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Folder Title:
R&D [Research & Development] & Tax Incentives - $6 Billion [Climate Change Technology Initiative]

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Climate Change Technology Initiative
$6.3 billion over 5 years

- $2.7 billion for increased R& D spending
- $3.6 billion for tax incentives

Buildings:
- provide tax incentives and partnerships to develop and deploy housing technologies, including highly efficient heating and cooling systems, appliances, and power generation
- streamline codes and regulations to create markets for advanced technologies
- encourage 1 million solar roofs in next 10 years

Industry:
- engage in public/private partnerships to reduce energy consumption
- establish additional R&D and tax credits for investment in combined heat and power, which captures currently wasted heat

Transportation:
- engage in public/private partnership to develop and deploy highly efficient new cars and trucks, 2-3 times more efficient than previous generations
- promote alternatives to single-occupancy vehicle travel through incentives on public transport, van pools, parking, and coordinating with other DOT programs

Electricity:
- promote renewable energy
- restructure electricity industry
- undertake R&D to extend life of nuclear power plants
- develop lower-carbon coal combustion technology

Carbon removal and sequestration:
- undertake R&D to remove carbon dioxide from combustion gases or sequester it so it doesn't enter the atmosphere, e.g. through biological processes

Crosscutting analysis and research:
- study options for trading system and develop institutional capacity
- assess new scientific results and appropriate responses

Climate Change Technology Initiative (CCTI)

Last fall, the President announced a nine-point plan to begin addressing climate change, including a five-year, $5 billion package of tax incentives and research and development spending to spur energy efficiency and help develop low-carbon energy sources. With the historic agreement in Kyoto in December 1997 to reduce greenhouse gas emissions, the President is now proposing a $6.3 billion initiative over 5 years -- $2.7 billion in increased spending and $3.6 billion in tax incentives. (See Table 1.) For FY 1999, the budget shows $473 million in increased spending on climate-change related technologies ($1.292 billion vs. $819 million in FY 1998) and $421 million in tax incentives, for a total first-year initiative of $894 million.

TABLE 1

Direct Programs & Tax Incentives	Dollars in Millions				
BY AGENCY	1997 Actual	1998 Estimate	1999 Proposed	Dollar Change: 1998 to 1999	Total Increase 1999-2003
Energy	657	729	1060	+331	+1,899
Environmental Protection Agency	86	90	205	+115	+677
Housing and Urban Development	--	--	10	+10	+10
Commerce	--	--	7	+7	+38
Agriculture	--	--	10	+10	+86
R&D Program Total	743	819	1,292	+473	+2,710
Tax Incentives	--	--	421	+421	+3,635
Climate Change Technology Total	743	819	1,713	+894	+6,345

TABLE 2

Direct Programs	Dollars in Millions		
BY AREA OF EFFORT	1998 Estimate	1999 Proposed	Dollar Change: 1998 to 1999
Buildings	146	264	+118
Industry	156	216	+60
Transportation	246	356	+110
Electricity	220	332	+112
Carbon Sequestration and Cross-Cutting Research	0	42	+42
Policy Analysis, Market Incentives	6	26	+20
Program Direction	45	57	+12
Climate Change Technology Direct R&D Total	819	1,292	+473

Columns may not add due to rounding.

The principal focus of the initiative is an R&D portfolio that covers the four major carbon-emitting sectors of the economy (buildings, industry, transportation, and electricity), plus carbon removal and sequestration, Federal facilities, and crossing cutting analyses and research. (In Table 2, Federal Facilities are included under Buildings.)

BUILDINGS

- ***Accelerate the deployment of existing technologies.*** Major improvements in the energy efficiency of both residential and commercial buildings can be obtained through better labeling of highly efficient technologies and appliances (such as the easily identified Energy Star label), through demonstrations and partnerships with builders and developers, and through two related tax credits:

    - one that encourages the purchase of certain highly efficient building equipment (electric heat pumps, natural gas heat pumps, advanced central air conditioners, and fuel cells for power generation); and,

    - one that provides a credit for the purchase of highly-efficient new homes.

- ***Partnerships for Advanced Technologies in Housing (PATH).*** HUD will lead a team that includes DOE and EPA to work with the building industry to develop, demonstrate, and deploy housing technologies and practices that are inexpensive, highly efficient, and attractive to consumers. This effort will also focus on streamlining Federal, state, and local codes and regulations, education outreach, and creating local markets for PATH housing using pilot sites and demonstrations.

- ***Million Solar Roofs.*** In June of 1997, the President announced an initiative to encourage the installation of one million solar hot water and solar photovoltaic (PV) installations on buildings over the next 10 years. DOE will fund cost-reduction R&D for solar thermal and rooftop PV systems, and will establish partnerships with communities, builders, and other Federal agencies to promote the use of building-mounted solar systems.

    - In addition, a tax credit is proposed to encourage the purchase of rooftop solar thermal and PV systems.

- ***Increased R&D.*** In addition to encouraging the deployment of the best available technologies, DOE is also increasing its research on building systems modeling, to help architectural engineers, and on major components such as next-generation heat-pumps, cooling systems, furnaces, and lighting.

INDUSTRY

- ***Partnerships with industry.*** DOE works closely with industry on technology roadmaps and plans to reduce energy consumption and secure early reductions in greenhouse gas emissions. Industries already engaged in this effort include aluminum, steel, glass, paper and forest products, metal casting, and chemicals. These technology roadmaps form the basis for cost-shared R&D with industry teams and consortia.

