AIR AND RADIATION

Bruce Steiner
AISI
1101 17th Street, N.W. ste. 1300
Washington DC 20036-4700

Dear Mr. Steiner,

As part of our efforts to identify cost effective opportunities to reduce greenhouse gas emissions while enhancing the U.S. economy, the Environmental Protection Agency has been working with other branches of the U.S. government, and has gathered data and conducted an analysis of potential investments in the iron and steel industry which, if implemented, not only modernize and improve production, but also improve energy efficiency. The analyses include cost curves which characterize a wide range of technologies and an economic model which links technology, cost and emission information with macroeconomic factors such as the price of fuel. The model may prove a useful tool to evaluate investment opportunities under a variety of economic conditions. It also provides information on the net effect on air emissions from changed conditions or investment decisions.

We would like to invite you to review this work and exchange information regarding opportunities for improved energy efficiency in the iron and steel industry. I hope you will be able to attend a 1 ½ day workshop on June 4-5 at the Hyatt Regency Capital Hill, 400 New Jersey Avenue, NW, Washington, D.C. Executives and senior managers involved in purchasing fuel and determining future corporate investments in technology will benefit from participating in detailed presentations and discussions with developers of the analyses and the model. Members of the steel industry will discuss the potential for additional adoption of combined heat and power (CHP), the potential for increased recycling to reduce the energy intensity of steel, and use of steel by-products such as steel slag and blast furnace slag. There will be ample opportunity to interact with the presenters and to provide comments, suggestions and data to improve the analyses. A detailed draft agenda is enclosed. As a result of the comments and information exchanged during the conference, EPA will refine the analyses and share the updated models with all participants. We expect that the report and model will be useful tools for evaluating and supporting investment decisions that enhance corporate profitability and performance, improve the economy and reduce greenhouse gas emissions.

To receive additional information and to register for the workshop, please call Bob Trent at ICF Kaiser. He can be reached at (703) 934-3728 tel, (703) 934-3968 fax, or via e-mail at btrent@icfkaiser.com.

If you have any questions about the agenda, please contact Jeanne Briskin at (202) 564-9135 or Skip Laitner at (202) 564-9833.

I look forward to seeing you in June.

See next page

Sincerely,

K Hogan / vg

Kathleen Hogan, Director
Atmospheric Pollution Prevention Division

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FROM: ROYAL YORK HOTEL FAX NO.: 416 368 9040

Technology Strategy Workshop for the Iron and Steel Industry

A Working Proposal — Not to be Cited or Quoted

Objective: To continue on-going technical discussions between the Iron and Steel industry and the United States Government to examine the role of technology in reducing Greenhouse Gas emissions based on their net economic benefit to industry.

Suggested Dates: June 4-5, 1998

Suggested Location: Hyatt Regency, Washington, D.C.

Prospective Invitees: The invitations would be made to high-level agency and support staff (including EPA, DOE, and DOC) as well as industry representatives including trade association representatives, plant managers, and vice-presidents of environmental engineering or their equivalents.

Workshop Focus: The 1½ day workshop would include a comprehensive review of all greenhouse gas emissions. The review would be anchored by an in-depth discussion of broadly-available technologies that can reduce those emissions. The latter discussion will focus on cost-effective technologies and opportunities which enhance both productivity and competitiveness.

Among the questions that might be addressed are the following industry-specific issues:

1. What will the iron and steel industry look like over the next two decades? (i.e. production levels, energy use, products, etc.). Do industry representatives agree with the projections set forth in the models?

2. What thought has been given by the iron and steel industry with regards to climate change and energy efficiency? Has the 10 percent below 1990 level been modified by industry over the past year? Is there opportunity for stretch beyond this target and still provide a significant benefit to industry?

3. What are the key technologies that are now available to industry that might reduce greenhouse gas emissions in a cost-effective manner?

4. What are the significant barriers to the successful deployment of those technologies?

5. What are the potential incentives currently being discussed by the Administration (i.e. early credit, tax incentives and technology programs, regulatory flexibility, domestic and/or international emissions trading).

6. What constitutes the iron and steel industry? (Which SIC codes are considered part of the industry? Where does cokemaking fit into a prospective agreement? And what about offsite oxygen production?)

Possible Workshop Materials: A series of written documents might be provided to workshop participants: From the Department of Commerce, background information on international competitiveness; the Department of Energy, a review of its Vision 2020 opportunities; and the EPA, identification of near-term, cost-effective opportunities to reduce greenhouse gas emissions and a comparison of international energy intensities for this industry sector. In addition, participants would also receive business-as-usual and projections and alternative scenarios for the years 2010 and 2020 (based upon AEO98 and other models).

Note - DOE has not seen this letter or Agenda DOC was told the meeting was

Possible Workshop Agenda

Date	Time	Session	Content
June 4	*Morning*	*Plenary*	
	9:00 - 9:30	Welcome and Opening Remarks	Goal of workshop - what do we want to get out of this? Give background of activities at EPA re monitoring/analysis of iron and steel industry and why it is important to get input from industry
	Morning	*Technical Sessions*	
	9:30 - 10:45	Industry Panel	(1) Overview and history of what steel industry has been doing with respect to energy efficiency and GHG reductions; (2) Case study integrated mill; and (3) Case study from secondary mill
	10:45 - 11:30	LBNL International Comparison	Compare energy intensities of the U.S. iron and steel industry with both industrialized and developing countries
	11:30 - 12:00	Q and A	Facilitate a discussion of key issues and concerns that might be evaluated or reviewed in more detail in later work sessions
	12:00 - 1:30	Lunch	Working Lunch?
June 4	*Afternoon*	*Technical Sessions*	
	1:30 - 2:45	Boston University Model	Presentation by Matthias Ruth of the BU industry model, including BAU and alternative projections for 2010 and 2020, followed by facilitated discussion
	2:45 - 3:15	Break	
	3:15 - 4:30	LBNL Cost Curves	LBNL Team to present technology cost curves, followed by facilitated discussion
	4:30 - 5:30	DOE vision for 2020 - actions beyond BAU	Joint industry and OIT presentation on vision technologies and roadmap
	5:30 - 6:00	Closing remarks for Day One	Recap of presentations and reiterate the need for industry's input
June 5	*Morning*	*Technical Sessions*	
	8:30 - 8:45	Opening Remarks and Day 1 Recap	Review of Day One Discussions with Overview of Next Steps
	8:45 - 10:00	Additional opportunities for GHG reductions	Discussion of CHP opportunities and DOE/EPA efforts to remove barriers to CHP (presentation panel to include Industry, DOE/OIT, OAP and OAQPS). Followed by opportunities for recycling, and the possible use of steel byproducts (i.e. slag in cement production) with Industry, DOE and EPA panel
	10:00 - 10:20	Break	
	10:20 - 11:45	Working toward the Next Steps	Facilitated breakout groups to pull together key ideas, opportunities and concerns that might form the basis for actual industry agreements
	11:45 - 12:30	Recap and Closing	Report back from breakout sessions and discussions of the next steps

DOE has yet to be notified of or requested to make this presentation

File:
Industry-by-Industry
Plans:
Correspondence

cc: DIRR

Domestic Industry by Industry

AHAM washington
association of home appliance manufacturers

government relations office
701 pennsylvania avenue, nw ▲ suite 900 ▲ washington, dc 20004
tel 202 • 434 • 7484 ▲ fax 202 • 434 • 7400 ▲ e-mail ahamdc@aham.org

December 29, 1997

VIA HAND DELIVERY

Mr. Todd D. Stern
Assistant to the President and Staff Secretary
The White House Office
Ground Floor, West Wing
1600 Pennsylvania Avenue, NW
Washington, DC 20502

Dear Mr. ~~Stern~~ Todd:

As we discussed, I am forwarding the appliance industry's proposal for inclusion in the President's Climate Change Initiative.

As the attached paper discusses, we recommend federal support of "Accelerated Replacement/Early Retirement" of older, less efficient appliances. This proposal would provide *immediate* carbon reduction benefits at a modest cost and would economically benefit consumers and businesses as well.

I would appreciate your comments on this proposal and would be glad to discuss it further.

Sincerely yours,

Chuck Samuels

Charles A. Samuels
Government Relations Counsel

CAS/cam
enc

cc: Kevin Fay, ARAP

DCDOCS: 120908.1 (2l@k01!.doc)

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December 1997

FEDERAL SUPPORT FOR ACCELERATED REPLACEMENT/EARLY RETIREMENT OF OLDER, LESS ENERGY-EFFICIENT APPLIANCES OFFERS IMMEDIATE ENVIRONMENTAL AND CONSUMER BENEFITS FOR THE PRESIDENT'S CLIMATE CHANGE INITITATIVE

Accelerated Replacement/Early Retirement And The Climate Change Initiative

In his October 22, 1997 global climate change speech, President Clinton recognized that US industry has produced "a large group of efficient new refrigerators, computers, washers/dryers, and other appliances." Strong federal support for programs of accelerated replacement and early retirement of older, inefficient appliances for existing appliances, which are far more efficient, would play a significant role in meeting the US and international climate change goals without economically burdening manufacturers or consumers, requiring costly retooling, or relying on not yet developed technology.

This program would complement the Energy Star and national appliance standards programs and *could save annually over 3 Quads or 48 million metric tonnes carbon equivalent.*

New Appliances Offer Major Climate Change Benefits But Consumers Are Reluctant to Part With Older, Well-Functioning Products

New appliances are many times more efficient and less energy-consuming than the hundreds of millions of their predecessors which are used in American homes and this progress will continue through new product development, appliance standards, and incentive programs. Refrigerators use 50% less energy than 1980 units. This trend will be accelerated after 2001 when standards require an additional 30% reduction. Clothes washers use 14% less energy than their 1980 counterparts, highly efficient clothes washers were introduced in 1997, and new clothes washer standards will go into effect within the next 10 years. Dishwashers and room air conditioners use 28% less energy than 1980 units and new room air conditioner standards go into effect in 2000.

Americans have benefited from purchasing high quality, long-lasting appliances which they keep in use for many years and, particularly in the case of refrigerators, use as a second unit when the original unit is replaced. Appliance replacement is usually deferred until product failure, delaying by many years the introduction of new energy-efficient equipment, thereby impeding the benefits of new products impacting the Kyoto Protocol's 2008 - 2012 commitment period. The average refrigerator recycled in 1997 is well over 20 years old. Approximately three of four "replaced" refrigerators still are used, consuming energy.

There have been only a few scattered, uncoordinated, and short term programs to 1) accelerate early purchases of appliances even when the existing appliance is still functioning, and 2) encourage and incentivize consumers to dispose or "cut the cord" of second products.

Accelerated Replacement/Early Retirement Complements the Energy Star and Appliance Standard Program

A 1995 DOE study and subsequent regulatory and market developments substantiate that well over 3 Quads of energy could be saved annually by replacing the existing stock of appliances with appliances meeting current minimum federal efficiency standards resulting in more than 48 million metric tonnes of carbon equivalent saved per year. If there could be significantly increased disposal of second refrigerators then far more energy could be saved. The program, taking into account economic and environmental paybacks, would have high net present values and substantial returns for federal dollars invested.

These programs would complement the DOE/EPA Energy Star program, which is more narrowly aimed to encourage consumers to purchase highly efficient appliances. Accelerated replacement also gets the consumer to the retailer years earlier. Early retirement of the old product ensures that the energy gains of the new purchase are not lost. Appliance standards could continue to significantly impact over time the minimum efficiency of products sold but accelerated replacement/early retirement can provide climate change benefits immediately while providing manufacturers economic return on costly regulatorily-induced design changes which competition has not allowed firms to pass on to consumers.

Federal support for these programs should be paralleled by a major federal effort to educate consumers, both adults and students, on the economic and environmental benefits of buying newer, more energy-efficient appliances. Imbuing consumers with this understanding requires that consideration of life cycle costs and deferred paybacks must become an essential part of consumer education at all levels.

The Federal Accelerated Replacement/Early Retirement Program

The appliance industry urges the President to include a key role for accelerated replacement/early retirement as part of his $5 billion climate change proposal to the Congress. *A 5-year program* specifically would include:

1) Federal support and encouragement of state, local, and utility incentive and communications programs seeking to accelerate replacment of existing appliances. This program can be coordinated with the Energy Star program and will reap immediate dividends.

2) Federal Support and encouragement of state, local, utility, and retailer programs to encourage and pay "bounties" to consumers "cutting the cord" on replaced refrigerators.

3) Federal financial support for consumer and student energy efficiency education. The federal government should support programs to integrate energy efficiency calculations into adult and student educational programs so that Americans can appreciate the economic as well as environmental value over time of energy efficiency in the same manner in which they consider other investments.

****

There is great opportunity for a win-win for the Administration's climate change program, consumers, manufacturers, and, most importantly, the environment in encouraging consumers to purchase new high efficiency products and dispose of older, inefficient products.

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outreach
~~Dom~~
1 2

JW MARRIOTT HOTEL
ON WESTHEIMER BY THE GALLERIA

Business Center

5150 Westheimer, Houston, TX 77056
Phone (713)-961-1500

Date: 4/22/98 Guest Room #: _____

Guest Name: Denise Swink
DOE Office of Industrial Technologies

Please deliver this fax to:

Name: Bill Antholis

Fax #: 202-456-5334

This fax is from:

Name: Denise Swink

Company: USDOE

Number of Pages **including** this cover page: 2

Additional Comments:

1) The founding legacy for Industries of the Future did not have to do with Climate issues. Basically we realized a whole new way of doing business was required to insure globally competitive sustainable U.S. industry. For decades, government, the private sector, universities, etc. had been charting their own course for investments in future technology, with a lot of unused patents being picked up by foreign firms. There had to be a better way to align industrial customer needs with capabilities of technology developers. How does everyone get the most bang for the buck and achieve industrial sector goals? The key was to encourage industry to think long term. Then scarce capital could be effectively spread in near, mid and long term investments to achieve long term goals.

2) What statutory authority was needed? None. Previous energy authorizing legislation called broadly for partnerships to improve energy efficiency. Epact 1992 provided even more definition.

3) Where did funds come from for grants for industry? From existing programs - - as visions and roadmaps were completed funds that had gone to government-decided-upon investments were dedicated to funding competitions for best capabilities to meet priorities for the visions and roadmaps.

4) Were these programs subsumed into preexisting bureaus? Yes, but subsumed is not the correct term. These programs were facilitated by existing organizations with relevant missions. No new organizations have been created.

5) How much interagency coordination was required to launch? For IOF none has been required. The industry leads the effort and we facilitate bringing the relevant other organizations to partner into the process.

No emissions accounting is required. The industry evaluates progress against it's targets established in visions and roadmaps. Emissions accounting and early credit are key elements why the IOF does not solely satisfy the objectives of the industry consolations. A broader effort encompassing IOF will be necessary.

6) How much initial consultation was done with business before launching? A lot - - some over a couple of years. But now that IOF is their process and DOE is considered a trusted partner, the infrastructure is in place to move quickly on the consultations. Also, industry take advantage of the lessons-learned in the process. Mining took only 4 months to develop a vision this year, whereas when IOF started it took the Forest Products industry a year.

7) What were the major road blocks? Trust! We need to convince these folks consultations are a driver for their contribution to a whole new way of industry engagement to the development and execution of U.S. environmental policy. It's not an open account to change all existing environmental regulations, but a way for the most effective and economic results addressing future environmental challenges.

Outreach

Industry by Industry

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Page 1

Notes on History of EPA/OAR & OPPE voluntary industrial partnerships
DRAFT – For Internal Use Only

- EPA's Office of Policy Planning and Evaluation's Climte Wise Program has launched sector-specific industrial partnerships focusing on energy efficiency and pollution prevention in the following sectors:
  - Pharmaceuticals (1995)
  - Semiconductors (1996)
  - Iron and Steel Industry (1996)
  - Cement (1996)
  - Food Processing (1996)

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- EPA's Office of Atmospheric Protection (OAP) has launched sector-specific industrial partnerships from 1991 to the present:
  - Green Lights & Energy Star Buildings (1991)
  - Natural gas industry (1993)
  - Chemical industry (1993)
  - Aluminum industry (1995)
  - Semiconductor industry (1996)

- Statutory Authority – Statutory authorities include, among others, the Clean Air Act, the Pollution Prevention Act of 1990, and the Global Climate Protection Act of 1987. For example, under Section 103 of the Clean Air Act, 42 U.S.C. 7403:

> (g) Pollution prevention and emissions control.
>
> In carrying out subsection (a), the Administrator shall conduct a basic engineering research and technology program to develop, evaluate, and demonstrate nonregulatory strategies and technologies for air pollution prevention. Such strategies and technologies shall be developed with priority on those pollutants which pose a significant risk to human health and the environment, and with opportunities for participation by industry, public interest groups, scientists, and other interested persons in the development of such strategies and technologies. Such program shall include the following elements:
>
> (1) Improvements in nonregulatory strategies and technologies for preventing or reducing multiple air pollutants, including sulfur oxides, nitrogen oxides, heavy metals, PM-10 (particulate matter), carbon monoxide, and carbon dioxide, from stationary sources, including fossil fuel power plants. Such strategies and technologies shall include improvements in the relative cost effectiveness and long-range implications of various air pollutant reduction and nonregulatory control strategies such as energy conservation, including end-use efficiency, and fuel-switching to cleaner fuels. Such strategies and technologies shall be considered for existing and new facilities.

And, for example, under the Global Climate Protection Act of 1987, 15 U.S.C. 2901:

> Section 1103. Mandate for Action on the Global Climate.
> (a)Goals of United States Policy.–United States policy should seek to–
>
> * * *
>
> (3) identify technologies and activities to limit mankind's adverse effect on the global climate by–

(A) slowing the rate of increase of concentrations of greenhouse gases in the atmosphere in the near term; and

(B) stabilizing or reducing atmospheric concentrations of greenhouse gases over the long term; and

(4) work toward multilateral agreements.

(b) Formulation of United States Policy.-- The President, through the Environmental Protection Agency, shall be responsible for developing and proposing to Congress a coordinated national policy on global climate change...

- Funding -- EPA provides no grants or money to industry partners. Appropriated funds are provided through EPA's Climate Change Action Plan budget. Funds are used by EPA, and by EPA contractors to provide technical support for measurement, etc.

- Organizational Structure --

OAP developed a strong infrastructure for partnership programs through the Green Lights program – with an emphasis on being able to communicate with business by understanding profitability concerns, financing constraints, organizational structure, etc. All of OAP's climate programs are housed within a single division – the Atmospheric Pollution Prevention Division (APPD), which has around 100 employees working on about a dozen programs.

OPPE's Climate Wise Program was designed to work with company partners as 'consultants' providing the know-how and effort needed to fit the needs of individual companies. The focus continues to be on empowering companies to take advantage of their own expertise and knowledge of what makes business sense. This business oriented approach resonates well with companies. In order to facilitate companies' participation and to leverage additional resources to the program, Climate Wise developed a network of over 30 state and local government partners that to date have recruited and serviced around 300 of Climate Wise's 420 partners.

- Interagency Coordination – In the beginning stages, the voluntary programs (such as Green Lights and Natural Gas Star) were launched as agency initiatives without structured interagency coordination. In October 1993, the CCAP was the result of a strong interagency effort to assemble a coordinated framework of existing and new voluntary programs to achieve the goal of returning U.S. emissions to 1990 levels by 2000. The Climate Wise Program was the only initiative under CCAP that was designed to be managed in full partnership between DOE and EPA. The interagency effort was a bottom-up effort by agencies to identify areas of opportunity across the economy. The interagency effort ensured no duplication, attempted to maximize program coverage across sectos, and estimated program impacts using a central energy/emissions forecast. Since CCAP, program development and launches has been the responsibility of the individual agencies. Interagency coordination has improved over the years, with several successful collaborative efforts (e.g., Energy Star, Climate Wise) between EPA and DOE in particular. A recent interagency effort coordinated by CEQ was undertaken to score the success and projected impacts of the full slate of CCAP programs. The analysis was reviewed by most agencies, including CEA and OMB. The scoring and the progress of these programs were

communicated last July in the Second U.S. National Communication to the FCCC (*U.S. Climate Action Report 1997*). Similar interagency reviews are expected in future years.

- Industry Consultation – Initial consultation with industry is the cornerstone of each program's success. Successful programs must be based on a firm understanding of technical options, industry circumstances, and organizational constraints. Industry consultations are also important for developing the structure of the partnership so that it is supportive – not threatening – to the industry. At the same time, the agency must ensure that the partnerships can meet environmental goals, and must be mindful of the success and failures of alternative approaches in the past. Initial consultations have been broadly targeted – including trade associations – but informal (no FACA since the voluntary programs are not consensus-based). Climate Wise, for example, was launched in1994 with 12 charter members who also served on a year long steering committee to help design and develop the program.

- Major Roadblocks – There have been four major roadblocks in the initial development of the programs, both of which can be overcome by working closely with the industry. The first roadblock is industry suspicion of government agencies and our ability to follow through with a cooperative, rather than heavy-handed approach. Although always present in initial consultations, this roadblock has become progressively easier to overcome since EPA now has thousands of successful partnerships. For many programs, partners with EPA have signed a Memorandum of Understanding with EPA detailing their commitment (as well as the agency's responsibilities to provide support). Each industry or potential partner must be approached with a clear understanding that they will need to be convinced that the government can and will work cooperatively. The second roadblock is that companies need information on the cost-effectiveness and profitability of the range of options for improving efficiency/reducing emissions. Even in companies where some engineers or divisions have up-to-date information on options, that information may not be understood throughout the company, including financial officers, management, and (importantly for industry compacts) government affairs officers. Like the first roadblock, this can be overcome through initial consultations. The third roadblock has been in the area of funding and resources. While the partnership programs have experienced rapid growth, budgets and available resources have actually shrunk. Companies like Phillips Electronics and USX have recently told Climate Wise staff that they wished they had been recruited with more intensity at an earlier date. An immediate full court press for fortune 500 companies to join Climate Wise was limited by resource restraints. The fourth roadblock to the initial development of the program was simply time. It took about a year to develop the pertinent materials and infrastructure to really be ready to work with the diversity of issues and needs in the industrial sector.

Outreach Industry by Industry

US ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF AIR AND RADIATION

IMMEDIATE OFFICE - fax (202) 260-5155
phone (202) 260-7400

TO: Dirk Forrister cc: Todd Stern	FAX#: 343-1162 PHONE#:
FROM: David Doniger	PHONE#:

COMMENTS:

These are the utility documents we discussed.

-David

page 1 of ___ (including cover sheet)

OFFICE OF AIR AND RADIATION FAX AND PHONE NUMBERS

office	fax	phone	mailcode	room number
immediate office	(202) 260-5155	(202) 260-7400	6101	937WT
OAQPS -DC	(202) 260-0451	(202) 260-5375	6101	933WT
OPMO	(202) 260-4185	(202) 260-7415	6102	947WT
OMS	(202) 260-3730	(202) 260-7645	6401	901WT
ORIA	(202) 233-9651	(202) 233-9320	6601	Judiciary Square
OAP	(202) 233-9586	(202) 233-9140	6201	Judiciary Square
OPAR	(202) 260-9766	(202) 260-5580	6103	925WT
OAQPS - NC	(919) 541-2462	(919) 541-5616	MD-10	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 10 1998

OFFICE OF
GENERAL COUNSEL

MEMORANDUM

SUBJECT: EPA's Authority to Regulate Pollutants Emitted by Electric Power Generation Sources

FROM: Jonathan Z. Cannon
General Counsel

TO: Carol M. Browner
Administrator

I. Introduction and Background

This opinion was prepared in response to a request from Congressman DeLay to you on March 11, 1998, made in the course of a Fiscal Year 1999 House Appropriations Committee Hearing. In the Hearing, Congressman DeLay referred to an EPA document entitled "Electricity Restructuring and the Environment: What Authority Does EPA Have and What Does It Need." Congressman DeLay read several sentences from the document stating that EPA currently has authority under the Clean Air Act (Act) to establish pollution control requirements for four pollutants of concern from electric power generation: nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon dioxide (CO_2), and mercury. He also asked whether you agreed with the statement, and in particular, whether you thought that the Clean Air Act allows EPA to regulate emissions of carbon dioxide. You agreed with the statement that the Clean Air Act grants EPA broad authority to address certain pollutants, including those listed, and agreed to Congressman DeLay's request for a legal opinion on this point. This opinion discusses EPA's authority to address all four of the pollutants at issue in the colloquy, and in particular, CO_2, which was the subject of Congressman DeLay's specific question.

The question of EPA's legal authority arose initially in the context of potential legislation addressing the restructuring of the utility industry. Electric power generation is a significant source of air pollution, including the four pollutants addressed here. On March 25, 1998, the Administration announced a Comprehensive Electricity Competition Plan (Plan) to produce lower

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prices, a cleaner environment, increased innovation and government savings. This Plan includes a proposal to clarify EPA's authority regarding the establishment of a cost-effective interstate cap and trading system for NO_x reductions addressing the regional transport contributions needed to attain and maintain the primary National Ambient Air Quality Standards (NAAQS) for ozone. The Plan does not ask Congress for authority to establish a cap and trading system for emissions of carbon dioxide from utilities as part of the Administration's electricity restructuring proposal. The President has called for cap-and-trade authority for greenhouse gases to be in place by 2008, and the Plan states that the Administration will consider in consultation with Congress the legislative vehicle most appropriate for that purpose.

As this opinion discusses, the Clean Air Act provides EPA authority to address air pollution, and a number of specific provisions of the Act are potentially applicable to control these pollutants from electric power generation. However, as was made clear in the document from which Congressman DeLay quoted, these potentially applicable provisions do not easily lend themselves to establishing market-based national or regional cap-and-trade programs, which the Administration favors for addressing these kinds of pollution problems.

II. Clean Air Act Authority

The Clean Air Act provides that EPA may regulate a substance if it is (a) an "air pollutant," and (b) the Administrator makes certain findings regarding such pollutant (usually related to danger to public health, welfare, or the environment) under one or more of the Act's regulatory provisions.

A. Definition of Air Pollutant

Each of the four substances of concern as emitted from electric power generating units falls within the definition of "air pollutant" under section 302(g). Section 302(g) defines "air pollutant" as

> any air pollution agent or combination of such agents, including any physical, chemical, biological, [or] radioactive . . . substance or matter which is emitted into or otherwise enters the ambient air. Such term includes any precursors to the formation of any air pollutant, to the extent that the Administrator has identified such precursor or precursors for the particular purpose for which the term "air pollutant" is used.

This broad definition states that "air pollutant" includes any physical, chemical, biological, or radioactive substance or matter that is emitted into or otherwise enters the ambient air. SO_2, NO_x, CO_2 and mercury from electric power generation are each a "physical [and] chemical . . .

substance which is emitted into . . . the ambient air," and hence, each is an air pollutant within the meaning of the Clean Air Act.[1]

A substance can be an air pollutant even though it is naturally present in air in some quantities. Indeed, many of the pollutants that EPA currently regulates are naturally present in the air in some quantity and are emitted from natural as well as anthropogenic sources. For example, SO_2 is emitted from geothermal sources; volatile organic compounds (precursors to ozone) are emitted by vegetation; and particulate matter and NO_x are formed from natural sources through natural processes, such as naturally occurring forest fires. Some substances regulated under the Act as hazardous air pollutants are actually necessary in trace quantities for human life, but are toxic at higher levels or through other routes of exposure. Manganese and selenium are two examples of such pollutants. EPA regulates a number of naturally occurring substances as air pollutants, however, because human activities have increased the quantities present in the air to levels that are harmful to public health, welfare, or the environment.

B. EPA Authority to Regulate Air Pollutants

EPA's regulatory authority extends to air pollutants, which, as discussed above, are defined broadly under the Act and include SO_2, NO_x, CO_2, and mercury emitted into the ambient air. Such a general statement of authority is distinct from an EPA determination that a particular air pollutant meets the specific criteria for EPA action under a particular provision of the Act. A number of specific provisions of the Act are potentially applicable to these pollutants emitted from electric power generation.[2] Many of these specific provisions for EPA action share a common

---

[1] See also section 103(g) of the Act (authorizes EPA to conduct a basic research and technology program to develop and demonstrate nonregulatory strategies and technologies for air pollution prevention, which shall include among the program elements "[i]mprovements in nonregulatory strategies and technologies for preventing or reducing multiple air pollutants, including sulfur oxides, nitrogen oxides, heavy metals, PM-10 (particulate matter), carbon monoxide, and carbon dioxide, from stationary sources, including fossil fuel power plants.").

[2] See, e.g., section 108 (directs Administrator to list and issue air quality criteria for each air pollutant that causes or contributes to air pollution that may reasonably be anticipated to endanger public health or welfare and that is present in the ambient air due to emissions from numerous or diverse mobile or stationary sources); section 109 (directs Administrator to promulgate national primary and secondary ambient air quality standards for each air pollutant for which there are air quality criteria, to be set at levels requisite to protect the public health with an adequate margin of safety (primary standards) and to protect welfare (secondary standards)); section 110 (requires states to submit state implementation plans (SIPs) to meet standards); section 111(b) (requires Administrator to list, and set federal performance standards for new sources in, categories of stationary sources that cause or contribute significantly to air pollution that may reasonably be anticipated to endanger public health or welfare); section 111(d) (states must establish performance standards for existing sources for any air pollutant (except criteria

feature in that the exercise of EPA's authority to regulate air pollutants is linked to a determination by the Administrator regarding the air pollutants' actual or potential harmful effects on public health, welfare or the environment. See, e.g., sections 108, 109, 111(b), 112, and 115. See also sections 202(a), 211(c), 231, 612, and 615. The legislative history of the 1977 Clean Air Act Amendments provides extensive discussion of Congress' purposes in adopting the language used throughout the Act referencing a reasonable anticipation that a substance endangers public health or welfare. One of these purposes was "[t]o emphasize the preventative or precautionary nature of the act, i.e., to assure that regulatory action can effectively prevent harm before it occurs; to emphasize the predominant value of protection of public health." H.R. Rep. No. 95-294, 95th Cong., 1st Sess., at 49 (Report of the Committee on Interstate and Foreign Commerce). Another purpose was "[t]o assure that the health of susceptible individuals, as well as healthy adults, will be encompassed in the term 'public health,' . . . ." Id. at 50. "Welfare" is defined in section 302(h) of the Act, which states:

> [a]ll language referring to effects on welfare includes, but is not limited to, effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants.[3]

EPA has already regulated SO_2, NO_x and mercury based on determinations by EPA or Congress that these substances have negative effects on public health, welfare, or the environment. While CO_2, as an air pollutant, is within EPA's scope of authority to regulate, the Administrator has not yet determined that CO_2 meets the criteria for regulation under one or more

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pollutants or hazardous air pollutants) that would be subject to a performance standard if the source were a new source); section 112(b) (lists 188 hazardous air pollutants and authorizes Administrator to add pollutants to the list that may present a threat of adverse human health effects or adverse environmental effects); section 112(d) (requires Administrator to set emissions standards for each category or subcategory of major and area sources that the Administrator has listed pursuant to section 112(c)); section 112(n)(1)(A) (requires Administrator to study and report to Congress on the public health hazards reasonably anticipated from emissions of listed hazardous air pollutants from electric utility steam generating units, and requires regulation if appropriate and necessary); section 115 (Administrator may require state action to control certain air pollution if, on the basis of certain reports, she has reason to believe that any air pollutant emitted in the United States causes or contributes to air pollution that may be reasonably anticipated to endanger public health or welfare in a foreign country that has given the United States reciprocal rights regarding air pollution control); Title IV (establishes cap-and-trade system for control of SO_2 from electric power generation facilities and provides for certain controls on NO_x).

[3] The language in section 302(h) listing specific potential effects on welfare, including the references to weather and climate, dates back to the 1970 version of the Clean Air Act.

provisions of the Act. Specific regulatory criteria under various provisions of the Act could be met if the Administrator determined under one or more of those provisions that CO_2 emissions are reasonably anticipated to cause or contribute to adverse effects on public health, welfare, or the environment.

C. EPA Authority to Implement an Emissions Cap-and-Trade Approach

The specific provisions of the Clean Air Act that are potentially applicable to control emissions of the pollutants discussed here can largely be categorized as provisions relating to either state programs for pollution control under Title I (e.g., sections 107, 108, 109, 110, 115, 126, and Part D of Title I), or national regulation of stationary sources through technology-based standards (e.g., sections 111 and 112). None of these provisions easily lends itself to establishing market-based national or regional emissions cap-and-trade programs.[4]

The Clean Air Act provisions relating to state programs do not authorize EPA to require states to control air pollution through economically efficient cap-and-trade programs and do not provide full authority for EPA itself to impose such programs. Under certain provisions in Title I, such as section 110, EPA may facilitate regional approaches to pollution control and encourage states to cooperate in a regional, cost-effective emissions cap-and-trade approach (see Notice of Proposed Rulemaking: Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone, 62 F.R. 60318 (Nov. 7, 1997)). EPA does not have authority under Title I to require states to use such measures, however, because the courts have held that EPA cannot mandate specific emission control measures for states to use in meeting the general provisions for attaining ambient air quality standards. See Commonwealth of Virginia v. EPA, 108 F.3d 1397 (D.C. Cir. 1997). Under certain limited circumstances where states fail to carry out their responsibilities under Title I of the Clean Air Act, EPA has authority to take certain actions, which might include establishing a cap-and-trade program.[5] Yet EPA's ability to invoke these provisions for federal action depends on the actions or inactions of the states.

Technology-based standards under the Act directed to stationary sources have been interpreted by EPA not to allow compliance through intersource cap-and-trade approaches. The

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[4] Title IV of the Act provides explicit authority for a cap and trade program for SO_2 emissions from electric power generating sources.

[5] For example, section 110(c) requires EPA to promulgate a Federal implementation plan where EPA finds that a state has failed to make a required submission of a SIP or that the SIP or SIP revision does not satisfy certain minimum criteria, or EPA disapproves the SIP submission in whole or in part. In addition, section 126 provides that a State or political subdivision may petition the Administrator for certain findings regarding emissions from certain stationary sources in another state. If the Administrator grants the petition, she may establish control requirements applicable to sources that were the subject of the petition.

Clean Air Act provisions for national technology-based standards under sections 111 and 112 require EPA to promulgate regulations to control emissions of air pollutants from stationary sources. To maximize the opportunity for trading of emissions within a source, EPA has defined the term "stationary source" expansively, such that a large facility can be considered a "source." Yet EPA has never gone so far as to define as a source a group of facilities that are not geographically connected, and EPA has long held the view that trading across plant boundaries is impermissible under sections 111 and 112. See, e.g., National Emission Standards for Hazardous Air Pollutants for Source Categories; Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry, 59 Fed. Reg. 19402 at 19425-26 (April 22, 1994).

III. Conclusion

EPA's regulatory authority under the Clean Air Act extends to air pollutants, which, as discussed above, are defined broadly under the Act and include SO_2, NO_x, CO_2, and mercury emitted into the ambient air. EPA has in fact already regulated each of these substances under the Act, with the exception of CO_2. While CO_2 emissions are within the scope of EPA's authority to regulate, the Administrator has made no determination to date to exercise that authority under the specific criteria provided under any provision of the Act.

With the exception of the SO_2 provisions focused on acid rain, the authorities potentially available for controlling these pollutants from electric power generating sources do not easily lend themselves to establishing market-based national or regional cap-and-trade programs, which the Administration favors for addressing these kinds of pollution problems. Under certain limited circumstances, where states fail to carry out their responsibilities under Title I of the Act, EPA has authority to take certain actions, which might include establishing a cap-and-trade program. However, such authority depends on the actions or inactions of the states.

Environmental Provisions in Electricity Restructuring Legislation

The Administration has committed to supporting electricity restructuring legislation that both reduces electricity costs and protects the environment. In President Clinton's October 22 climate policy speech, he said:

> "We must unleash competition in the electricity industry, to remove outdated regulations and save Americans billions of dollars. We must do so in a way that leads to even greater progress in cleaning our air and delivers a significant down payment in reducing greenhouse gas emissions."

The accompanying fact sheet on restructuring stated:

> "Done correctly, this process can save consumers in their utility bills and reduce carbon emissions. . . . With appropriate market-based provisions, electricity restructuring legislation could reduce carbon emissions by creating incentives to produce and use electricity more efficiently and with less pollution."

The electric power industry faces significant new environmental challenges over the same 10-15 year period during which it will undergo restructuring. Power plants emit four major air pollutants: nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon dioxide (CO_2), and mercury. Their emissions must be reduced in order to fulfill the Administration's commitment to clean air and to meet our greenhouse gas emissions budget under the Kyoto Protocol.

Five Reasons for an Integrated Economic and Environmental Strategy

There are five strong reasons not to try to address the economic issues facing the electric sector in isolation from its environmental challenges, but instead to fashion an integrated economic and environmental strategy for this sector in order to deliver on the President's commitments.

First, electricity restructuring probably will lead to *increases* in these emissions, not reductions, unless it is accompanied by appropriate market-based pollution limits, ideally patterned on the successful "cap-and-trade" program established to control acid rain. Pollution increases should be expected over the next 10-15 years and beyond, even taking into account several proposed elements of the legislation (the renewables portfolio standard, the public benefits fund, and consumer information on emissions characteristics) that have broad agency and constituency support and serve other important environmental objectives. While DOE projects that with these provisions the bill would reduce emissions, EPA's best estimate is that in the absence of emission caps, electricity restructuring as a whole (including both wholesale and retail competition) is expected to result in carbon and NO_x emissions increases on the scale shown in the following table, even with the proposed renewables portfolio and related provisions.

Annual Increases of Carbon and Nitrogen Oxide Emissions
Resulting from Electricity Restructuring[1]

Pollutant	2000	2005	2010
Carbon (million metric tonnes)	40	63	62
Nitrogen Oxides (thousands of tons)	391	640	553

The differences in agencies' assessments turn on such questions as how much more power will be generated at older, less-efficient coal-burning plants; how many nuclear units will retire early; relative prices for coal and gas; how much electricity demand will increase as prices fall; how much power can be transmitted among regions. The latest Energy Information Administration forecasts (Annual Energy Outlook 1998) corroborate the EPA view, projecting higher carbon dioxide emissions through 2010 and beyond. Early results from wholesale competition also indicate that deliveries of bulk power from the Ohio Valley to the Northeast increased by more than 40 percent in 1996, based on utility filings with the Federal Energy Regulatory Commission. Environmentally, this amounts to substituting power from some of the highest-emitting Midwestern coal-fired units in place of cleaner units in the Northeast. Partly due to such shifts, carbon emissions from power generation increased by 4.7% in 1996 and continued to increase in 1997.

On this analytical background, the Administration would not be in a position to guarantee that emissions will not increase, let alone that they will decrease by amounts that constitute a "significant down payment" on needed reductions.

Second, large economic savings can be achieved if power generating firms know the full suite of their future requirements for these various pollutants and can engage in integrated planning and implementation of their investments in control measures. A serial approach -- for example, deciding now to invest in "add-on" NO_x and SO_2 controls without anticipating additional requirements, and then adjusting as CO_2 and mercury measures are established in subsequent steps -- would sharply increase total control costs compared to an up-front, integrated approach. If given clear signals at the outset concerning future carbon reduction requirements, firms would likely de-emphasize "add-on" control investments that are effective for only two of the pollutants and engage in greater fuel switching, which addresses all four pollutants and thereby substantially reduces total costs.

Third, uncertainty over pollution requirements is already affecting divestment and investment decisions in the industry. Allowing this uncertainty to linger will impose a substantial economic drag on the restructuring process. Firms trying to determine the best mix of generating assets, and the right balance between generation and conservation investments, need clear signals

[1] Sulfur dioxide emissions would remain constant because of the acid rain cap, but compliance costs would increase. Mercury emission trends were not specifically analyzed but would tend to follow carbon.

concerning the future costs of environmental requirements for different kinds of generating plants. Lacking such signals, the industry may make costly and inefficient investment choices, reducing the savings to consumers and the boost to the U.S. economy that should come from restructuring. Leaving the industry's environmental challenges for later will also make them even harder to resolve, as parties that have already made their investment choices based on one view of their future can be expected to resist actions that they feel impose unanticipated costs. It will also be easier to address these issues during a period when total electricity costs are falling.

Fourth, while EPA currently *has authority* under the Clean Air Act to establish pollution control requirements for each of these pollutants, these current authorities do not easily lend themselves to establishing market-based cap-and-trade programs, which are broadly recognized as the ideal way to approach these kinds of pollution problems. EPA's authority to directly establish federal cap-and-trade programs is limited to acid rain.[2] Cap-and-trade programs for other power plant pollutants may be possible under other Clean Air Act provisions, but would require at a minimum coordinating the actions of as many as 50 states. Emissions caps and emissions trading could also be problematic under Clean Air Act provisions for setting technology-based performance standards. Regulation of power plant emissions under existing authorities, therefore, would be less flexible and more costly than it should be.

In short, what is needed is *smarter*, not more extensive, authority -- enhanced authority as to *how* EPA may control these pollutants, in order to achieve the necessary reductions at the lowest cost and with the most private sector flexibility.

Fifth, electricity restructuring is increasingly identified as a key environmental issue for the coming year. (See the New York Times editorial, 1/2/98: "This does not sound like an environmental issue, but it is. . . . Mr. Clinton should get out ahead of it.") Including market-based (cap-and-trade) provisions for these pollutants in the Administration's restructuring proposal would draw strong support from important constituencies (environmentalists, Eastern states, progressive utilities and other businesses). It would be seen as a concrete step to move forward domestically on global warming while continuing to work for progress internationally in follow-up to Kyoto. There are obvious constituencies and Congressional forces that would oppose these provisions. On the other hand, there are signs that key opponents on climate change (e.g., the auto industry) may be rethinking their positions. The legislative process for restructuring legislation is likely to go into the next Congress, regardless of these provisions. In that case, the Administration has every reason to start on the high ground.

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[2] Title IV of the Clean Air Act creates a cap-and-trade program for sulfur dioxide emissions from power plants for the purposes of reducing acid rain. Any additional SO_2 reductions needed to meet the new fine particle public health standard will have to be taken under other provisions that are implemented primarily by the states.

Electricity Restructuring and the Environment:
What Authority Does EPA Already Have, and What Does It Need?

EPA currently has authority under the Clean Air Act to establish pollution control requirements for all four pollutants of concern from electric power generation: nitrogen oxides, sulfur dioxide, carbon dioxide, and mercury. Action could be taken under provisions for meeting national ambient air quality standards, addressing transboundary pollution, or setting technology-based emission standards.

But unlike the Act's acid rain provisions,[1] these current authorities do not lend themselves to establishing market-based national or regional cap-and-trade programs, which are broadly recognized as the ideal way to approach these kinds of pollution problems.

In short, what is needed is *smarter*, not more extensive, authority -- enhanced authority as to *how* EPA may control these pollutants, in order to achieve the necessary reductions at the lowest cost and with the most private sector flexibility.

To illustrate, Clean Air Act provisions for meeting national air quality standards and addressing transboundary pollution place program design and implementation into the hands of as many as 50 states. A multi-state cap-and-trade program resembling acid rain could be created under the Act if the states cooperate to set up coordinated and interlocking programs. EPA is establishing this framework right now for NO_x emissions across a 22-state region. EPA can encourage, but not compel, the states to cap power plant emissions and allow trading. A single federal cap-and-trade program would be much easier to establish and much more certain to deliver the economic benefits of market-based approaches. But current authorities do not allow a single federal approach for NO_x or the other pollutants.

Other provisions of the Act for setting technology-based emissions performance standards for new and existing sources, or for hazardous air pollutants, could be used to regulate power plant emissions. But these provisions operate on the basis of emission rates (e.g., pounds per kilowatt/hour), rather than caps on total emissions. They also are generally thought to bar emissions trading. This would drive EPA to follow a less efficient and more costly plant-by-plant approach.

The key elements needed in restructuring legislation are clear federal authority (1) to establish national (or where relevant, regional) emissions caps for power generation facilities, and (2) to provide for emissions trading among such facilities. One approach would be to provide in the restructuring bill that decisions *whether* to adopt further controls, and *how much* to reduce

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[1] Title IV of the Clean Air Act creates a cap-and-trade program for sulfur dioxide emissions from power plants for purposes of reducing acid rain. Any additional reductions needed in power plant SO_2 emissions to meet the new fine particle public health standard will have to be taken under other provisions that are implemented primarily by the states.

emissions, would be made under criteria like those in the current Clean Air Act (e.g., Does the pollutant endanger public health or welfare? What emission reductions are achievable taking into account cost?). The new legislation, however, should provide for these reductions to be implemented through emissions caps and emissions trading. These implementation provisions would generally resemble the acid rain provisions of the current Clean Air Act.

Finally, to stay focused on an integrated strategy for this sector, avoid raising broader Clean Air Act issues, and address jurisdictional concerns, it is important that these provisions be structured as an integral title of the new legislation, not as a separate Clean Air Act amendment.

Domestic FORRISTER
Industry by Industry

Global Climate Change and the Steel Industry

Why is the issue important to steel?

What are the key steel industry issues for U.S. global climate policy?

What has the industry done to help reduce greenhouse gas emissions?

What additional voluntary reductions can the steel industry achieve?

What can government do to help the industry achieve emission reduction goals?

- Bethlehem
- LTV
- US Steel - Chuck Carson ..F
- WLAND
- Cargill - North State.

Why is the issue important to steel?

Steelmaking is energy intensive and largely coal-based

- 3% of U.S. energy consumption; 10% of industrial consumption
- 60% derived from coal to produce coke for conversion of iron ore to iron
- No feasible alternatives to coal or other carbon-based fuels
- Electricity another 7% of industry energy consumption, >50% at some EAF plants
- Coal-based power plants generate much of the electricity consumed
- Energy purchases represent 15-20% of steel manufacturing costs

Steel industry has made major investments in energy conservation

- Steelmaking is heavily capital intensive with long capital stock turnovers
- Improvements achieved principally through large capital investments
  - Phased out Open Hearth furnaces (since 6-8 yrs ago)
  - Increased continuous casting
  - Blast Furnace substitutes for coke
  - New ironmaking technologies
  - Increased use of Electric Furnaces → use more scrap.
  - New Electric Furnace processing technologies
  - Improved reheat furnace technology
- Reductions also from better energy management (measurement, insulation)
- Industry has accomplished 45% reduction in energy consumption since 1975 → tonnage roughly flat @ 100 million to
- Reductions accomplished without mandates or energy taxes

But pace of reductions is slowing, further reductions more difficult to obtain

- **Continuous casting approaching 100%** → not much more gain poss. here.
- **Scrap availability & quality may limit use of Electric Furnaces**
- **Wider use of scrap substitutes will limit Electric Furnace energy benefits**
- **Blast furnace coke substitution has limits**
- **Investment costs compete with need to modernize, meet customer demands**
- **Demand for higher value steel products** → coatings; heat treats. Add energy req'ts.
  ↳ grow
- **Raw steel production has been flat, growth expected** → ala residential framing...
- **Additional environmental control requirements** → bag houses, scrubbers → not letting up...

Economic consequences could be devastating for domestic steel industry

- Increased energy prices suggested as only way to achieve significant national reductions
- Steel industry energy prices would double (>$5 billion/year)
- Argonne study
  - Substantial increase in manufacturing costs ($39-128/ton)
  - Significant shift of production to developing countries (30%)
  - Commensurate loss of U.S. steelmaking jobs (100,000)
  - Distorts balance between steelmaking sectors
- ESI study → sector specific... Clyde Prestowitz...
  - Reduced domestic demand (21%) and shipments (30%)
  - Decreased exports (26%), increased imports (14%)

Some studies show signif price incr. are only signal that wd

Double costs w/ $100/ton...

Current costs = $50/ton...

28% Imported...
5% Exported...

Developing countries are major competitors for U.S. steel makers

- **4 of top 10 steelmaking countries are not Annex 1 countries**
- **China, Korea, India, Brazil (plus Mexico, not in top 10)**
  -- all net gains 95-96 -- all others declined.
- **China largest, among least energy efficient, fastest growing**
- **Shifting production has no positive environmental benefit, likely negative**
- **Major trade problems with former Soviet bloc**
- **Concerns with EU bubble --**

Canada
Japan
Germany
Italy
~~France~~ Ukraine

Ukraine = in top 10...

China = largest steel prod in world.
fastest growing....
least environmentally controlled.
bee-hive coke ovens!

[India = 2½ times as much energy per ton.

What are the key steel industry issues for U.S. global climate policy?

A global solution is needed

- Commitments needed from both developed and developing countries
- Major steel competitors are developing nations

Maximum flexibility is needed in achieving any goals

- Voluntary programs/commitments
- Emission trading schemes - monitoring, enforcement issues : makes sense. major Q's still.
- Joint implementation, technology transfer, R&D incentives : applaud.
- Recognition of progress to date → part of deal.

Taxes and energy reduction mandates should be avoided → antibrain

- Distort markets
- Threaten competition
- Reduce capital, self-defeating : for every dollar taxed, a dollar less to use for r, d+d.

Science must lead policy

◊ consider in light of uncertainties

What has the industry done to help reduce greenhouse gas emissions?

More effective utilization of materials – on-going.

- Recycling of waste oxides - sinter plants, other processes
- Coke substitutes in Blast Furnaces
- Recycling of coke oven wastes to coke ovens
- Increased utilization of slags
- Increased scrap utilization - dezincing, e.g.
- Recovery of waste heat & energy → good bit of interruptable pwr.

Improved energy efficiency in existing processes

- Increased utilization of continuous casting - approaching 100%
- Moved toward more continuous processing generally
- Energy conservation projects, better energy mgt. - info transfer, measurement

[Coupling]

Other in-plant efforts to reduce emissions

- Reduced energy for lighting (Green Lights)
- Improved environmental performance generally [lots of inefficiency of products]
- Reduction of in-plant traffic

Development & implementation of new technology

- Development of new ironmaking technologies
- Development of waste oxide smelting process
- Development of strip casting and thin strip casting
- Electric Furnace processing advances
  - DC furnaces, shaft furnaces (vs AC furn)
  - Ladle refining
  - Oxygen injection, oxy-fuel burners
- Refractory research

Employee & community awareness & education programs

Product-related emission reduction efforts

- Auto-Steel Partnership, USAMP life-cycle activities
  4 of a kind
- Participation in PNGV
- Development of ultra-light steel auto body (ULSAB) → Int'l effort vs. composites + alum. + other lightweights
  - lighter, stronger, cheaper.
- Promotion of steel recycling - formation of Steel Recycling Institute
- Promotion of steel in residential housing - more energy efficient, saves trees???
- Improved electrical efficiencies for steels in electrical equipment
  ▷ transformers, etc.

- Heavy pressure → alum + plastics.

What additional voluntary reductions can the steel industry achieve?

More effective utilization of materials

- Increased waste oxide utilization
- Greater scrap utilization
- Fuel substitution

Improve energy efficiency of existing processes

- More direct hot charging of mills
- Progress toward more continuous processing
- Increased waste heat recovery, co-generation
- Other low-grade energy recovery : Hot water. Reduced head.
- Install variable speed drives where feasible
- Fuel substitution

Other in-plant efforts to reduce emissions

- Increase participation in existing voluntary programs
- Reduce plant traffic
- Convert plant vehicles to low-emission units
- Plant vegetation → Green belts

Develop and install new technologies

- Install more alternative ironmaking processes
- Increase R&D to reduce energy or CO2 emissions
- Retire & replace existing processing units with more efficient technologies

Increase employee & community awareness & education of energy reduction & recycling

Product-related emission reduction efforts

- Seek energy reductions through steel solutions
  - Autos
  - Construction, Infrastructure
  - Appliances
  - Containers
- Reduce energy associated with transportation of steel products
- Promote life-cycle benefits of steel
- Increase emphasis on steel recycling

Overall steel industry expectation

of at least 10% greenhouse gas emission reduction

below 1990 levels by 2010

through voluntary efforts

What can government do to help the steel industry achieve emission reduction goals?

- Recognize uncertainties; avoid overstatement, exaggeration
- Work toward more cost-effective environmental controls, laws, & regulations
- Support electricity competition & customer choice
- Recognize the benefits of and promote voluntary programs
- Provide assistance and incentives for R&D and installation of energy-efficient & CO2 reduction processes/technologies
- Provide incentives for development of renewable energy, CO2 sinks
- Promote joint implementation, technology transfer, flexibility
- Promote energy efficiency labeling
- Promote life-cycle analysis in procurement policies
- Develop safe, economical nuclear power
- Include all greenhouse gas emissions in efforts to address issue

DUPONT CHEMICAL, Circleville, OH or Mt. Clemens, MI

Background: DuPont is the 13th largest corporation in the U.S. and the 26th largest in the world. DuPont has about 105,000 employees and annual sales of more than $42.2 billion. In 1995, DuPont exports were $4.2 billion, making the company one of the largest U.S. exporters.

Energy Use: DuPont uses 10% of the total energy consumed by all U.S. chemical companies combined.

Greenhouse Gas Reduction Activities: DuPont, the first company to join Climate Wise in 1994, was recognized at a White House ceremony that same year. DuPont pledged to reduce its greenhouse gas emissions by 40% by 2000, and has already reduced emissions by 19%. It has committed to reducing manufacturing energy use by 15% per unit of production, which is 2 times the average energy efficiency improvements seen by the entire industry sector. In 1994, the first year as a Climate Wise partner, DuPont saved over $31 million. DuPont plans to reduce 18 million metric tonnes of carbon dioxide-equivalent gases by the year 2000, equivalent to taking almost 4 million cars off the road, and has already reduced about 22 million metric tonnes of gases world wide.

Circleville, OH: The Circleville, Ohio facility is located about 25 miles from Columbus on the Scioto River and has 1,048 employees. The chemical plant and other industrial facilities are surrounded by farmland. The facility manufactures Mylar (a food packaging material), Kapton (a plastic film) and other synthetic materials. DuPont has taken a number of steps to increase energy efficiency at this facility, including recycling 5 million tons of organic waste into fuels for cement kilns, re-capturing wasted steam which eliminates 970 tons of CO2 per year, and investing in energy efficient technology at all levels of processing. This facility saves $100,000 annually in energy costs.

Mt. Clemens, MI: The Mt. Clemens, MI facility is located about 25 miles from Detroit in a mixed industrial and residential area, next to a currently idle Ford facility, and has about 1,000 employees. The facility manufactures plastics and acrylic resins for the auto industry and others. DuPont's corporate statement claims that its "engineering polymers" (plastics or resins) lightens the weight of automobiles, resulting in a 33 percent reduction in total vehicle emissions since 1980. This facility has made its manufacturing processes more efficient and put in place state-of-the-art preventative maintenance programs to curb energy use. These actions have allowed the facility to double its production over the last five years without increasing energy use.

CEO: Charlie O. Holliday, Jr. is the CEO and President of DuPont. DuPont is not a member of the Global Climate Change Coalition. The company has received several awards for its energy conservation/environmental protection efforts, and has been very aggressive in seeking and accepting recognition for their achievements in energy efficiency and greenhouse gas reductions. In addition, DuPont's corporate policy acknowledges the existence of climate change, the need to reduce greenhouse gas emissions, and is committed to voluntary methods to achieve this end.

Industry &

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DOE Office of Industrial Technologies

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Fax #: 202-456-5334

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Name: Denise Swink

Company: USDOE

Number of Pages **including** this cover page: 2

Additional Comments:

1) The founding legacy for Industries of the Future did not have to do with Climate issues. Basically we realized a whole new way of doing business was required to insure globally competitive sustainable U.S. industry. For decades, government, the private sector, universities, etc. had been charting their own course for investments in future technology, with a lot of unused patents being picked up by foreign firms. There had to be a better way to align industrial customer needs with capabilities of technology developers. How does everyone get the most bang for the buck and achieve industrial sector goals? The key was to encourage industry to think long term. Then scarce capital could be effectively spread in near, mid and long term investments to achieve long term goals.

2) What statutory authority was needed? None. Previous energy authorizing legislation called broadly for partnerships to improve energy efficiency. Epact 1992 provided even more definition.

3) Where did funds come from for grants for industry? From existing programs - - as visions and roadmaps were completed funds that had gone to government-decided-upon investments were dedicated to funding competitions for best capabilities to meet priorities for the visions and roadmaps.

4) Were these programs subsumed into preexisting bureaus? Yes, but subsumed is not the correct term. These programs were facilitated by existing organizations with relevant missions. No new organizations have been created.

5) How much interagency coordination was required to launch? For IOF none has been required. The industry leads the effort and we facilitate bringing the relevant other organizations to partner into the process.

No emissions accounting is required. The industry evaluates progress against it's targets established in visions and roadmaps. Emissions accounting and early credit are key elements why the IOF does not solely satisfy the objectives of the industry consolations. A broader effort encompassing IOF will be necessary.

6) How much initial consultation was done with business before launching? A lot - - some over a couple of years. But now that IOF is their process and DOE is considered a trusted partner, the infrastructure is in place to move quickly on the consultations. Also, industry take advantage of the lessons-learned in the process. Mining took only 4 months to develop a vision this year, whereas when IOF started it took the Forest Products industry a year.

7) What were the major road blocks? Trust! We need to convince these folks consultations are a driver for their contribution to a whole new way of industry engagement to the development and execution of U.S. environmental policy. It's not an open account to change all existing environmental regulations, but a way for the most effective and economic results addressing future environmental challenges.

FAX...FAX...FAX...FAX...FAX...FAX...FAX...FAX...FAX...FAX...FAX...

Dom Industry by Industry

US ENVIRONMENTAL PROTECTION AGENCY
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'98 APR 9 PM6:55

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COMMENTS:

Goals for industry consultations

page 1 of 4 (including cover sheet)

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OAQPS -DC	(202) 260-0451	(202) 260-5575	6101	933WT
OPMO	(202) 260-4185	(202) 260-7415	6102	947WT
OMS	(202) 260-3730	(202) 260-7645	6401	901WT
ORIA	(202) 233-9651	(202) 233-9320	6601	Judiciary Square
OAP	(202) 233-9586	(202) 233-9140	6201	Judiciary Square
OPAR	(202) 260-9766	(202) 260-5580	6103	925WT
OAQPS - NC	(919) 541-2462	(919) 541-5616	MD-10	

Note to Todd Stern
From David Doniger
April 9, 1998

Here is information you requested yesterday on a goal for the industry consultations.

Goal:

The President could challenge industry to double the expected rate of improvement in energy efficiency and greenhouse gas reduction.

Another way this could be stated: to double the expected rate of improvement in greenhouse gas intensity (GHG per unit of production).

Tons:

Achieving this goal would translate into an annual reduction of industry carbon emissions by approximately 100 million metric tons in 2010.

That's looking at carbon dioxide only. The number could be larger if we look at all GHGs. It will require a bit more work to crank the all-GHG numbers.

"Industry" means both the key energy-intensive sectors that are listed on the attached table and less-intensive, but faster growing sectors. Examples of non-energy intensive manufacturing sectors:

- Lumber and Wood Products: e.g. plywood, sawmills and planing mills
- Fabricated Metal
- Transportation Equipment: e.g. motor vehicle parts and accessories
- Textile Mill Products
- Electronic and Other Electronic Equipment: e.g semiconductors

(Under present trends, the latter group will account for more emissions in 2010 than the former.)

The attached table presents two ways of coming up with this 100 MMT estimate. One is based on achieving twice the rate of energy efficiency improvement projected in the 1998 EIA Annual Energy Outlook (AEO-98). The other is based on the DOE 5-Lab Study.

- We get roughly 50 MMT from the energy intensive industries; this represents about 20 MMt directly from doubling the improvement in end-use energy efficiency, plus about another 25-30 MMT from CHP, fuel switching in pulp and paper (i.e., burning black liquor), and miscellaneous low carbon processes.

- We get another roughly 50 MMT from non-energy-intensive but fast growing sectors.

This does not include reductions from the electric power sector. We will need to think about an appropriate goal for this sector separately.

Industry-Specific Reductions in Carbon Emissions
(Million Metric Tons of Carbon per Year 2010)

	AEO 98 2X Efficiency	DOE/EERE Lab Study
Energy Intensive Sectors		
Energy Efficiency (end use)		
Aluminum	0.8	0.4
Pulp and Paper	4.4	3.3
Iron and Steel	3.9	3.4
Bulk Chemicals	3.9	5.0
Refining	3.1	5.8
Cement	0.9	0.6
Food	1.6	n/a
Glass	0.9	n/a
Energy Efficiency Subtotal	19.4	20.6
Other Savings		
Combined Heat and Power (CHP)	18.9	10.7
Fuel Switching (IGCC)	10.0	10.0
Low Process Carbon Technologies	4.0	4.0
Other Subtotal	32.9	24.7
Energy Intensive Total	**52.3**	**45.3**
Non-Energy Intensive Sectors		
Energy Efficiency (end use)	40.0	
41.2		
Other Savings		
Combined Heat and Power (CHP)	11.1	6.3
Non-Energy Intensive Total	**51.1**	**47.5**
Total Industry Savings	**103**	**93**
Energy Intensive	51%	49%
Non-Energy Intensive	49%	51%

Examples of non-energy intensive manufacturing sectors:

- **Lumber and Wood Products: e.g. plywood, sawmills and planing mills**
- **Fabricated Metal**
- **Transportation Equipment: e.g. motor vehicle parts and accessories**
- **Textile Mill Products**
- **Electronic and Other Electronic Equipment: e.g semiconductors**

Ind. by Ind.

4-10 Copy to Todd Stern

Here's what came back on the computer search re steel industry

TJ

MEMO:
TO: TJ Glauthier, Rosina Bierbaum, Henry Kelly
FROM: Sam Baldwin (456-6073)
RE: White House Climate Change Task Force Industry Consultations
DATE: April 3, 1998

Per the meeting last Friday with Dirk Forrister to determine how to best identify Federal R&D programs with industry, I had a RADIUS search done for the case of the steel industry. Attached are the results for FY 1996. The summary table identifies $42 million in steel industry related R&D across 5 agencies—DOC, DOD, DOE, DOT, and NSF—and across 7 categories, as defined below. I have also attached several search abstracts representative of the detail that is generated by the RADIUS search, which is then aggregated to provide the totals listed in the table.

Please let me know if you have any questions.

'98 APR 13 AM8:57

Research and Development Supporting the Steel Industry, by Substantive Area and Federal Agency
(dollars in thousands)

	Production	Manufacturing	Building	Coatings	Integrity	Recycling	Cleaning	Total
DOC	826	8,597		697	799			10,919
DOD	380	1,680	1,000	2,640	2,560	1,000		9,260
DOE	4,579	4,502	2,957	1,647	504	2,800		16,989
DOT		2,000						2,000
NSF	560	1,363	246	346	572		149	3,087
Total	6,346	18,143	4,203	5,330	4,435	3,800	149	42,255

04-02-98 18:02 FROM:RAND ROOM 981 ID:2028425927 PAGE 4/4

MEMORANDUM

DATE: April 2, 1998
TO: Sam Baldwin, OSTP/Environment Division
FROM: Donna Fossum and Dave Trinkle, CTI
SUBJECT: How Federal R&D Supports the Nation's Steel Industry

Attached is the information requested from the RaDiUS Database that details the research and development (R&D) activities of the Federal government that most directly support the nation's steel industry. The seven categories of R&D that were identified are:

(1) Production - This category includes R&D having to do with iron mining and steel production. It also includes the creation of alloys and advanced steels, as well as byproducts of steel production.

(2) Manufacturing - This category comprises R&D on manufacturing with steel: forming, welding, cutting, stamping, casting, etc.

(3) Building - This category includes R&D on steel structures that is not encompassed by the Manufacturing category.

(4) Coatings - This category consists of R&D on steel coatings, films, lubricants, and other surface treatments used for corrosion or wear resistance, friction reduction, etc.

(5) Integrity - This category includes R&D on the quality of steel and the measurement of such quality. The concepts of fatigue, corrosion, fracture, cracking, and strain of materials, as well as monitoring and detection, are the focus of this category.

(6) Recycling - This category includes R&D on the recycling of steel components.

(7) Cleaning - This category includes several bodies of R&D that specifically pertain to the cleaning, removing of paint, or other treatments for steel surfaces.

All the information presented herein came from the RaDiUS Database. When reviewing this information, please note that, because steel is a common building and manufacturing material, it is not always

identified explicitly in the research abstracts contained in RaDiUS. In several areas, in particular, our searches may have underestimated pertinent levels of effort, including:

- mining of minerals and metals
- metal and alloy processing
- metal and alloy manufacturing
- recycling

Most specifically, the Department of the Interior may support some relevant iron detection and mining R&D that was not retrieved by our searches. Conversely, some of the funding we display may be generous. In some cases, it was not possible to determine with great accuracy what fraction of the funds devoted to a particular R&D effort were spent specifically on activities that were directly relevant to steel.

Also note that the categorization used to characterize different types of steel-related R&D has limitations. The main difficulty is that much of the research is potentially relevant to multiple categories. For example, some research that is "manufacturing" also includes aspects that are relevant to building, coatings, recycling, and integrity. Furthermore, it was difficult to determine from some of the research abstracts retrieved by our RaDiUS searches which categories are relevant, so judgment calls were made. In some cases, the funding was split evenly among two or more categories.

Please let us know if you have any questions regarding the results or methodology.

Encl.

Level 5 Award/Task Detail

RaDiUS®

Query Specifications:

Fiscal Year: 1996
Federal Organization(s): All Federal Organizations
Search term(s): (iron% AND $mine) OR (steel% AND ($manufacture OR $cast OR $join OR $weld OR %forming OR $drill OR $cut OR machining OR $process OR $stamp OR die%)) OR (steel% AND ($byproduct OR corrosion OR $lubricate OR friction OR $coating OR joining OR recycl%))
Performer(s): All performers
Level 5 Award criteria: All awards

Level 5 Award/Task Information -- #171 of 218

Parent Federal Organizations

Level 1 National Science Foundation
- Level 2 Engineering (ENG)
  - Level 3 Civil & mechanical systems (CMS)
    - Level 4 Surface engineering tribology

Level 5 Award/Task Detail:

Note: Budget authority and obligations are reported in thousands of dollars. Figures presented in italics are not included in totals to prevent double counting or inclusion of non-federal amounts in federal totals.
Click here for explanation of highlighting .

Access/Distribution Restriction:	**A - Distribution Unlimited - Unrestricted Access**
RaDiUS ID: 50160032630	**Award/Task Number:** 9526411 **SBIR Award:** N
Type of Funding Mechanism:	Extramural / Grants / Project
Estimated Start/End Dates:	Sep 1995 to Aug 1996
Performer:	U of Rhode Island
Performer Type:	Not specified
Performer Location:	Kingston, RI
District:	Rhode Island Second Congressional District
Contact Name:	Richard Brown rbrown@egr.u
Phone:	401/792-1000
Funding:	
Total Federal Funding for All Years:	$39.8K
Average Annual Federal Funding:	$19.9K

Level 5 Award/Task Abstract:

LONG DESCR: 9526411 Brown Recent studies have shown that zirconium nitride can protect stainless **steel** against seawater **corrosion**. It appears that the effect is due to natural conversion of a thin layer of the nitride to hydrated zirconium oxide. Under an SGER award a study will be made of various other refractory nitrides for their potential use as **corrosion** protection **coatings**. Pourbaix diagrams will be constructed and candidate materials for testing will be chosen from those that have stable oxides or hydrated oxides at the pH and open potential levels of seawater. The selected nitride **coatings** will be deposited by plasma arc methods and tested for **corrosion** resistance by electrochemical techniques. The results may make it possible to replace chromate conversion **coatings** with the environmentally more benign nitride **coatings**. *** ::

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Level 5 Award/Task Detail

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Query Specifications:

Fiscal Year: 1996
Federal Organization(s): All Federal Organizations
Search term(s): (iron% AND $mine) OR (steel% AND ($manufacture OR $cast OR $join OR $weld OR %forming OR $drill OR $cut OR machining OR $process OR $stamp OR die%)) OR (steel% AND ($byproduct OR corrosion OR $lubricate OR friction OR $coating OR joining OR recycl%))
Performer(s): All performers
Level 5 Award criteria: All awards

Level 5 Award/Task Information -- #121 of 218

Parent Federal Organizations

Level 1 **Dept of Energy**
Level 3 Reimbursables

Level 5 Award/Task Detail:

Note: Budget authority and obligations are reported in thousands of dollars. Figures presented in italics are not included in totals to prevent double counting or inclusion of non-federal amounts in federal totals.
Click here for explanation of highlighting .

Access/Distribution Restriction:	**C - U.S. Federal Government and Contractors Only**
Reason:	**AM - Administratively Determined**
RaDiUS ID: 48506017145	**Award/Task Number:** ORNL188686043J **SBIR Award:** N
Type of Funding Mechanism:	Transfers / Incoming / Reimbursable-Traditional
Estimated Start/End Dates:	Jul 1993 to Aug 1996
Requester:	NRC/DIVISION OF ENGINEERING TECHNOLOGY
Performer:	Oak Ridge National Laboratory (ORNL)
Performer Type:	Federal Government
Performer Location:	Oak Ridge, TN
Contact Name:	Hultgren, R. O.
Phone:	423-574-9277
Funding:	
Average Annual Federal Funding:	$501.2K
1996 Actual Funding:	Federal: *$515.5K;*

Level 5 Award/Task Abstract:

TITLE: Inspection of **Steel** Containments and Liners :: LONG DESCR: The overall objective of this project is to understand the significant factors relating to occurrence of **corrosion**, efficacy of inspection, and structural capacity reduction of **steel** containments and liners of reinforced concrete structures. Criteria will be provided for use by NRC license reviewers to establish current structural capacity margins and to estimate future structural capacity marginsfor **steel** containments and liners. ::

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Level 5 Award/Task Detail

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Query Specifications:

Fiscal Year: 1996
Federal Organization(s): All Federal Organizations
Search term(s): (iron% AND $mine) OR (steel% AND ($manufacture OR $cast OR $join OR $weld OR %forming OR $drill OR $cut OR machining OR $process OR $stamp OR die%)) OR (steel% AND ($byproduct OR corrosion OR $lubricate OR friction OR $coating OR joining OR recycl%))
Performer(s): All performers
Level 5 Award criteria: All awards

Level 5 Award/Task Information -- #61 of 218

Parent Federal Organizations

Level 1 Dept of Defense
Level 2 Dept of the Army
Level 3 0601102A - Defense Research Sciences
Level 4 BH57 - Scientific Problems with Military Applications

Level 5 Award/Task Detail:

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Click here for explanation of highlighting .

Access/Distribution Restriction:	**A - Distribution Unlimited - Unrestricted Access**
RaDiUS ID: 16698011660	**Award/Task Number:** DA348925 **SBIR Award:** N
Type of Funding Mechanism:	Extramural / Grants / Project
Estimated Start/End Dates:	Aug 1994 to Sep 1997
Performer:	COLORADO SCHOOL OF MINES GOLDEN
Performer Type:	Public Educational Institution
Performer Location:	Golden, CO
District:	Colorado Second Congressional District
Contact Name:	OLSON, D L
Phone:	303-273-3955
Funding:	No data available

Level 5 Award/Task Abstract:

TITLE: HIGH STRENGTH STEEL WELDMENT RELIABILITY 32823-MS :: LONG DESCR: TO

INVESTISGATE THE USE OF HYDROGEN TRAPS TO REDUCE **WELD** METAL DIFFUSIBLEHYDROGEN CONTENT AND HYDROGEN CRACKING SUSCEPTIBILITY IN HIGH STRENGTH **STEEL** WELDMENTS. 1. HYDROGEN TRAP FORMATION DATA WILL BE DETERMINED EXPERIMENTALLY AND BINDING ENERGIES OF ALLOYING ADDITIONS WILL BE CALCULATED BY QUANTUM MECHANICAL METHODOLOGY TO IDENTIFY PROMISING ALLOYING ADDITIONS FOR **WELD** METAL HYDROGEN GETTERING. 2. SHIELDED METAL ARC **WELDING** ELECTRODES WILL BE PRODUCED CONTAINING SYSTEMATIC VARIATIONS IN ALLOYING ADDITION COMPOSITION FOR EVALUATION IN SINGLE-PASS **WELD** DEPOSIT EXPERIMENTS. MICROSTRUCTURAL CHARACTERIZATION AND COMPUTATIONAL CHEMISTRY TECHNIQUES WILL BE APPLIED TO DETERMINE THE INTERACTION OF THE ALLOY ADDITIONS WITH THE CONVENTIONAL ALLOYING ELEMENTS IN **STEEL** AND THEIR EFFECTS ON HYDROGEN TRAPPING. 3. BOTH DIFFUSIBLE AND TOTAL **WELD** HYDROGEN CONCENTRATION WILL BE MEASURED TO ESTABLISH THE OPTIMUM EXPERIMENTAL ELECTRODE COMPOSITION. DEPOSITS CONTAINING BOTH HYDROGEN-CONTROL ADDITIONS AND NO ADDITIONS WILL BE IMPLANT TESTEDTO QUANTIFY THE EFFECTIVENESS OF HYDROGEN-GETTERING ADDITIONS TO HIGH STRENGTH **STEEL** WELDMENTS. ::

KEYWORDS:

ADDITION;ALLOYS;CHEMISTRY;COMPOSITION(PROPERTY);COMPUTATIONS;CONCENTRATION(CH STRENGTH ALLOYS;HYDROGEN;HYDROGEN EMBRITTLEMENT;METHODOLOGY;NUCLEAR BINDING ENERGY;OPTIMIZATION;QUANTUM THEORY;RELIABILITY;**STEEL**;TRAPS;**WELD** METAL;**WELDING**;WELDMENTS;**WELDS**;WELDMENT RELIABILITY;HYDROGEN EMBRITTLEMENT;HYDROGEN TRAPS;CRACKING(FRACTURING);HIGH STRENGTH **STEEL** WELDMENTS;ALLOYING **WELDING** ELECTRODES ::

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Level 5 Award/Task Detail

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Query Specifications:

Fiscal Year: 1996
Federal Organization(s): All Federal Organizations
Search term(s): (iron% AND $mine) OR (steel% AND ($manufacture OR $cast OR $join OR $weld OR %forming OR $drill OR $cut OR machining OR $process OR $stamp OR die%)) OR (steel% AND ($byproduct OR corrosion OR $lubricate OR friction OR $coating OR joining OR recycl%))
Performer(s): All performers
Level 5 Award criteria: All awards

Level 5 Award/Task Information -- #21 of 218

Parent Federal Organizations

Level 1 Dept of Commerce
Level 2 National Institute of Standards & Technology
Level 3 Advanced Technology Program
Level 4 Advanced technology program

Level 5 Award/Task Detail:

Note: Budget authority and obligations are reported in thousands of dollars. Figures presented in italics are not included in totals to prevent double counting or inclusion of non-federal amounts in federal totals.
Click here for explanation of highlighting .

Access/Distribution Restriction:	A - Distribution Unlimited - Unrestricted Access
RaDiUS ID: 70133000412	**Award/Task Number:** 70NANB5H1086 **SBIR Award:** N
Type of Funding Mechanism:	Extramural / Cooperative Agreements / Traditional
Estimated Start/End Dates:	Mar 1995 to Mar 1998
Performer:	CRUCIBLE COMPACTION METALS DIVISION
Performer Type:	Industry/Business
Performer Location:	Oakdale, PA
District:	Multiple congressional districts in Pennsylvania
Contact Name:	Brian Belanger
Phone:	301-975-2162
Place of Performance:	Oakdale PA
Funding:	
Total Federal Funding for All Years:	$908.0K
Average Annual Federal Funding:	$227.0K
1996 Actual Funding:	Federal: $550.1K; Non-Federal: $0.0K

Level 5 Award/Task Abstract:

TITLE: Rapid Solidification Powder Metallurgy for High-Nitrogen Stainless **Steels** :: SHORT DESCR: MATHEMATICAL MODEL TO DESIGN ALLOYS WITH SUPERIOR INTERGRANULAR STRESS **CORROSION** CRACKING RESISTANCE :: LONG DESCR: Crucible Compaction Metals proposes to implement a strategy for designing new nitrogen-containing stainless **steel** alloys to create new alloys particularly suited for marine and high chloride environments that tend to accelerate corrosion processes in the present generation of alloys. From a mathematical model predicting a range of specific nitrogen/**iron-based** alloys whose properties and performance are within the target values, actual alloy compositions will be melted, atomized into powders, and then formed into specific shapes and components by a method known as hot isostatic pressing. Once actual metal is in hand, each designed alloy then will be subjected to chemical, mechanical, and **corrosion** resistance tests, which will serve as a check on the model. A larger production run of the most promising alloy then will follow from which a finished part will be **manufactured** and sent to an end user for a field trial. Besides use in marine settings, the petrochemical, pulp and paper, power generation, and other industries in which **steels** must perform in corrosion-inducing environments could benefit from this class of the new **steel**. ::

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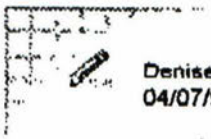
Industry Sec –
Industry

Office of the Assistant Secretary
Energy Efficiency and Renewable Energy

To:	Martha W	From:	Janet
Office:	WH CCTF	Date:	7 Apr
Fax No.:	343 1163	Fax No.:	202-586-9260
Phone No.:	1074	Phone:	202-586-9220

Number of pages (including cover): 2

COMMENTS: Martha – Attached are the ideas from Denise (586.9232); she will be the best person with whom to follow up. My ideas for Georgia Pacific efficiency improvements – past & planned – come from the outside. To follow up here, call Jeffrey Levine of Cauthen & Assoc @ 202/638.0125



Denise Swink
04/07/98 03:29 PM

To: Janet Anderson/EE/DOE@DOE, Vernellia Johnson/EE/DOE@DOE, Phil Dougherty/EE/DOE@DOE
cc:
Subject: Presidential Site Visits

Janet and Dan - Here are some of my ideas - I haven't looked into availibility, yet, per Todd's direction - I don't know how enthusiastic the plants would be for the President to visit, but I do know the people involved with us at these plants are very much champions of our partnerships - so here t'is -

General Motors Power Train Division, Saginaw, Michicigan - large plant using most modern metals casting technologies

Ford Glass Plant, outside Nashville by 30 minutes drive - large plant making windshields, very active in our glass industry partnership

Dow Chemical, La Porte, Texas - huge chemical complex, maybe largest in the world; Dow is very active in our chemical industry partnership

I still think Burns Harbor is the best candidate - if there is problems with a Bethlehem Pennsylvania plant, we could really play up the Burns Harbor showcase as a technological way to overcome the problems in PA!

Industry By Industry

'98 APR 8 PM3:18

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
THE ADMINISTRATOR

TO: Todd Stern
456 2215

FROM: Stephanie Cutter

COMMENTS:

Number of Pages to follow: _____
Date: _____
Time: _____

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APR-08-98 15:10 FROM:OFC OF ADMIN./OCEPA TO:202 260 3684

DUPONT CHEMICAL, Circleville, OH or Mt. Clemens, MI

Background: DuPont is the 13th largest corporation in the U.S. and the 26th largest in the world. DuPont has about 105,000 employees and annual sales of more than $42.2 billion. In 1995, DuPont exports were $4.2 billion, making the company one of the largest U.S. exporters.

Energy Use: DuPont uses 10% of the total energy consumed by all U.S. chemical companies combined.

Greenhouse Gas Reduction Activities: DuPont, the first company to join Climate Wise in 1994, was recognized at a White House ceremony that same year. DuPont pledged to reduce its greenhouse gas emissions by 40% by 2000, and has already reduced emissions by 19%. It has committed to reducing manufacturing energy use by 15% per unit of production, which is 2 times the average energy efficiency improvements seen by the entire industry sector. In 1994, the first year as a Climate Wise partner, DuPont saved over $31 million. DuPont plans to reduce 18 million metric tonnes of carbon dioxide-equivalent gases by the year 2000, equivalent to taking almost 4 million cars off the road, and has already reduced about 22 million metric tonnes of gases world wide.

> **Circleville, OH:** The Circleville, Ohio facility is located about 25 miles from Columbus on the Scioto River and has 1,048 employees. The chemical plant and other industrial facilities are surrounded by farmland. The facility manufactures Mylar (a food packaging material), Kapton (a plastic film) and other synthetic materials. DuPont has taken a number of steps to increase energy efficiency at this facility, including recycling 5 million tons of organic waste into fuels for cement kilns, re-capturing wasted steam which eliminates 970 tons of CO2 per year, and investing in energy efficient technology at all levels of processing. This facility saves $100,000 annually in energy costs.
>
> **Mt. Clemens, MI:** The Mt. Clemens, MI facility is located about 25 miles from Detroit in a mixed industrial and residential area, next to a currently idle Ford facility, and has about 1,000 employees. The facility manufactures plastics and acrylic resins for the auto industry and others. DuPont's corporate statement claims that its "engineering polymers" (plastics or resins) lightens the weight of automobiles, resulting in a 33 percent reduction in total vehicle emissions since 1980. This facility has made its manufacturing processes more efficient and put in place state-of-the-art preventative maintenance programs to curb energy use. These actions have allowed the facility to double its production over the last five years without increasing energy use.

CEO: Charlie O. Holliday, Jr. is the CEO and President of DuPont. DuPont is not a member of the Global Climate Change Coalition. The company has received several awards for its energy conservation/environmental protection efforts, and has been very aggressive in seeking and accepting recognition for their achievements in energy efficiency and greenhouse gas reductions. In addition, DuPont's corporate policy acknowledges the existence of climate change, the need to reduce greenhouse gas emissions, and is committed to voluntary methods to achieve this end.

APR-08-98 15:11 FROM:OFC OF ADMIN./OCEPA TO:202 260 3884 PAGE 2/2

Industry by Industry

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
THE ADMINISTRATOR

TO: Todd Stern
456-2215

FROM: Stephanie Cutter
260-9828

COMMENTS:

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April 6, 1998

MEMORANDUM TO TODD STERN

FROM: STEPHANIE CUTTER

SUBJECT: SITES FOR INDUSTRY-BY-INDUSTRY CONSULTATION

Attached are two site ideas that may work for the kick-off of the Industry-by-Industry Consultation. Both of these sites provide a good visual: an industrial setting on a river or lake, or with green areas nearby. These sites have been vetted – no significant enforcement problems exist. I am waiting on information on two other sites, and will send them over tomorrow.

Please call me at 260-9828 if you have any questions or would like me to further develop any of these site ideas.

cc: Dirk Forester
Martha Wofford

SITES FOR KICK-OFF OF INDUSTRY-BY-INDUSTRY CONSULTATION:

- **NORTH STAR STEEL, St. Paul, Minnesota**

Background: North Star Steel, a division of the Cargill Corporation, is the nation's 8th largest steel industry. The St. Paul facility produces roughly 1 million tons of steel per year, and employs 400 people. The facility is located on a picturesque section of the Mississippi River outside of downtown St. Paul. North Star Steel has nine other facilities located in Kentucky, Ohio, Minnesota, Michigan, Iowa, Texas and Arizona, and employs 3,100 people nationwide.

Energy Use: North Star is seen as a leader in the Mid-West of mini-mills steel manufacturers -- smaller, more energy-efficient mills that recycle steel from old cars, etc. to make new products. This effort makes steel the most recycled material in the U.S. North Star has a recycling subsidiary, North Star Recycling, Inc., which provides scrap for North Star Steel. Scrap is melted down in an electric furnace, a process that uses less than half the energy of the traditional oxygen furnace.

Greenhouse Gas Reduction Activities: North Star was the first of the nations' ten largest steel companies to sign up as a Climate Wise partner, opening the door for others like Bethlehem Steel. In addition to its recycling efforts, North Star is pioneering new energy-efficient technologies. The St. Paul facility recently replaced its older furnaces with a new, cutting-edge Direct Current furnace, which will reduce the facility's energy use by 15-20% with comparable reductions in greenhouse gas emissions.

CEO: James Thompson is the CEO of North Star. The company signed up as a Climate Wise partner at the end of March 1998, the first of the top ten steel companies to join. The company considers itself the industry leader in terms of energy-efficient and advanced production technologies. Unlike other steel companies, North Star is not a member of the Global Climate Change Coalition.

- **INLAND STEEL COMPANY, East Chicago, Indiana**

Background: Founded in 1893, Inland Steel is the fifth largest steel producer in the United States, accounting for approximately five percent of the nation's steel production. The 1,900 - acre steelmaking complex in East Chicago is located on Lake Michigan and produces 6 million tons of raw steel annually.

Energy Use: Coal accounts for approximately 71% of the energy consumed at the East Indiana facility. A large on-site cogeneration unit is being built to recover coke gas emissions and generate both electricity and steam for Inland's operations. This new system will provide 75% of the energy that Inland is currently purchasing from the nearby power plant.

Greenhouse Gas Reduction Activities: As part of its energy-efficiency activities, Inland is constructing the world's most advanced coke-making and cogeneration facilities at the East Indiana site. This new state-of-the-art cogeneration system captures wasted gas and heat from

the coke making process, and converts it to electricity. The excess electricity not used at the steel mill is sold to the nearby electric company, NIPSCO. The result is less energy use, and less green house gas emissions by both the Inland facility and NIPSCO.

The new coke-making facility is using technology that is environmentally cleaner and less expensive than any other competing processes. The new process will virtually prevent all emissions of coke-oven gases, which include benzene and other known human carcinogens. When completed later this year, the facility will produce 1.33 million tons of coke per year.

CEO: Robert Darnall, the CEO of Inland Steel, was named Steelmaker of the Year in 1995. Inland is not a Climate Wise partner, but is very proud of its advanced, clean cokemaking process and their pathbreaking cogeneration deal. Inland is not a member of the Global Climate Change Coalition.

Outreach
Industry by Industry
- Forest & Paper

AF&PA Meeting with Mr. Todd Stern
Assistant to the President for Special Projects
on the
Implications of the Kyoto Protocol for the U.S. Forest Products Industry

March 24, 1998

Key Discussion Points

(1) The U.S. forest products industry is a major contributor to the U.S. economy, but the ability to respond to international competitive pressures is essential to its continued viability.

(2) The U.S. forest products industry has a combination of unique attributes that must be taken into consideration in the development of international and domestic global climate change policy.

A. The pulp and paper manufacturing segment of the industry is the nation's most capital intensive and has one of the longest industrial capital investment cycles.

B. While the U.S. forest products industry is a relatively energy-intensive manufacturing sector, it has made significant strides to improve energy efficiency.

C. The U.S. forest products industry creates and uses renewable and sustainably-produced energy sources that substitute for fossil fuels.

D. Forests, through reforestation, afforestation and sustainable forest management practices, act as carbon sinks which offset carbon dioxide emissions. Similarly, wood and paper products have the capacity to act as long-term carbon storage reservoirs.

(3) The U.S. government must provide flexibility that allows trade-offs between attaining certain conflicting environmental objectives and its policies must take into account the environmental spending imposed by other government programs.

(4) As the Administration moves forward, resolution of these issues and others is critical in order for the U.S. forest products industry to successfully participate in the global climate change process.

POINT 1: **The U.S. forest products industry is a major contributor to the U.S. economy, but the ability to respond to international competitive pressures is essential to its continued viability.**

Background

- The U.S. forest products industry ranges from state-of-the-art paper mills to small family-owned saw mills and some 7 million individual woodlot owners. As a whole, the industry directly employs about 1.6 million people. Indirect employment accounts for another 2.7 million jobs. The industry produces wood and paper products valued at more than $200 billion a year.

- The industry is currently competitive in the marketplace, in part due to its aggressive investments in equipment in the late 1980's. In fact, in 1996, exports were valued at $13.7 billion, which represents 2.2 percent of total U.S. merchandise exports.

- In the absence of "meaningful participation from developing countries" the U.S. forest products industry would be at a serious competitive disadvantage. According to recent studies, the delivered variable cost of pulp today from U.S. manufacturing facilities is substantially higher than pulp from countries this industry directly competes with such as Brazil, Chile, Indonesia, and Malaysia.

  -- Compare, for instance, the variable production and transportation costs for U.S. hardwood pulp delivered to Northern Europe at $337/ton to: (1) $297/ton for Brazil; (2) $301/ton for Chile; and (3) $193/ton for Indonesia. (Source: Resource Information Systems, Inc., October 1997).[1]

- The failure to include developing countries, and hence the threat to the U.S. industry's competitiveness, is compounded by the fact that many of these countries already heavily subsidize their domestic industry. As a consequence, mills in developing countries often have state-of-the-art manufacturing equipment, and easy access to cheap raw materials.

CONCLUSION: **It is essential that there be equal application of the protocol provisions regarding manufacturing facilities in both developed and developing countries. A treaty that does not include developing countries would give only the illusion of true reductions and benefits at a significant economic penalty to signatory countries. Failure to include developing countries will result in growth in their emissions to being the largest emitters by the next century and, in fact, exceeding the reductions made at great pain by developed countries. Accompanying this no-net benefit will be large cost increases to U.S. manufacturing facilities without similar cost increases by developing nation competitors. The result will be the shift of U.S. manufacturing (and jobs) overseas.**

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[1] It is worthy of note that although the variable production and transportation costs for competitors in developed countries such as Sweden and Finland currently are roughly equivalent to those of the United States, their energy costs are less than one-half the current costs borne by U.S. pulp and paper manufacturers. Imposition of higher energy costs on U.S. firms thus will provide an additional competitive challenge the industry will have to meet.

POINT 2: **The U.S. forest products industry has a combination of unique attributes including capital investment cycle, energy intensiveness, creation and use of renewable biomass energy and, carbon sinks and sequestration that must be taken into consideration in the development of international and domestic global climate change policy.**

A. Capital Investment Cycle: The U.S. pulp and paper industry is the most capital intensive in the world. It also has one of the lengthiest capital investment cycles among basic industries--about 30 years.

- With more than 10 cents out of every sales dollar going to fund capital investments, the industry is the nation's most capital-intensive. Since 1980, capital spending by the paper and allied products industry totaled $131 billion, with about $71 billion of that total carried out by the industry's primary sector (pulp, paper and paperboard mills) and the remainder accounted for by the converting sector. Each paper industry employee is supported, on average, by $123,000 worth of plant and equipment -- which ranks #1 among all U.S. manufacturing sectors in investment per employee.

- Because of its high level of fixed investment, the industry has not been able to remain profitable at operating rates below 90 percent. Thus, even a small loss in international competitiveness can jeopardize operating rates and cause a downward spiral.

- Having just completed a major capacity expansion cycle, the industry's health depends on realizing the "back end of the cycle" returns and cash flow from those investments in order to remain competitive through the next business cycle. Remaining globally competitive is absolutely essential for the industry to realize the back end of the cycle.

CONCLUSION: The industry has shown its ability to develop and implement new technology without an adverse impact on profitability and competitiveness. If technological innovation is forced into an unnaturally shorter time period, however, the likely result will be severe economic disruption.

B. Energy Use: **While the U.S. forest products industry is a relatively energy-intensive manufacturing sector, it has made significant strides to improve energy efficiency.**

- The U.S. pulp and paper industry is committed to: (1) increased use of renewable domestic energy sources such as wood residues; and (2) improved energy efficiency through cogeneration, and product and process improvements.

- Significant strides in attaining these goals already have been achieved. For instance, data covering 1972-1995 show that the pulp and paper segment of the industry:

  -- increased use of self-generated and biomass sources of energy by the U.S. pulp and paper industry from 40 percent of total energy used in 1972 to 56 percent in 1995 (wood products manufacturing currently derives 74 percent of its energy requirements from biomass);

- -- reduced total oil consumption by 68 percent;

- -- reduced total consumption of fossil fuels and purchased energy by about 9.1 percent; and

- -- reduced average use of fossil fuels and purchased energy per ton of output from 19.1 million BTUs in 1972 to 11.0 million BTUs in 1995.

- The steps taken to achieve these significant increases in self-generated and biomass sources of energy and decreases in the use of fossil fuels took place even as the industry increased production by 67 percent in the 1972-1995 time period.

CONCLUSION: It is likely that the industry's demonstrated commitment to improving energy efficiency means that most existing cost-effective technologies already are being employed. Domestic implementation of a emissions reductions program therefore must go beyond the artificial timetables dictated by the Kyoto Protocol to recognize that, by virtue of their pro-activity, some industrial sectors will need a longer time to develop and install next-generation energy-efficient technology.

C. Creation and Use of Renewable Biomass Fuel: The U.S. forest products industry creates and uses renewable and sustainably-produced energy sources that substitute for fossil fuels.

- Wood wastes (wood chips, bark, sawdust and manufacturing scraps) and pulping liquors recovered from the manufacturing and harvesting processes are the dominant sources of biomass fuel. (As noted above, 56 percent of the fuel used by the pulp and paper segment of the industry comes from self-generated and biomass sources of energy; the wood products segment currently derives 74 percent of its energy from biomass.)

- When these biomass fuels are burned, the carbon dioxide that is emitted becomes part of the natural carbon cycle through tree photosynthesis. This cycle is a closed-loop: tree growth readily absorbs the emitted carbon. Hence there is no net atmospheric contribution of carbon dioxide.

- The burning of wood waste and wood by-products displaces the use of over 230 million barrels of oil per year.

CONCLUSION: In order to ensure increased use of biomass fuels as substitute for fossil fuels, emissions from use of biomass energy must continue to be treated by the Administration and the Intergovernmental Panel on Climate Change (IPCC) as a net-zero contributor to greenhouse gas emissions.

D. Carbon Sinks & Sequestration: Forests, through reforestation, afforestation and sustainable forest management practices, act as carbon sinks which offset carbon dioxide emissions. Similarly, wood and paper products have the capacity to act as long-term carbon storage reservoirs.

- Total carbon in forests increases a net of 200 million metric tons annually.

- Private industrial forest lands are expected to sequester 14 million metric tonnes in 2010 versus a negative sequestration rate in 1990. (Source: "Productivity of America's Forests and Climate Change," U.S. Forest Service)

- Paper and solid wood products such as housing and furniture also continue to store carbon for decades after harvest.

- The total carbon content in new paper and solid wood products is approximately 65 million metric tons annually, of which 70 percent remains in long-term carbon sinks.

- The Kyoto Protocol carbon sink provision is confusing and subject to broad domestic and international interpretations. Taken literally, the sink definition is narrowly defined as applying only to afforestation, reforestation and deforestation since 1990. Inexplicably, deforestation is defined as a sink though clearly a source of emissions. The term "harvesting", which had been included in earlier versions, was deleted in the final text. Presumably, if retained, this would have enabled long-term storage of carbon in wood products to be recognized.

CONCLUSION: Both international and domestic greenhouse gas emissions reduction strategies must accept the role of carbon sequestration in forests and long-term storage in wood and paper products by providing a one-for-one credit against emissions for carbon storage.

POINT 3: **The U.S. government must provide flexibility that allows trade-offs between attaining certain conflicting environmental objectives and its policies must take into account the environmental spending imposed by other government programs.**

- At a capital cost to industry of about $2.8 billion, EPA recently finalized new air standards and revised water limits for the U.S. pulp and paper industry in the Cluster Rule. Yet, as EPA concedes, the technologies needed to meet these standards will result in a net increase in greenhouse gas emissions.

- Another good example of the dilemma caused by conflicting environmental objectives is paper recycling. While recycling is recognized as a desirable manufacturing activity from an environmental point of view, paper recycling companies do not share the same advantages of using biomass energy or having forest sink capabilities to potentially offset emissions. To assure continued progress toward increased paper recovery rates, already at over 45 percent, crippling demands on resources to reduce greenhouse gas emissions reductions must not be imposed on recycling efforts or the incentive to achieve the environmental benefits of recycling will be lost.

- Efforts to reduce greenhouse gas emissions are only one of the potential demands on capital that will be put on the forest products industry. The following table contains estimates of other environmental compliance costs anticipated to be borne by the industry between now and 2012--the deadline contemplated for reaching emissions reduction targets.

The Global Climate Treaty in Context

Rule	Estimated Capital Cost ($ billions)	Time Frame for Compliance
Cluster Rule	$ 2.8	1998-2006
Great Lakes Water Regulations/Sediment Quality Criteria	1.25	1999-2006
National Ambient Air Standards for Ozone and Particulate Matter/Regional Haze Air Standards	1.0-4.0	2003-2008
Industrial Combustion Coordinated Rulemaking	0.25-1.0	2001-2004
Maximum Achievable Control Technology Air Standards for Wood Manufacturing Facilities	0.50-0.75	2001-2004
TOTAL	**$ 5.8-$9.8**	**1998-2008**
Greenhouse Gas Emissions Reductions	**???**	**2008-2012**

- Since 1980, environment-related capital spending (excluding recycling) by U.S. producers of paper, paperboard and pulp amounted to $11.2 billion or 11.6 percent of total capital spending. Between 1998 and 2006, which is just prior to the beginning of the 2008-2012 Kyoto budget period, the industry is expected to incur $5.8 to $9.8 billion in new environmental capital expenditures to meet existing EPA regulatory requirements. These new expenditures will increase environmental outlays to approximately 25 percent of total capital investments. The danger is that spending for productivity, quality, and capacity may be "crowded out," jeopardizing the industry's future competitiveness in world markets.

- As a percentage of sales, the pulp, paper and paperboard industry spends over 2.5 percent of its operating costs on pollution abatement. This is about four times greater than all manufacturing sectors on average and substantially higher when compared directly to petroleum, primary metal, chemicals and the stone/clay/glass sectors.

CONCLUSION: With the industry facing another $6 billion to $10 billion in capital investments to comply with other environmental regulations for the next decade, it is imperative that the U.S. provide regulatory agencies with the flexibility to choose between attaining sometimes conflicting environmental goals, rather than simply applying another layer of costs to the top of the burden.

POINT 4: **As the Administration moves forward, resolution of these issues and others is critical in order for the U.S. forest products industry to successfully participate in the global climate change process.**

Specifically, the forest products industry would appreciate information on the Administration's:

- position with respect to the application of emissions reduction requirements across all industrial, commercial, and transportation sectors;
- plan to evaluate and credit improvements in energy efficiency made before 1990 and how this credit could be factored in to contemplated carbon emission reductions requirements;
- intentions regarding the implementation of emissions reductions, i.e., through a permitting scheme or an emissions trading program;
- process and timetable for developing and finalizing an emissions trading program;
- view of what percentage of U.S. greenhouse gas emissions reductions will be achieved through carbon sequestration activities;
- commitment to treating biomass fuel as a net zero contributor to greenhouse gas emissions;
- willingness to work with the forest products industry to obtain recognition for sequestration of carbon in forest lands established prior to 1990;
- view of which entities will receive credits for carbon sequestration activities, i.e., will firms responsible for creating carbon sinks on their property be eligible to take credit;
- willingness to consider the inclusion of carbon storage credits for long-term storage in wood and paper products;
- organizational structure for addressing this complex issue and plans to involve industries, such as the Forest Products Industry, that possess unique characteristics and expertise; and
- plans to provide regulatory authorities with flexibility that will allow trade-offs between attaining conflicting environmental objectives to be made.

The Forest Products Industry's Information Needs for Responding to the Administration Initiative on Global Climate Change

The Forest Products Industry would appreciate information on the Administration's:

- position with respect to the application of emissions reduction requirements across all industrial, commercial, and transportation sectors;
- plan to evaluate and credit improvements in energy efficiency made before 1990 and how this credit could be factored in to contemplated carbon emission reductions requirements;
- intentions regarding the implementation of emissions reductions, i.e., through a permitting scheme or an emissions trading program;
- process and timetable for developing and finalizing an emissions trading program;
- view of what percentage of U.S. greenhouse gas emissions reductions will be achieved through carbon sequestration activities;
- commitment to treating biomass fuel as a net zero contributor to greenhouse gas emissions;
- willingness to work with the forest products industry to obtain recognition for sequestration of carbon in forest lands established prior to 1990;
- view of which entities will receive credits for carbon sequestration activities, i.e., will firms responsible for creating carbon sinks on their property be eligible to take credit;
- willingness to consider the inclusion of carbon storage credits for long-term storage in wood and paper products;
- organizational structure for addressing this complex issue and plans to involve industries, such as the Forest Products Industry, that possess unique characteristics and expertise; and
- plans to provide regulatory authorities with flexibility that will allow trade-offs between attaining conflicting environmental objectives to be made.

The Global Climate Treaty in Context

Anticipated Estimated Capital Expenditures Imposed on the Forest Products Industry by Other Environmental Regulations: 1998-2008

Rule	Estimated Capital Cost ($ billions)	Time Frame for Compliance
Cluster Rule	$ 2.8	1998-2006
Great Lakes Water Regulations/Sediment Quality Criteria	1.25	1999-2006
National Ambient Air Standards for Ozone and Particulate Matter/Regional Haze Air Standards	1.0-4.0	2003-2008
Industrial Combustion Coordinated Rulemaking	0.25-1.0	2001-2004
Maximum Achievable Control Technology Air Standards for Wood Manufacturing Facilities	0.50-0.75	2001-2004
TOTAL	**$ 5.8-$9.8**	**1998-2008**
Greenhouse Gas Emissions Reductions	**???**	**2008-2012**

Domestic Industry by Industry

ADDENDUM A: INDUSTRY PLANS FOR EARLY REDUCTIONS

Draft: March 27, 1998

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

-- President Clinton, October 22, 1997

GOAL:
Develop plans of action to achieve early voluntary reductions in greenhouse gas emissions in key sectors of the economy with the goal of making as much progress as possible toward the targets set in Kyoto.

RATIONALE:
To the extent that cost-effective reductions in greenhouse gases can be achieved in the near- to medium-term through voluntary efforts, the burdens associated with meeting future targets will be reduced and the rate of build up of greenhouse gases will be slowed.

INDUSTRY'S ROLE:
To develop a plan for reducing greenhouse gas emissions beyond "business as usual." Building on existing government-industry partnerships, the plan should identify:

- an emissions reduction goal;
- the path forward for achieving that goal using cost-effective measures;
- barriers to achieving reductions that could be removed;
- incentives that could be created to encourage such reductions;
- possible changes in federal procurement or practices;
- options for reducing emissions through trading or sequestration;
- opportunities for achieving reductions abroad; and,
- a longer-term research and development strategy.

FEDERAL GOVERNMENT'S ROLE:
To facilitate the development and implementation of industry plans by:

- inventorying existing programs and resources with the potential to reduce greenhouse gas emissions;
- where appropriate, provide collaborative support to facilitate a broad-based industry dialogue, to contribute technical and analytic assistance, and to provide other assistance in the development of industry plans for early action;
- working cooperatively, wherever possible, to remove barriers and create new incentives for reducing emissions; and,
- developing guidelines for early credit for qualifying reductions.

WHY PARTICIPATE:
Participating industries will be able to jump start their search for low cost reductions, benefit from federal support in such efforts, and be poised to help shape and take advantage of credit for early actions.

TIMETABLE:

Kick-Off Meetings with Initial Sectors	March-April
Plan Preparation	April-August
Initial Sector Plans Presented	September-October
Additional Plans and Implementation	November and beyond

SCOPING PAPER: INDUSTRY CONSULTATIONS

Draft: March 27, 1998

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

-- President Clinton, October 22, 1997

Background:

In his climate change address at the National Geographic Society auditorium on October 22, 1997, President Clinton challenged American industries to develop their own action plans, and he pledged for his Administration to work with state and local governments to remove any barriers to greater energy efficiency. In urging companies to take early action, the President also committed to ensure that firms receive appropriate credit for their achievements.

There are a number of industrial sectors that have expressed interest in working with the Administration on climate change policy, although some are more advanced in their thinking than others.

- The Task Force convened interagency meetings last fall with three sectors that were prepared to make proposals to the Administration: steel, cement and airlines. Natural gas, renewable and energy efficiency firms continue to want to play a key role.

- Task Force and agency staff had very productive individual meetings last fall with electric utilities, pulp and paper, natural gas and a couple of petroleum companies. Although they are still trying to evaluate their posture toward the issue in the wake of the Kyoto agreement, there are progressive companies in each sector that we should engage soon to help influence the evaluations others are making.

- Since the Kyoto Conference, other key sectoral players have stepped forward to express interest in being involved: appliance manufacturers, chemicals and aluminum.

- Additionally, the Administration has good relations with a set of industry leaders active in the President's Council on Sustainable Development, DOE's Industries of the Future and Climate Challenge programs and EPA's "Green" and Climate Wise partnerships.

Besides these groups, there are other important industries that are likely to be interested in participating as this effort matures.

This paper outlines a process to deliver agreements with industries that volunteer to enter emission reductions agreements. This approach is attractive to both sides:

- Participating industries will be able to jump start their search for low cost reductions, benefit from federal support in such efforts, and be poised to help shape and take advantage of

credit for early actions.

- The Federal government gets a head start on emission reductions and a cooperative audience to help inform remaining policy and implementation decisions.

I. PROCESS

A. In General --

1. Goals — The consultations should maintain a clear focus on enabling industries to meet the President's challenge of developing early voluntary action plans within nine months. Industries will be encouraged to make commitments as close as possible to the Kyoto target. Also, firms will be the most forthcoming if meetings are designed to --

   - strategize on removing barriers;
   - assure early credit;
   - and inform federal climate policy development (e.g., the $6.3 billion incentive package; the emissions trading program design; federal energy use; and the ongoing international negotiations).

2. CEO Vision — The consultations will be most successful if those active in the discussions have directions from their CEO's. (The alternative -- if they do not have CEO cover for what they are doing, they will be conservative.) Prior to sectoral meetings, a senior White House or Cabinet official [or a high-level former CEO] should speak with at least two key CEOs about the talks in order to assure their engagement.

3. Crosscutting — There will be a crosscutting effort to cut across all groups on some overall design questions. This could assure that each group benefits from lessons of the others, and it could help us achieve a coherent overarching policy structure. The issue of credit for early action and perhaps emissions trading will be discussed in separate, expedited inter-agency fora.

4. Agencies — From the onset, the effort needs to take advantage of agency expertise and abilities, particularly their strengths to carry out follow-up actions.

5. Strategy — This approach is designed to empower firms ready to begin addressing their greenhouse gas responsibilities to get started with the assurance that they will not be penalized for acting early and, in fact, will be rewarded.

B. Operational Considerations

1. Background Analyses

   Documents will be prepared for each sector compiling background information currently available in the agencies. These papers will be used

to inform the Federal teams and provide some basis for discussions with the private sector.

2. Scoping Mtg. We should convene a small "scoping group" to plan each consultation. It should contain a few select industry leaders combined with a few federal experts. This group can help strategize about the best way to frame questions, how the effort should be defined for that sector, and how to ensure the best outcomes.

3. Attendance We should be inclusive of as many companies as possible. Pending review of FACA requirements, the meetings would be more constructive if they were "off the record." It might also be useful to have a follow up meeting to vet any ideas with others involved with the sector (academics, labor leaders and public interest groups).

On the federal side, we should assemble expert teams from relevant agencies (Energy, EPA, Commerce, Agriculture, Transportation, Defense, Interior, NASA, State, USTR, AID) and White House offices (NEC, CEQ, OSTP, OMB, NSC). We should select a leader for each sectoral team to help focus activities, drive the process and serve as a point of contact.

4. Guidance Sectors will be asked to prepare in advance of the consultations information on industry historical emissions, future trends, and potential reductions. For example, they could determine what the industry's baseline was in 1990 (or 1995 for those gases), what the scenarios are for 2008 to 2012 and what actions could bring the greatest improvements to those scenarios. It could also be beneficial to review the industries' competitive situation in the international economy, its business trends (including energy and environment) and its research and development plans. The ultimate goal is to reach agreement on a voluntary reduction plan, either collectively or individually.

4. Industry Kick-Off

After the scoping meetings, the next activity will be a kick-off meeting with industry. The Federal teams will invite the wider industry membership to participate and set the time line for action. When industry has had time to draft a preliminary response, the Federal teams will follow-up, review the plans and respond to agency requests.

5. Follow Up The federal team should ensure that ideas are submitted for expedited consideration in the policy process. Agencies should have primary responsibility to carry out follow-up activities, pursuant to their proper authorities, under coordination by White House offices.

6. Rolling Effort Because some industries have already begun to think in terms of early action, the consultations will begin with these sectors and then proceed in a parallel fashion with other sectors. At the end of scoping meetings with one

set of sectors, not only will consultations begin with those industries, but a new set of sectors will begin scoping meetings. This will give some industries more time to learn about opportunities for emission reductions and will help moderate the burden on Federal resources.

C. Time Line

A time line has been developed to describe the actions and responsible parties for the tasks required to develop agreements with several industry sectors by October.

1. Initial Preparations (present -- early March)

   The goal of the initial phase is to prepare the Federal government to effectively engage the private sector. Tasks will include the preparation of planning documents (including sector analyses), the establishment of the Federal leadership structure, and the finalization of the list of sectors.

2. Scoping Meetings (first phase -- March; remaining sectors -- April - June)

   The goal of the second stage is to plan industry consultations in conjunction with representatives of each sector. Tasks will include contact with selected sector CEOs and Cabinet members or other senior White House personnel, scoping meetings with a subgroup of leaders from each industry sector, a roll-out event, and input from labor and environmental groups.

3. Industry Consultations (first phase -- April - August)

   The goal of the third stage is to encourage voluntary emission reduction commitments from the industry sectors, improve understanding of technology opportunities, and identify and reduce barriers to these reductions. The focus will be on holding industry consultations through a series of meetings: an industry kick-off to present charge to full industry membership and then meetings with Federal teams to review commitment plans and plan implementation.

4. Agreements and Follow-Up (September – October)

   The goal of the final phase is to ensure agreements with the first set of sectors are finalized and set into motion. Draft agreements will be prepared with responsibilities/activities for both industry and Federal agencies. There will be a roll-out event before work continues on remaining industries, moving from a second phase of scoping meetings into full industry consultations.

II. SPECIFIC GROUPS

There are specific players in key industries that can provide important inroads into most of the major emissions sectors. I would recommend that we begin consultations with the groups that have already expressed interest (noted with an asterisk [*]). As we build a track record of success, it will be easier to bring others on board.

Sectors with High Emissions

Energy Intensive Industries
The industrial sector represents one-third of all end use emissions. Seven of the highest energy intensive industries emit 80 percent of the greenhouse gases from industrial manufacturing. Four of these are being considered for inclusion in the first phase of consultations. In addition, the cement industry is among the highest ranking industrial carbon emitters, due to carbon dioxide released during the calcification process and a high energy intensity.

1. Steel *
2. Aluminum *
3. Pulp and Paper *
4. Chemicals *
5. Cement *
6. Glass
7. Foundries
8. Refineries
9. Agriculture
10. Mining

Electric Power
Electric utility emissions comprise one-third of U.S. source emissions.

11. Electric Power *

Transportation
The transportation sector represents a final third of U.S. end use emissions. Autos and light trucks constitute the bulk of the transportation sector emissions (52%), with airlines emitting an additional 15%. Freight trucks bring the total highway emissions to 74%.

12. Airlines *
13. Fleets *
14. Autos
15. Railroads

Future Growth Industries
Industry sectors whose emissions are projected to rise in the future also need to be a part of the consultations.

16. Telecomm/ Electronics

Cross-Cutting Groups
Sectors whose activities crosscut multiple sectors will also be consulted.

17. Buildings
18. Small Businesses

Sectors with Solutions

19. Natural Gas
20. Renewables
21. Efficiency
22. Appliances
23. Equipment Vendors

III. Addendum

A: Industry Plans for Early Reductions -- A one-page summary description
B: Time Line -- Details on the activities planned through October

ADDENDUM B: TIME LINE

Draft: March 27, 1998

I. Initial Preparations (present -- early March)

Goal: To prepare the Federal government to effectively engage the private sector.

(1) Prepare planning documents that will be used as templates to guide the consultations for all sectors.

- Finalize template for Sector Analyses; analyses will include sections on sector emissions, options for emissions reductions, current sector activities, and barriers to or opportunities for emissions reductions. [*WHCCTF: 3/2*]

- Draft Sector Analyses for 1-2 sectors; assignments made for agency leads for remaining sectors [*Agencies (DOE/EPA): 3/2*]

- Draft questions to be addressed in consultations [*WHCCTF: 3/2*]

(2) Establish Federal leadership structure

- Assemble an Assistant Secretary Council, with representatives of each relevant agency, to give oversight and guidance. [*WHCCTF/Agencies: late February/early March*]

- Establish technical teams from the agencies to be responsible for each sector [*WHCCTF/Agencies: late February/early March*]

(3) While consultations will occur with the full list of industries categorized in the scoping paper, initial meetings will proceed in a rolling manner to immediately address those industries who are already close to making voluntary commitments to reduce emissions.

- Narrow the list of industries to 6-8 for first set of scoping meetings and full consultations; determine broad strategy for remaining sectors on the list [*WHCCTF/Agencies: early March*]

  Preliminary list: steel, airlines, electric utilities, aluminum, pulp & paper and cement; possibly buildings, autos, chemicals, fleets, electronics

- Select a member of the Assistant Secretary Council to join each sector group [*WHCCTF/Agencies: early March*]

- Draft Sector Analyses for 6-8 sectors prepared and approved [*Agency leads: second week of March*]

(4) Present work to Assistant Secretaries Council for discussion [*WHCCTF/Agencies: second week of March*]

II. Scoping Meetings (first phase -- March; remaining sectors -- April - June)

Goal: To plan industry consultations in conjunction with representatives of each sector.

(1) Establish contact with selected sector CEOs through calls and/or meetings with Cabinet members or other senior White House personnel. Timing might vary from sector to sector and could be held before or parallel to scoping meetings.

- Contact at least two CEOs from each sector to assure their engagement. [*WHCCTF: varies*]

(2) Hold a preliminary, scoping meeting with a subgroup of leaders from each industry sector to help plan the full industry consultations. It will be important to have appropriate industry people at these meetings who have the ability to at least informally speak for their CEOs and/or industries.

- Identify a small number of principal players in each sector from the private sector [*Agency leads: early March*]

- Draft agenda for scoping meeting to include discussions on the structure of the consultations (agenda, questions, etc.), participants, and review of draft sector analyses [*WHCCTF: early March*]

(3) The scoping meetings could probably be done in two weeks, holding about three each week. [*WHCCTF/Agency teams: 3/15 - 3/30*]

(4) Roll-out event to lay out plans (vision, scope, time table)

- Two parts: POTUS or VPOTUS meeting with CEOs followed by a larger briefing of DC representatives from key sectors [*WHCCTF: mid to late March*]

(5) Input from labor and environmental groups is also highly desirable. Teams for these "sectors" will also be assembled, and their efforts will be incorporated into the industry consultations.

III. Industry Consultations (first phase -- April - August)

Goal: To encourage voluntary emission reduction commitments from the industry sectors, improve understanding of technology opportunities, and identify and reduce barriers to these reductions.

(1) Before the start of the first phase of consultations, the input from the scoping meetings should be incorporated into the Sector Analyses.

- Finalize questions for industry and other inputs for consultations [*WHCCTF/Asst Sec Council: 4/15*]

- Using the other documents, draft an options workbook matching barriers and potential opportunities with existing options available to sectors (inventory of Federal "carrots") [*WHCCTF/Asst Sec Council: 4/15*]

(2) The actual industry consultations will involve as broad a participation within each sector as possible. The consultations will require a series of meetings. First, an industry kick-off to present charge to full industry membership. Second, meetings with Federal teams to review commitment plans and plan implementation. [*Agency teams/WHCCTF: 1st set, end April - late May; 2nd set, July - early Aug.*]

(3) At the earliest appropriate time, the labor and environmental groups will be incorporated into the process. Their exact participation may vary from sector to sector.

(4) We will also convene consultations with industries offering technological solutions in a way that informs and enhances the emission reduction agreements with emitting industries. These may take the form of separate meetings, depending on what works best with a given sector.

(5) Industry teams will present draft agreements to the Assistant Secretary Council. [*Agency leads: end* August]

IV. Agreements and Follow-Up (September -- October)

Goal: To ensure agreements are finalized and set into motion.

(1) The draft agreements will include responsibilities/activities for both industry and Federal agencies. The industry section will include their commitments on emissions reductions. The Federal agency section would include the help already available to sectors and potential agency actions to address barriers identified. Ideally, endorsements from labor, environments and some relevant state agencies will be

solicited. [*Agency teams: September*]

(2) A roll-out event by senior administration officials with presentations by industry and by agencies. [*Mid-October*]

(3) Continue work on remaining industries, moving from a second phase of scoping meetings into full industry consultations. [*End of October*]

Domestic Industry by Industry

Draft 3/25

TALKING POINTS: INDUSTRY VOLUNTARY PARTNERSHIPS

* Today's announcement kicks off the Administration's effort to partner with key industrial sectors in a voluntary program to reduce greenhouse gases.

* Over the next six months we hope to have finalized with many of the key industrial sectors voluntary plans which identify actions that can be taken both by the federal government and these sectors that will

  -- improve the efficiency in the way we use energy,
  -- enhance our economic productivity, and
  -- reduce emissions of greenhouse gases.

BACKGROUND

* The idea for this initiative can be traced back to the CEO Roundtable on climate change held by the President with almost a dozen business leaders last August. The business leaders in that meeting affirmed that substantially more could be done on a voluntary basis to reduce greenhouse gas emissions.

* In his major address on climate change policy on October 22, 1998, the President announced that these voluntary compacts would be a center piece of the initial stage of our nation's efforts to reduce the threat of climate change. This stage essentially covers the ten year period between now and the year 2008 when binding targets are called for under the Kyoto Protocol.

CONTENT OF PLANS

* The voluntary plans will identify:

  -- an emissions reduction goal that industry is committed to achieving
  -- a road map of the actions that will be taken to achieve this goal;
  -- actions the federal government can take to remove market barriers to enhanced efficiency; and
  -- possible incentives to spur private sector actions.

* Examples the types of possible actions by the federal government that may be considered as part of these plans include:

  -- modifying federal procurement standards to encourage wider use of products with lower associated greenhouse gas emissions;
  -- marshaling expertise within the federal national labs to advance technologies aimed at

reducing greenhouse gas emissions; and
-- assisting in consumer and public education efforts.

* These plans will build on a number of related activities already underway between industry and the federal government, including:

  -- **DOE's Visions of the Future**: a program in which the most energy intensive industries have developed goals for improved economic competitiveness and energy efficiency, along with accompanying technological road maps to get there.

  -- **Various voluntary climate programs**: now involving over 5,000 businesses, non-profits, and state and local governments, these were started as part of the 1992 Climate Change Action Plan and include such programs as Green Lights, Energy Star Office Products and Buildings, Climate Wise and Climate Challenge.

  -- **Climate Change Technology Initiative**: the $6.3 billion five year package of tax credits and research and development incentives aimed at spurring actions to reduce greenhouse gas emissions.

SCHEDULE/NEXT STEPS

* The Administration has had initial discussions with a number of industries reflecting their willingness to participate in this initiative. These include the iron and steel, the airline, pulp and paper, electric utilities, cement, semiconductor, chemicals, and aluminum industries.

* Over the next several months, industries will begin developing their plans, with the first set of final plans likely to be ready in the fall of this year.

Domestic Industry by Industry

Draft 3/25

INDUSTRY VOLUNTARY PROGRAMS: FACT SHEET

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

-- President Clinton, October 22, 1997

* Today's announcement kicks off the start of the Administration's effort to partner with key industries in a voluntary program to reduce greenhouse gas emissions.

* The goal of this effort is to develop by this fall, voluntary plans with key sectors aimed at identifying and achieving energy saving opportunities and reducing greenhouse gas emissions.

* Through private sector initiatives and partnerships with the federal government, these plans will identify ways to remove barriers and to provide incentives to enhancing our economic vitality while reducing greenhouse gas emissions.

BACKGROUND

* In his climate change policy address on October 22, 1997, President Clinton challenged American industries to develop action plans to voluntarily reduce their greenhouse gas emissions.

* The President also committed the federal government -- the single largest consumer of energy -- to lead the way in enhancing the way it purchases and uses energy.

* These voluntary efforts are aimed at removing barriers and creating new awareness for the expanded use of energy and cost saving technologies.

* These partnerships go hand-in-hand with the Administration's proposed Climate Change Technology Initiative -- a $6.3 billion package of tax credits and research and development programs aimed at jump starting private sector efforts to enhance energy and economic efficiency.

* Together, these two non-regulatory efforts should go a considerable way toward putting our nation on the path toward reaching the goals agreed to in Kyoto.

VOLUNTARY PLANS

* **Industry's voluntary plans** which will form the centerpiece of this initiative will focus on:
    - -- an emissions reduction **goal**;
    - -- the **path forward** for achieving that goal;
    - -- identification of **market barriers**, if any, to be removed;
    - -- the identification of **incentives**, if any to spur action;
    - -- potential role for **federal leadership**;
    - -- opportunities for **emissions trading**, here and abroad; and
    - -- identification of a longer-term **research and development** plan.

* The role of the **federal government** will be to:

    - -- inventory **existing federal programs** and activities with the potential to aid in reducing greenhouse gas emissions;
    - -- work cooperatively, wherever possible, to **remove barriers and create incentives** for reducing emissions;
    - -- provide **technical assistance** in measurement and reporting of emissions; and
    - -- develop guidelines for insuring **early actions are appropriately rewarded** in any future regulatory regime.

* Federal agencies will also organize **technology workshops** to bring together those sectors offering technological solutions with those seeking opportunities to reduce their greenhouse gas emissions

* Voluntary plans will build on existing public-private sector partnerships, including the almost 40 voluntary programs underway as part of the **Climate Change Action Plan** initiated in 1992.

    - -- These programs involve over 5,000 participants including small and big businesses, state and local governments, schools and religious organizations. By 2010, projected reductions from these actions are estimated to be over 150 million metric tonnes of carbon equivalent and $50 billion annually in reduced energy costs.

* These voluntary efforts will provide a foundation for a domestic emissions trading regime once binding targets take effect in 2008 as called for under the Kyoto Protocol.

SCHEDULE

* Development of Initial Set of Sectoral Voluntary Plans:	April-August
Technology Workshops	May-August
Announcement of Initial Set of Sectoral Plans	Sept. - Oct.
Follow-up and Additional Sectoral Plans	On-going

Domestic Industry by Industry

Iron and Steel Industry:
Background Information for Industry Consultations

U.S. Industry at a Glance:

- Based upon 1997 data, there is a total of 142 operating steel plants in the U.S.
  - 20 integrated plants (with 40 blast furnaces) owned by 14 companies
  - 122 secondary plants, or minimills (with 226 electric arc furnaces) owned by 85 companies
- The industry emits an estimated 49 million metric tons of carbon equivalent (MMTce) in greenhouse gas emissions (GHG).
- The top 10 producers account for 50 percent of the 1995 sales, including US Steel (integrated), Bethlehem Steel (integrated), LTV Corporation (integrated), Nucor (minimill), National Steel (integrated), Inland Steel (integrated), AK Steel (specialty), WHX (integrated), Rouge Steel (integrated), and Weirton (integrated).
- In 1997 the industry shipped approximately 106 million net tons of steel, a 24 percent increase over 1990 levels. It imported an estimated 30 million tons in that year. Based upon 1995 data, it employs about 355,000 people.
- The industry has achieved a 68 percent recycling rate for the past six years. Each ton of recycled steel conserves 2500 pounds of iron ore, 1400 pounds of coal, and 120 pounds of limestone.
- Primary energy intensity of steel making (million Btu per ton produced) for selected countries in 1994: Unites States, 24.14; Japan, 19.87; Germany, 16.90 (1993); France, 20.66, Italy, 15.19 (1992); Brazil, 26.16; Poland, 26.86 (1993); China, 34.43 (1993); and South Korea, 16.54.
- The U.S. rate of improvement in energy intensity was 1.4 percent per year in the period 1971-1994 when measured as a change in primary energy consumption per ton of raw steel produced.

Background Information

The iron and steel industry is the fourth largest energy-consuming subsector in the United States, behind petroleum refining, pulp and paper, and bulk chemicals. The production of iron and steel is a batch process that involves six different steps, including: (1) ore concentration and coke production; (2) ore reduction in which ore is either sintered or pelletized; (3) ironmaking in which the ore is reduced to either pig iron in blast furnaces (which accounts for 97 percent of global iron production), or sponge iron by direct reduction processes using syngases from fossil fuels to reduce ore at temperatures below the melting point of iron (about 3 percent of current production); (4) steel making which takes place in either the basic oxygen furnace (BOF) using molten iron ores, or electric arc furnaces (EAF) using mostly scrap materials. Primary steel making using the BOF process accounts for about 57 percent of total steel production while secondary production using EAFs account for about

43 percent of steel production; (5) casting into ingots or slabs; and (6) rolling and finishing.

In 1997, there was a total of 142 operating steel plants operating in the United States, including (a) 20 integrated plants with 40 blast furnaces owned by 14 companies; and (b) 122 secondary plants (sometimes referred to as "mini-mills") with 226 electric arc furnaces owned by 85 companies. The production of molten iron ore in integrated steel making is the more energy intensive process, using more than twice the energy per ton of steel comparing to the recycling of scrap in second plants. Greenhouse gas emissions are almost entirely the result of the incomplete use of energy in the various processes described above.

The top eight producers account for 75 percent of the sales, including US Steel, Bethlehem Steel, LTV Corporation, National Steel, Inland Steel, Armco, Weirton, and Wheeling-Pittsburgh. In 1997 the industry shipped 106 million net tons of steel. Steel imports are estimated to be 30 million tons for that same year. Total employment was about 355,000 people in 1995 (based upon Annual Survey of Manufactures data for SIC categories 331 and 332).

In 1994, the latest year for which comparable data is now available, the primary energy intensity of steel making in the Unites States was 24.14 million Btu (MBtu) per ton of steel produced. For comparison, the 1994 energy intensity in Japan is estimated to be 19.87 MBtu per ton; in Germany, 16.90 (1993); France, 20.66; Italy, 15.19 (1992); Brazil, 26.16; Poland, 26.86 (1993); China, 34.43 (1993); and South Korea, 16.54.

The industry has made steady improvements in its overall energy efficiency. The U.S. rate of improvement in energy intensity was 1.4 percent per year in the period 1971-1994 when measured as a change in primary energy consumption per ton of raw steel produced. Other key benchmark data for the iron and steel industry is shown in Table 1 below as adapted from EIA's Annual Energy Outlook 1998 (AEO98) which references SIC categories 331 and 332. The information includes energy consumption, carbon emissions, and total greenhouse gas emissions for the years 1990, 1998 and 2010. Based upon the AEO98 forecast, total greenhouse gas emissions (measured in million metric tons of carbon equivalent, or MMTce) are expected to increase from 43 MMTce in 1990 to 49.2 MMTce in 2010.

Table 1: Benchmark Data for Selected Years

Category of Information	*1990*	*1998*	*2010 BAU*
Crude Steel Production (million tons)	99	112	n/a
Net Shipments (million tons)	85	117	122
Output (Billions of 1987 Dollars)	57.45	70.50	74.04
Site Energy (Trillion Btu)	1,747	1,988	1,977
Economic Energy Intensity (kBtu/$)	30.41	28.20	26.70
Physical Energy Intensity (Site MBtu/ton)	17.64	17.75	n/a
Physical Energy Intensity (Primary MBtu/ton)	21.04	21.56	n/a
Energy Related Carbon Emissions (MMT)	42.10	48.40	48.30
Total Greenhouse Gas Emissions (MMTce)	43.00	49.20	49.20

Source: The above information has been adapted from AEO98, referencing SIC sectors 331 and 332 (except the crude steel production data which are taken from AISI; 1998 production is estimated on 1996 levels, based on an average growth rate of about 3% per year experienced between 1991 and 1996). Note that the energy and emissions referenced above do not include Coke Oven Gases, which appears to be consistent with AISI accounting for its 1990 benchmark. Adding Coke Oven Gases to the totals would increase total emissions. Further discussions with AISI will clarify this accounting framework. Physical Energy Intensity (Primary MBtu/ton) was calculated based on an average heat rate of 10,500 Btu/kWh.

Defining Technological Opportunities

A number of methods can be used to inform our collaboration with industry on possible goals, such as: (1) doubling some historical rate of energy efficiency improvement; (2) doubling the forecasted rate of energy efficiency improvement; or (3) using DOE/National Labs engineering estimates of technology-specific cost curves to estimate cost-effective energy saving investments. This section explores these alternatives by applying them to the iron and steel industry. Table 2 illustrates potential targets and emission savings using each of these methods. With each of these methods, there is some uncertainty which is discussed in more detail below.

Table 2: Alternative Goals for Iron and Steel in 2010		
Scenario	**GHG Emissions (MMTCe)**	**Emission Reductions**
AEO98 Business-as-Usual Forecast	49.2	--
Two-Times a 1.4% Historical Rate of Improvement	37.0	12.2
Two-Times a 0.45% Forecasted Rate of Improvement	46.6	2.6
Technology-Specific Cost Curves	<38.7	10.5

Historically, energy intensity in the iron and steel industry has varied from year to year. Over the period from 1971 to 1994, however, energy efficiency improved at an average rate of 1.4 percent per year when measured as the number of Btus per ton of steel produced. Doubling this rate of improvement over the forecast would lead to a 25 percent overall improvement in energy efficiency in the years 1998 through 2010 relative to the business-as-usual case. This improvement in energy efficiency implies a corresponding emission reduction of 12.2 MMTce. On the other hand, doubling the forecasted rate of improvement (0.45 percent) would result in only a 5 percent overall improvement relative to the 2010 BAU forecast, with corresponding emission reductions of only 2.6 MMTCe.

A number of issues arise when using energy intensity to define a stretch target. First, energy intensity can vary widely from year to year. Depending on the period of years chosen, the average annual rate for iron and steel could vary from a 2.1 percent improvement in energy efficiency in the years 1975-1990 to a 0.6 percent improvement in the years 1974-1984 (when energy prices were quite high). Second, energy intensity can be measured several ways: energy use per unit of output; energy use per dollar of output; or energy use per dollar value added. Each metric can have a different impact. For example, if measured as the amount of energy per ton of steel produced in 1975-1990, the efficiency improvements are estimated to increase by 2.1 percent annually. On the other hand, when measured as the amount of energy per constant dollar of output, the rate of improvement is only 1.0 percent annually for that same period.

Finally, a cost-curve analysis by the Lawrence Berkeley National Laboratory (LBNL) suggests an economic potential to reduce energy consumption by 17 percent per ton of steel compared to current practice. The LBNL analysis, originally done for EPA's Atmospheric Pollution Prevention Division (APPD), suggests that a combination of structural changes (e.g., increasing the market share of the less energy-intensive EAF production from 43 to 50

percent), coupled with normal improvements in energy intensity, could easily drop GHG emissions to 10 percent below 1990 levels by 2010. Cost-effective measures to reduce emissions include simple housekeeping improvements, improved heat recovery and process controls, the use of combined heat and power (CHP) systems, better use of adjustable speed drives on fans and compressors, reduced material losses, and optimized oxygen production.

The American Iron and Steel Institute (AISI) has proposed a target of 10 percent below 1990 levels by 2010. There is a wide range of issues that need to be agreed upon as a result of the consultation process prior to entering actual industry negotiations. These are outlined below:

- What specific sub-sectors within an industry will be included in the consultations? In the case of iron and steel, does it include off-site production of coke and oxygen? Does it include blast furnace and basic steel products (SIC 331) as well as iron and steel foundries (SIC 332)? The AISI proposal data, for example, appears to be limited largely to SIC 331.

- What are the benchmark numbers for all greenhouse gases in 1990? Again, in the case of iron and steel, other gases are about 0.9 MMTCe larger than carbon emissions alone. The difference between carbon and total GHG emissions will vary widely among some industries.

- What are the industry trends, such as increasing production levels and technology changes, that will shape both the future growth in emissions and the opportunities to cost-effectively reduce those emissions?

- What other considerations may be important to a given industry that might increase the level of reductions above a cost-effective target? For instance, other productivity gains resulting from the energy efficiency investments may increase the benefits to industry such it might be able to consider additional reductions. Dematerialization is another example that may secure additional reductions. On the one hand, the industry is promoting an ultralight steel car. The goal is to reduce the amount of steel in a vehicle by up to 35 percent and still maintain and improve the structural and saftey performance. At the same time, the chemical industry is promoting the use of high strength plastics as a substitute for metals. If successful, this may also reduce the amount of steel needed in a typical passenger car.

Key Economic Drivers Shaping the Industry

The iron and steel industry has undergone a significant restructuring since the early 1980s, driven both by domestic and international competition. Since that time, both total factor productivity and product quality has improved. The technologies used in the production or

iron and steel will evolve in response to perhaps five different economic drivers. These include:

- *Domestic competition between primary and secondary steel producers.* The secondary producers (i.e., mini-mills), relying on scrap metal and electric arc furnaces, now hold about 43 percent of market share. This compares to a 4 percent share in 1986. The shift to secondary production is expected to rise to more than 50 percent by 2010.

- *International competition, particularly where the U.S. dollar is valued higher relative to other currencies.*

- *Changes in levels and patterns of demand.* A major example of this potential shift is competition from the aluminum and chemical industries which are seeking to provide a greater share of structural components as substitutes for steel products.

- *Changes in the relative price for energy, capital, labor and scrap materials.* Integrated mills, for instance, are roughly twice as intensive as secondary mills. Hence, a rise in capital costs may favor secondary producers. On the other hand, a drop in coal costs and changes in technologies which allow primary producers to bypass the coking process may tend to favor integrated mills.

- *Environmental concerns.* These will continue to push both segments of the industry to develop new technologies. For example, coke dry quenching (using an inert gas instead of water to cool the newly-formed coke) is more often used as an environmental control technology to reduce dust emissions. But it also has energy savings benefits provided the added capital costs and operating expenses can be justified by the savings and/or benefits to the society.

A Summary of Technologies Which Can Reduce GHG Emissions:

Near term and/or cost-effective measures: Examples of cost-effective measures for integrated mills (including casting and rolling) include injection of natural gas into the blast furnace, improved maintenance procedures, hot blast stove automation, improved blast furnace control systems, energy monitoring and management systems, combined heat and power, variable speed drives on combustion air fans, efficient ladle preheating, thin slab casting, and optimized oxygen production. An LBNL cost-curve analysis of integrated steel mills done for APPD suggests an economic potential to reduce **current** U.S. primary steel making energy consumption by 17 percent. Further LBNL analysis suggests that assuming constant crude steel production of about 100 million tons, carbon emissions from energy consumption could drop to 10 percent below 1990 levels by 2010 through structural changes alone (e.g., increasing EAF and mini-mill market share from 43 to 50 percent). Additional

carbon reductions are possible based on extending the business-as-usual trends in energy efficiency improvement.

Midterm measures not quite cost-effective: Examples of measures for integrated mills that reduce energy use and carbon emissions but that are not currently cost-effective include basic oxygen furnace gas and sensible heat recovery, coke dry quenching, and hot charging (or preheating steel slabs before they enter the rolling mills).

Program Opportunities:

DOE Industries of the Future, Climate Wise, Energy Star, NICE-3, Motor Challenge, Air Compressor Challenge, Advanced Turbines Systems, Industrial Assessment Centers, among others. (See the program inventory of agency programs for further details.)

Sources or Contacts:

American Iron and Steel Institute (AISI), 1101 17th Street NW, Suite 1300, Washington, D.C. 20036-4700. Telephone: (202) 452-7100; Fax: (202) 463-6573.

Steel Manufacturers Association (SMA), 1730 Rhode Island Avenue, NW Suite 907, Washington, DC 20036-3101. Telephone: (202) 296-1515; Fax: (202) 296-2506.

Specialty Steel Industry of North America (SSINA), 3050 K Street, N.W., Washington, DC 20007. Telephone: (202) 342-8630; Fax: (202) 338-5534.

U. S. Department of Energy, Office of Industrial Technologies (OIT), Room 5F-065, EE-20, 1000 Independence Ave., SW, Washington, D.C. 20585. Scott Richlen, Steel: (202) 586-2078; Fax: (202) 586-9234.

EPA Energy Star Program, Atmospheric Pollution Prevention Division, 401 M Street NW, MS 6202-J, Washington, D.C. 20460. Virginia Gorsevski, Steel: (202) 564-9796; Fax: (202) 565-2254.

EPA Climate Wise Program, OPPE, 401 M Street NW, Washington, D.C. 20460. Pam Herman-Milmoe: (202) 260-4407; Fax: (202) 260-0572.

Department of Commerce, Room 4043 HCHB, Washington, D.C. 20230. Nazir Bhagat: (202) 482-3855.

Domestic Industry by Industry

FOREST PRODUCTS INDUSTRY:
Background Information for Industry

Sector Description

Nature of Sector

The forest products industry is broken up into two broad categories: 1) lumber and wood products (SIC 24) and 2) paper and allied products (SIC 26). Manufactured products from the lumber and wood products industry include whole logs, treated and untreated lumber, wood chips, hardwood flooring, furniture parts and frames, shingles, millwork (e.g., doors, window units, molding), kitchen cabinets, veneer and plywood, structural wood, pallets and skids, manufactured (mobile) and prefabricated homes, particle board, and other specialty items. The total value of these products shipped in 1994 was $103.5 billion. Energy consumption in this sector is relatively low – 491 trillion Btu in 1994, or just 16% of the total consumed by both SIC 24 and 26. There are a large number of companies in this sector (see below), which tend to be small in terms of both size and value of shipments. Many of the companies are privately-held, locally owned and operated

The paper and allied products segment of the forest products industry is a large energy consumer. With over 2,665 trillion Btu consumed in 1994, this industry ranks as the third largest energy consumer in the entire manufacturing sector, behind only the petroleum and chemicals industries. The paper and allied products industry manufactures pulp, paper, and paperboard products from virgin and recycled fiber. The industry shipped more than $143.6 billion worth of products in 1994, including newsprint, printing and writing papers, sanitary products, bags, cardboard, coated and uncoated containers, corrugated board, and construction-grade paper-board. The industry can be divided into two principal sectors. The energy-intensive mill sector processes raw materials into paper and paperboard, and includes pulp mills (SIC 261), paper mills (SIC 262), and paperboard mills (SIC 263). The converting sector further processes the sheets of paper and paperboard into other finished products such as envelopes and boxes. The mill sector accounts for about 95% of the energy used in the pulp and paper industry. Over the last twenty years, many of the smaller mills have been closed down and replaced with integrated mills that produce both pulp and paper and/or paperboard. These larger plants have great economies of scale and often also rely on company-owned forest resources as a significant virgin fiber source. The leading U.S. companies (e.g., International Paper, Kimberly-Clark, Georgia-Pacific Group) are diversified, multi-billion dollar global entities with holdings that include timberlands, and forestry, pulp and paper, and finishing operations.

Number and Size of Firms

Data on the number of firms was not available at the time of this writing. Exhibit 1 shows the most recent U.S. Census figures for the number of manufacturing *establishments* in the forest products industry in 1992, and Census data for number of employees and value of shipments (also for 1992).

Exhibit 1. Number and Size of Establishments in the Forest Products Industry, 1992

	No. of Establishments	No. of Employees	Avg. No. of Employees per Establishment	Value of Shipments (million $1992)	Avg. Value of Shipments per Establishment (million $1992)
Lumber and Wood (SIC 24)	21,623.0	657,500.0	30.4	81,764.8	3.8
Paper and Allied (SIC 24)	5,582.0	625,900.0	112.1	133,062.4	23.8
Pulp Mills (SIC 261)	55.0	15,900.0	289.1	5,465.6	99.4
Paper Mills (SIC 262)	310.0	130,600.0	421.3	32,786.4	105.8
Paperboard Mills (SIC 263)	219.0	51,500.0	235.2	16,140.0	73.7
TOTAL	27,789.0	1,481,400.0	N/A	269,219.2	N/A

Trade Associations, and Environmental Groups

American Forest and Paper Association (AF&PA): is the national trade association of the forest, pulp, paper, paperboard, and wood products industry. AF&PA, 1111 19th St., NW, Suite 800, Washington, DC 20036; (202) 463-2700, Fax: (202) 463-2785, email: INFO@afandpa.org, internet: http://www.afandpa.org

Technical Association of the Pulp and Paper Industry (TAPPI): is the technical association of the pulp and paper industry. TAPPI, 15 Technology Parkway S., Norcross, GA 30092 (or P. O. Box 105113, Atlanta, GA 30348-5113); (770) 446-1400, FAX: (770) 446-6947, email: servicelin@tappi.org, internet: http://www.tappi.org.

Forest Products Society (FPS): is a technical society devoted to advancing uses of wood and fiber resources. FPS, 2801 Marshall Court, Madison, WI 53705-2295; (608) 231-1361, FAX: (608) 231-2152, email: info@forestprod.org, internet: http://www.forestprod.org

National Council of the Paper Industry for Air & Stream Improvement, Inc. (NCASI): is a research organization that assists the forestry, pulp and paper, and wood products industries industry in meeting its environmental goals. NCASI, P.O. Box 13318, Research Triangle Park, NC, 27709-3318; (919) 558-1999, FAX: (919) 558-1998, email: efraser@ncasi.org, internet: http://www.ncasi.org

Institute of Paper Science and Technology (IPST): is a private graduate research university with engineering and scientific programs related to the pulp and paper industry. IPST, 500 10th Street, NW, Atlanta, GA 30318; (404) 894-5700, FAX: (404) 894-4778, internet: http://www.ipst.edu.

Industry Leaders

Exhibit 2 shows a select list of the top revenue-producers in the forest products industry, as reported in *Fortune* magazine's "Fortune 1000" list.

Exhibit 2. Corporate Leaders in the Forest Products Industry

Company Name	SIC	Fortune 1000 Rank	Revenues ($millions)	Profits as Percent of Revenues (%)	Number of Employees
International Paper	26	44	20,143.0	1.5	87,000
Kimberly-Clark Corp.	26	95	13,149.1	10.7	54,800
Georgia-Pacific Corp.	26	100	13,024.0	1.2	47,500
Weyerhaeuser Company	26	122	11,114.0	4.2	39,661
Champion Internat'l Corp.	26/24	243	5,880.4	2.4	24,400
James River Corp. of VA	26	253	5,690.5	2.8	23,050
Stone Container Corp.	26	275	5,148.8	(2.5)	24,200
Boise Cascade Corp.	26	277	5,122.7	0.2	19,976
The Mead Corp.	26/24	301	4,706.5	4.2	16,200
Union Camp Corp.	26	342	4,013.2	2.1	19,268
Temple-Inland Corp.	24	393	3,460.0	3.8	15,600
Willamette Industries, Inc.	26/24	396	3,425.2	5.6	13,700
Sonoco Products Co.	24	473	2,788.1	6.1	19,000
Bowater Inc.	24	677	1,718.3	11.7	5,025

Emissions from Sector

As already mentioned, pulp and paper mills consume over 95% of the energy consumed in the forest products industry. For this reason, energy consumption and related emissions data are generally collected only for this segment of the industry. The main greenhouse gas emissions produced by the pulp and paper industry are carbon dioxide (CO_2) and nitrous oxides (NOx). These emissions originate chiefly from the combustion of fossil and biomass fuels; little to no CO_2 or NOx are released from industrial processes. Exhibit 3 shows total energy consumption, CO_2 emissions, NOx emissions for available years during the 1990-2015 time frame for the pulp and paper industry.

Exhibit 3. Energy Consumption and Related Greenhouse Gas Emissions in the Pulp and Paper Industry

	1991	1995	2000	2005	2010	2015
Total Output (billion 87 $)	113.7	120.9	135.1	151.2	161.3	169.7
Energy Consumption (trillion Btu)						
Fossil fuel	1,215.0	1,306.0	1,322.8	1,331.0	1,313.0	1,284.0
Biomass fuel	1,257.0	1,261.0	1,357.0	1,474.0	1,553.0	1,611.0
Total	2,472.0	2,567.0	2,679.8	2,805.0	2,866.0	2,895.0
Btu Consumed/$ Output	21,741.4	21,232.4	19,835.7	18,551.6	15,808.0	15,280.9
CO_2 Emissions* (million tons)	105.9	119.6	124.3	126.7	126.6	125.7
lbs CO_2/$ Output	1.9	2.0	1.8	1.7	1.4	1.3
NOx Emissions (thousand tons)	307.0	316.0	N/A	N/A	N/A	N/A
lbs NOx/$ Output	5.4×10^{-3}	5.2×10^{-3}	N/A	N/A	N/A	N/A

* CO_2 emissions are calculated for fossil fuel-derived carbon only; biomass fuel emissions are assumed to be carbon-neutral

Technological Options for Greenhouse Gas Reductions

The pulp and paper industry is highly energy intensive. As shown in Exhibit 3, over 21,000 Btu of energy were consumed for every dollar of products shipped in 1995. This number is expected to drop dramatically by the year 2015, to about 15.2 thousand Btu per dollar. Carbon dioxide emissions are projected to remain fairly steady in the 1995 to 2015 period, despite a growing value of shipments. The pulp and paper industry has a number of near and longer term technological options for reducing energy consumption and greenhouse gas emissions (GHG) that will enable the industry to reduce its energy-intensity and GHG-intensity to these levels and lower in the future.

In the wood products industry, the most energy-intensive process is heat for the drying of wood and lumber. Improved, energy-efficient drying technologies that emit low concentrations of volatile organic compounds are currently under development. In the forest products industry, technologies that will optimize steam use, reduce the need for heat, better utilize available biomass resources, or help to balance the steam, heat, and power needs will improve the energy, GHG, and economic performance of the industry. Improved paper drying technologies (e.g., impulse drying and multiport cylinder drying) can improve the energy efficiency of this important process step by over 30% while boosting productivity and improving paper strength. The development of improved sensors for real-time process feedback and control of pulping and papermaking processes can reduce defective runs that must be re-processed and allow the use of greater amounts of recycled fiber. Improved biomass gasification combined cycle

technologies currently under development can enable a plant to produce more self-generated electricity from the same volume of biomass input, reducing reliance on purchased electricity generated from fossil fuels. These improved gasification technologies are needed in the next 10 years in order to match a widespread need within the industry to replace aging boilers. The research pathways developed by the forest products industry in response to its vision, *Agenda 2020*, set forth more detailed technology opportunities and goals in six priority areas: energy performance, environmental performance, sensors and controls, recycling, sustainable forest management, and improved capital effectiveness.

Existing Program Activities

Currently there are no CCAP activities underway in the forest products area. To date, no Climate Change Technology Initiative proposals have been submitted for forest products projects.

Barriers to or Opportunities for Reductions

High capital costs for new equipment make the forest products industry one of the most capital intensive processing industries. Therefore, it is especially important to time the introduction of new technologies so that it coincides as closely as possible to the normal equipment replacement times. Many of the chemical recovery boilers now used in U.S. pulp and paper mills will need to be replaced in the next ten to fifteen years. For this reason, it is very important to accelerate the development and commercial demonstration of advanced alternative technologies such as biomass combined cycle gasifiers. New technologies are very risky in high-volume, low-profit industries with process lines that operate 365 days a week, 24 hours per day. Commercial demonstrations of these technologies at a variety of operating mills will be essential for industry acceptance. Industry-government partnerships will help to speed the development and testing process and ensure that advanced technology is there when industry needs it.

Domestic Industry by Industry

Bulk Chemicals Industry:
Background Information for Industry Consultations

U.S. Industry at a Glance:

- The Chemical Industry produces highly varied products including bulk chemicals[1] and consumer products such as pharmaceuticals, soaps and cosmetics. In 1996, the production of major "bulk chemicals" included: Organic chemicals, 77 million tons; Inorganic chemicals, 135 million tons; Plastics Materials and Synthetics, 45 million tons; and, Agricultural chemicals, 116 million tons. Source: Chemical and Engineering News, June 23, 1997

- There is a total of 2,938 bulk chemical manufacturing establishments, of which over half are inorganic manufacturing facilities. The energy intensive (Mbtu/$ Value Added) subgroupings of chemicals are: Nitrogenous Fertilizers (SIC 287) - 269.5, Alkalies and Chlorine (SIC 281) - 135.5, Industrial Inorganic Gases (SIC 281) - 42.7 and Industrial Organic Chemical, nec - 58.1. Source: DOE, Manufacturing Consumption of Energy, 1994.

- In 1996, the bulk chemical sector employed 468 thousand people, which is almost half of the 1.02 million people employed by the total chemical and allied products sector. For the same year, bulk chemicals accounted for $42.2 billion of exports and $31.6 billion of imports. Source: Chemical and Engineering News, June 23, 1997

- The 50 largest producers yield 84% of chemical sales. The top 10 basic chemical producers, according to 1996 chemical sales, are Dow Chemical, DuPont, Exxon, Monsanto, Hoechst Celanese, Union Carbide, Amoco, Eastman Chemical and BASF Corp. and Huntsman. Examples of other companies which are significant producers, by sales, in their subsectors and overall are: SIC 281 (Occidental Chemical Company, BOC Group Inc. and Air Products and Praxair), SIC 282 (Rohm and Haas and Ashland), SIC 286 (Bayer Corp, Arco Chemical and Shell Oil). Source: Chemical and Engineering News, June 23, 1997. Ward's Business Directory, 1998.

- In 1990, capital spending for major chemical companies as a percentage of sales were 11%, in 1996, capital spending levels were at 8.8%. Source: Chemical and Engineering News, June 23, 1997

Background Information

The bulk chemical sector is the second largest energy-consuming subsector in the United States. The bulk chemical sector comprises of four chemical subcategories: Industrial Inorganic Chemicals, Plastics Materials and Synthetics, Industrial Inorganic Chemicals and

Agricultural Chemicals. The diverseness of categories reflects the diversity in products manufactured by the bulk chemical sector (basic chemicals, intermediate and final products) and manufacturing processes.

In 1996, the top 10 basic chemical manufacturing companies, by total sales worldwide, sold 88.4 billion dollars worth of chemicals. These companies include: Dow Chemical, DuPont, Exxon, Monsanto, Hoechst Celanese, Union Carbide, Amoco, Eastman Chemical and BASF Corp. and Huntsman. Examples of other companies which are significant producers, by sales, in their subsectors and overall are: SIC 281 (Occidental Chemical Company, BOC Group Inc. and Air Products and Praxair), SIC 282 (Rohm and Haas and Ashland), SIC 286 (Bayer Corp, Arco Chemical and Shell Oil). Total Employment for the bulk chemical sector in 1996 was 468 thousand people.

More than half of the energy consumed by the bulk chemical sector is for feedstock and the remainder for fuel and power (analysis of AEO98 supplementary tables). The sector also consumed 90% of the total energy used for fuel and power by the chemical and allied products sector and the Industrial Organic Chemical sub-sector accounted for 50% of the energy consumed by the bulk chemical sector (DOE/Manufacturing Consumption of Energy 1994). Of the total electricity consumed, almost 20% was generated on-site by cogeneration (DOE/Manufacturing Consumption of Energy 1994).

Using data presented in EIA's Annual Energy Outlook 1998 (AEO98), the energy intensity for bulk chemicals between 1990 and 1998 has declined by 5.8%, which is an average annual rate of 0.75%. Key benchmark data is shown Table 1 below as adapted from AEO98. The information includes energy consumption, carbon emissions and total greenhouse gas emissions for the years 1990, 1998 and 2010.

Table 1. Benchmark Data for Selected Years

Category of Information	*1990*	*1998*	*2010 BAU*
Output Physical Units (million short tons)	340	371.00	n/a
Output (Billions of 1987 Dollars)	143.30	153.83	183.33
Site Energy (Trillion Btus)	2,402	2,427	2,691
Energy Intensity (kBtus/$)	16.75	15.78	14.68
Energy Related Carbon Emissions (MMT)	49.80	49.80	56.20
Greenhouse Gas Emissions (MMTce)	68.10	68.00	74.20

Table 1. Benchmark Data for Selected Years

Source: The above information has been adapted from AEO98, referencing SIC sectors 281, 282, 286, 287. These four subsectors account for approximately 85% of the total industry used in the chemical industry's.

Defining Technological Opportunities:

As in other industries, a number of methods can be used to evaluate potential goals for the industry, such as (1) some historical rate of energy efficiency improvement; (2) doubling the AEO98 forecasted rate of energy efficiency improvement; or (3) using DOE/National Labs engineering or other estimates of technology-specific cost curves to estimate cost-effective energy saving investments. This section compares the first of these two alternatives by applying them to AEO98 forecasts for the bulk chemical industry. Table 2 illustrates potential targets and emission savings using each of these methods. With each of these methods, there is some uncertainty which is discussed in more detail below.

Table 2: Alternative GHG Reduction Goals for Bulk Chemicals in 2010

Scenario	GHG Emissions (MMTCe)	Emissions Reductions
AEO Business-as-Usual Forecast	74.2	--
One-Half the Historical Rate of Improvement of 3%, or 1.5% per Year	66.6	7.6
Two-Times Forecasted Rate of Improvement	70.4	3.8

Historically, energy intensity in the chemical industry has varied from year to year. Over the period from 1971 to 1991, however, energy efficiency improved at an average rate of 3.0 percent per year when measured as the number of Btus per constant dollar of output. It is unlikely this rate of improvement will occur in the period 1998 through 2010, but one-half of that rate, or 1.5 percent annually, may be possible. Applying this rate of improvement over the forecast period would lead to a 10 percent overall improvement in energy efficiency in the years 1998 through 2010 relative to the business-as-usual case. This gain in energy efficiency implies a corresponding emission reduction of 7.6 MMTce. On the other hand, doubling the AEO98 forecasted rate of improvement (0.6 percent) would result in only a 7 percent overall improvement relative to the 2010 BAU forecast, with corresponding emission reductions of only 3.8 MMTce.

Opportunities for GHG Reductions:

Near term and/or cost-effective measures: Housekeeping improvements, heat recovery, improved process controls, combined heat and power (CHP) production, adjustable speed drives on fans and compressors, reduced material losses, pinch analysis.

Midterm measures not quite cost-effective: Advanced distillation control methods, inorganic polymer membranes, bioprocessing technologies, advanced turbine systems.

Program Opportunities:

DOE Industries of the Future, Climate Wise, Energy Star, NICE-3, Motor Challenge, Air Compressor Challenge, Advanced Turbines Systems, Industrial Assessment Centers, among others.

Sources or Contacts:

U. S. Department of Energy, Office of Industrial Technologies (OIT), Room 5F-065, EE-20, 1000 Independence Ave., SW, Washington, DC 20585. Doug Faulkner, Chemicals: (202) 586-2119; fax: (202) 586-9234.

EPA Energy Star Program, Atmospheric Pollution Prevention Division, 401 M Street NW, MS 6202-J, Washington, DC 20460. Chyi Sun, Chemicals: (202) 564-9442, fax: (202) 565-2079.

EPA Climate Wise Program, OPPE, 401 M Street NW, Washington, DC 20460. Pam Herman-Milmoe: o: (202) 260-4407; fax: (202) 260-0572.

Department of Commerce, Room 4043 HCHB, Washington, DC 20230. Nazir Bhagat: (202) 48255.

Chemical Manufacturers Association, 1300 Wilson Boulevard, Arlington, VA 22209, (703) 741-5000

American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005, (202) 682-8000

Other Considerations: The chemical industry may reflect two different perspectives in how negotiations are likely to proceed. On the one hand, the petrochemical producers may be less willing to promote the efficient use of feedstocks and process energy. On the other hand, the large consumers of petrochemicals — ones with no stake in the production of petroleum resources — may have a more competitive interest in promoting greater productivity gains at all levels. There is also the case where petroleum refining industry and petrochemical production industry are integrated to a certain extent, and to the extent that the total energy required to produce each ton of a particular petrochemcial decreases, the integrated petroleum refiner/petrochemical manufacturer would also see a net increase in profit per ton

for that petrochemical. Related to the integrated nature of the refining/petrochemical industry, there are also numerous companies which produce petrochemicals as well as intermediate and final chemical products. Thus, if total energy required to produce a ton of product included energy required to produce the feedstock, petrochemical, and intermediate/final product, those companies have an incentive to improve both processes.

1. The Standard Industrial Code (SIC) for the Chemical and Allied Products industry is 28. SIC 28 is comprised of 8 subcategories; SIC 281-287 and 289. Bulk Chemicals are defined as chemicals in SIC 281, 282, 286 and 287. Other chemical subcategories, but not included in the bulk chemical definition, are Drugs (283), Soap, Cleaners, and Toilet Good (284), Paints and Allied Products (285) and Miscellaneous Chemical Products (289). These other subcategories often use bulk chemicals as feedstocks.

SIC	Sector	Subsector
281	Industrial Inorganic Chemicals	Alkalies and chlorine
		Industrial gases
		Inorganic pigments
		Industrial inorganic chemicals, not elsewhere classified (nec)
282	Plastics Materials and Synthetics	Plastics materials and resins
		Synthetic rubber
		Cellulosic manmade fibers
		Organic fibers, noncellulosic
286	Industrial Organic Chemicals	Gum and wood chemicals
		Cyclic crudes and intermediates
		Industrial organic chemicals, nec
287	Agricultural Chemicals	Nitrogenous fertilizers
		Phosphatic fertilizers
		Fertilizers, mixing only
		Agricultural chemicals, nec

Domestic Industry by Industry

Aluminum Industry: Background Information for Industry

SECTOR DESCRIPTION

The U.S. aluminum industry is the world's largest, annually producing about $37 billion in products and exports. U.S. companies are the largest single producer of primary aluminum. Top markets for the industry are transportation, beverage cans and other packaging, and infrastructure.

Primary aluminum is produced by the electrolysis of alumina through a consumable carbon anode in the Hall-Heroult process. Alumina is itself extracted from bauxite, a natural ore, by the Bayer process. Secondary aluminum is produced from recycled scrap. The aluminum industry produces ingots of pure (greater than 99%) aluminum that serve as feedstock for other materials and processes.

The domestic primary aluminum smelting industry (SIC 3334) consists of 23 facilities operated by 13 firms with a total workforce of approximately 20,000. The secondary smelting industry operates an estimated 68 plants employing 3,600 people. Overall, the U.S. aluminum industry employs more than 130,000 people, directly contributing more than $30 billion to the U.S. Gross Domestic Product. In 1996 the industry produced 3,577 thousand metric tons of primary aluminum and 3,285 thousand metric tons of secondary aluminum, up from 3,375 and 3,188 thousand metric tons, respectively, in 1995.

Table 1 shows the thirteen domestic primary producer companies in order of their annual capacities.

Table 1. U.S. Primary Aluminum Capacity - 1996

Company	(10^3 metric tons/yr)	Company	(10^3 metric tons/yr)
Aluminum Company of America (Alcoa)	1,285.0	Southwire	186.0
Alumax	597.0	Alcan Aluminum	186.0
Reynolds Metals	448.0	Columbia Falls Aluminum	168.0
Kaiser Aluminum & Chemicals	273.1	Goldendale Aluminum	167.8
Ormet	255.6	Vanalco	115.9
Century Aluminum	222.0	Northwest Aluminum	82.0
Noranda	215.0	TOTAL INDUSTRY	4,201.4

ENERGY USE AND EMISSIONS

In 1995 the primary aluminum sector consumed a total of 497 trillion Btu of energy for the process steps of alumina refining, anode manufacture, and electrolysis (smelting). An estimated additional 125 to 150

trillion Btu were consumed in secondary aluminum production and in aluminum semi-fabrication processes (including hot and cold rolling). On a unit basis, primary aluminum production requires approximately 115 million Btu/ton for the smelting step alone and 144 million Btu/ton for the combined steps of alumina refining, anode production, smelting, and primary ingot casting. These figures reflect the 1995 average aluminum smelting electricity requirement of 99.8 million Btu/ton of aluminum produced and an electricity conversion factor of 7,234 Btu/kWh (based on the U.S. aluminum smelting grid of 48% hydropower, 50% coal, 2% nuclear, and 0.5% natural gas). The specific energy use of secondary aluminum production (excluding semi-fabrication) is estimated to be 6.5 million Btu/ton.

Aluminum production generates greenhouse gases as both combustion and process emissions. Process emissions include CO_2 and perfluorocarbons (mainly CF_4 but also some C_2F_6) from electrolysis. Table 2 shows estimated emissions of CO_2 and perfluorocarbons (PFCs) from the primary aluminum industry in 1990 and 1995.

Table 2. Greenhouse Gas Emissions from Primary Aluminum Production

Emission	Million Metric Tons Carbon Equivalent (MMTce)	
	1990[a]	1995[b]
CO_2		
Combustion	7.6	6.2
Process[c]	1.7	1.3
Perfluorocarbons[d]	4.9	4.1
TOTAL	14.2	11.6

a Based on primary production of 4,460 thousand tons, smelting electricity requirement of 101.9 million Btu/ton, and (combustion) CO_2 generation rate of 5.630 tons of CO_2/ton of aluminum.

b Based on primary production of 3,720 thousand tons, smelting electricity requirement of 99.8 million Btu/ton, and (combustion) CO_2 generation rate of 5.514 tons of CO_2/ton of aluminum.

c Based on process-related CO_2 emission of 1.5 tons of CO_2/ton of aluminum in 1990 and 1.4 tons in 1995.

d Based on 0.0006 tons of CF_4/ton of aluminum and 0.00006 ton C_2F_6/ton of aluminum

Combustion-related CO_2 emissions for the process steps of alumina refining and smelting have been estimated at 6.2 MMTce in 1995, with the majority from generation of the electricity needed for smelting. Process emissions of CO_2 from consumption of the carbon anode during smelting totaled 1.3 MMTce that same year. Also, approximately 4.1 MMTce of PFCs were generated in 1995 (Note: the global warming potential at 100 years, compared to "1" for CO_2, is 6,500 for CF_4 and 9,200 for C_2F_6).

Estimates of growth in primary aluminum production have been obtained from The Aluminum Association (AA). AA predicts maximum primary aluminum production in the United States in 2010 of 4,950 thousand tons. This value is somewhat lower than the 2010 production level predicted in AEO98.

The energy intensity of aluminum smelting in 2010 is taken from the "efficiency scenario" of "Scenarios of U.S. Carbon Reductions" prepared by five national laboratories under DOE direction. In this scenario, it is assumed that 1,050 thousand tons of primary aluminum capacity are retrofitted with advanced

wettable cathode technology in combination with advanced process sensors and control systems. The energy intensity of these cells (and cells in any new production capacity) would be 85.5 million Btu/ton. Under business-as-usual conditions, this would yield greenhouse gas emissions for these years as shown in Table 3.

Table 3. Projected Greenhouse Gas Emissions from Primary Aluminum Production Under Business-As-Usual Conditions

Emission	2010 BAU[a] (MMTce)
CO_2	
Combustion	6.3
Process[b]	1.7
Perfluorocarbons[c]	2.5
TOTAL	10.5

a Based on primary production of 4,950 thousand tons, smelting electricity requirements of 85.5 million Btu/ton for 2,280 thousand tons of capacity and 99.8 million Btu/ton for the remaining 2,670 thousand tons of capacity, (combustion) CO_2 generation rates of 4.722 tons of CO_2/ton of aluminum for the former (higher efficiency) cells and 5.514 tons of CO_2/ton of aluminum for the latter cells.

b Based on process-related CO_2 emission of 1.4 metric tons of CO_2/metric ton of aluminum.

c Based on VAIP prediction of PFC emissions for 2010.

TECHNOLOGICAL OPTIONS FOR GREENHOUSE GAS REDUCTIONS

The main greenhouse gas emissions from primary aluminum production are CO_2 associated with the generation of electricity for smelting, CO_2 evolved during consumption of the carbon anode during smelting, and perfluorocarbons (mainly CF_4) produced during operating disturbances known as "anode effects." Greenhouse gas emissions from aluminum production could be reduced through the development of advanced cell technology that:

- reduces electricity requirements for smelting,
- eliminates the carbon anode, and
- reduces or eliminates anode effects.

One technology that will achieve this is non-consumable or inert anode technology, especially combined with wettable cathode technology. The adoption of this technology could increase energy efficiency up to 25%, reduce operating costs up to 10%, and eliminate PFC emissions and process-related CO_2 emissions from smelters adopting the technology. Table 4 shows the potential benefits of advanced cell technology in the year 2010 assuming 100% adoption of advanced cell technology (although this is degree of penetration is not feasible, it shows the *potential* savings). In this scenario, greenhouse gas emissions would be reduced by 5.5 MMTce over the business-as-usual case, and 9.3 MMTce over the 1990 base case.

EXISTING PROGRAM ACTIVITIES

In 1995 the primary aluminum industry entered into a voluntary partnership with the U.S. Environmental Protection Agency to reduce emissions of perfluorocarbons from aluminum smelting. The Voluntary Aluminum Industry Partnership (VAIP) Program has nearly unanimous industry participation (12 of 13 U.S. companies, representing 94 percent of domestic production capacity). Participating companies (partners)work with EPA to improve aluminum production efficiency while reducing PFC emissions. The partners have cumulatively committed to reduce PFC emissions 45 percent from the 1990 levels by the year 2000, roughly equivalent to 2.2 MMTce, and are already ahead of reduction schedules.

Table 4. Projected Best Case Benefits of Advanced Cell Technology in 2010

Emission	MMTce		
	1990 Base	2010 BAU	100% Use Inert Anode Tech[a]
CO_2			
Combustion	7.6	6.3	4.9
Process	1.7	1.7	0.0
PFCs	4.9	2.5	0.0
TOTAL	14.2	10.5	4.9

a Based on primary production of 4,950 thousand tons, smelting electricity requirement of 72.3 million Btu/ton of aluminum, (combustion) CO_2 generation rate of 3.996 tons of CO_2/ton of aluminum Units with inert anode technology are assumed to have zero emissions of process-related CO_2 and PFCs.

The VAIP program was designed to capture the environmental and financial benefits of reducing PFC emissions from primary aluminum smelters. VAIP partners have undertaken a wide variety of actions to minimize the frequency and duration of anode effects without sacrificing competitiveness, including improved employee training, changes in the alumina feed techniques, and the use of computer monitoring to optimize cell performance.

The Aluminum Association, representing the entire U.S. primary aluminum industry, and The Aluminum Company of America (Alcoa) have both recently issued position papers on global climate change. The Aluminum Association paper, "Global Climate Change: Technical Assessment of Needs and Issues," discusses current and planned activities addressing greenhouse gas emissions from aluminum production. The paper describes the industry's partnership with the U.S. Department of Energy, under which it hopes to pursue the development of inert anode technology, the most promising pathway for reducing aluminum industry greenhouse gas emissions.

The international aluminum community has pursued the development of non-consumable anode technology for many years. In February 1998 the U.S. aluminum industry (working with the Aluminum Association) published the *Inert Anode Roadmap*, which set a framework to guide the development of any new inert anode technology. In this framework, nine of the leading North American aluminum companies have developed a consensus on the required performance characteristics and development requirements of the technology. The industry anticipates that the framework will also serve to accelerate research efforts in advanced cell technology by aligning the different segments of the research

community toward a clearly defined goal. This initiative being taken by the aluminum industry is very timely considering the Clinton Administration's proposed additional funding of research and development aimed at reducing greenhouse gas emissions.

In 1997, the Office of Industrial Technologies at the U.S. Department of Energy prepared a brief proposal in response to that year's CCAP initiative. The proposal discussed plans to conduct further research in advanced cell technology and quantified the national benefits (in terms of greenhouse gas reductions) of accelerating the development of this technology.

BARRIERS TO OR OPPORTUNITIES FOR REDUCTIONS

A number of critical technology barriers must be overcome before inert anode technology can be successfully developed. These barriers fall into the following categories:

- anode materials
- basic knowledge
- measurement/evaluation/analysis
- systems

Some of the most critical barriers to the success of the technology exist because a "viable" material for fabricating the anodes has not yet been demonstrated. (Viable refers to the durability and longevity of the anode in keeping its initial thermal and chemical properties). There are also a number of fundamental issues related to the operation of inert anodes that have not yet been fully resolved. This is due in part to a lack of models that would yield a better understanding of the overall process. The most critical gap in basic knowledge is that not enough is known about bath surface reactions during use of the new technology. Measurement and systems barriers are related to testing, modeling, and controlling the new technology and the new or retrofitted cell.

Under the VAIP program, the primary aluminum industry is continuing to find new ways to optimize operations of the potlines, thereby further reducing PFC emissions.

Overcoming these technical barriers and achieving large reductions in greenhouse gas emissions requires a major financial investment in research and development on inert anode technology.

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