    - This work will be enhanced within DOE, and complementary efforts will be undertaken by EPA, USDA, and DOC (NIST), which will lead to voluntary greenhouse gas reduction programs within industry.

- ***Combined heat and power.*** This is an advanced form of cogeneration that integrates power generation with the provision of useful thermal energy in a factory or building.

    - R&D will be accelerated on advanced turbines, fuel cells, and other technologies, and new approaches to capturing useful work or heat through several temperature stages (e.g. electric generation, industrial process steam, steam building heat) in factories or commercial buildings will be demonstrated. When commercially accepted, these systems will allow us to capture the waste heat the Nation now throws away.

    - A 10 percent tax credit is also proposed for investments in combined heat and power systems that have depreciation recovery periods of 15 years or longer.

    - Tax credits are also proposed for certain investments to remove or recycle fluorine and fluorocarbon compounds that act as highly-potent greenhouse gases.

TRANSPORTATION

- ***Partnership for a New Generation of Vehicles (PNGV).*** A government-industry effort to develop an attractive, affordable car that meets all applicable safety and environmental standards and gets up to three times the fuel efficiency of today's cars, or roughly 80 miles per gallon. Five agencies participate in PNGV -- DOE is the largest player, followed by EPA, DOC, NSF, and DOT.

    - The program will lead to "concept cars" in the year 2000 and production prototypes in 2004.

    - This winter, industry and the government have announced the designs that they will pursue -- hybrid vehicles that combine a power source (a piston engine or fuel cell) with battery storage and electric motors.

- In FY99, the combined request for PNGV-related work in those agencies is $277 million, up from $227 appropriated in FY98.

- Tax credits are proposed to encourage the purchase of this type of highly-efficient vehicle, and to help make them more affordable. A $3,000 credit will be available starting January 1, 2000 for vehicles that are twice as efficient as the norm for their class, and a $4,000 credit will become available January 1, 2003 for vehicles that are three times as efficient as the norm. (The $3,000 credit would phase out by 2006, and the $4,000 credit would phase out by 2010.)

- ***Partnerships for Light and Heavy Trucks.*** Similar government-industry efforts are proposed to develop more efficient diesel engines for both light trucks and heavy trucks.

  - DOE has been engaged in R&D on more efficient large truck engines for several years, and that effort will be stepped up in FY99, in coordination with increased work on large diesel engines at EPA and DOD.

  - A government-industry partnership is currently being formed for R&D on smaller diesel engines suitable for light trucks and sport-utility vehicles (SUVs), which are the fastest-growing class of passenger vehicles. A clean, efficient diesel engine could improve the fuel-economy of light trucks and SUVs by 50 percent.

- ***Sustainable Transportation.*** This initiative would promote alternatives to single-occupancy vehicle travel using pilot projects in selected communities modeled after the highly successful approach adopted by the Portland, Oregon metropolitan region.

  - Tthe sustainable transportation programs in EPA and DOE will be coordinated with existing and planned DOT programs. (DOT is not funded within the Climate Change Technology Initiative, however.)

  - An amendment is proposed to current tax law to equalize treatment of parking and transit benefits. To encourage public transportation and vanpools, employers would be allowed to provide tax free transit and vanpool benefits in lieu of compensation, up to the same amount that they can provide for parking.

ELECTRICITY

- ***Renewable energy.*** Expand research partnerships for key renewable technologies such as wind, photovoltaics, geothermal, biomass, and hydropower to accelerate price reductions and improve performance. The same programs will also be supporting increased R&D in hydrogen production and storage and in superconductivity.

  - The FY99 budget proposes a $100 million increase in DOE for solar and renewable energy R&D -- a 37 percent increase over FY98.

- A 5-year extension is proposed for the tax credit for electricity produced from wind and biomass.

- The photovoltaic (solar electric) component of the Million Solar Roofs initiative (described above under "Buildings") also can be described as an electricity-sector initiative, providing "distributed generation."

• *Electricity Restructuring.* DOE and EPA will work with States and utilities on the restructuring of the electricity sector, to ensure that the restructuring does not create barriers to the adoption of renewable and low-carbon generating technologies.

• *Nuclear power-plant life extension.* DOE will initiate an R&D effort addressing the critical technology needs to allow currently-operating nuclear power plants to safely extend their opertaing lifetimes by 10 to 20 years.

- Under current NRC licences, approximately 60 annual gigawatts of electric generating capacity would have to be retired between now and 2015. (Most of that comes between 2005 and 2015.)

- Providing the technologies necessary to safely operate these plants for another 10 to 20 years will make the transition to other low-carbon energy sources, such as solar and renewable energy, much easier.

- (NRC has indicated that they would probably not grant any plant more than one life extension.)

• *Innovative coal combustion technologies.* In FY99, DOE will initiate a research program on innovative new approaches to coal combustion that offer the possibility of much lower carbon emissions than existing technologies.

Coal mixed w/ biomass
decarbonizing w

CARBON REMOVAL AND SEQUESTRATION.

• *Sequestration R&D.* Research initiatives are being funded in both basic and applied research to find ways to remove carbon dioxide (CO_2) from combustion gases and sequester (store) the carbon so that it does not enter the atmosphere.

- DOE's basic science office will engage in biochemical and microbial research.

- DOE's fossil energy office will conduct an applied sequestration R&D program, jointly managed with the basic science office.

- USDA will initiate research on enhancing the carbon-sequestering capabilities of agricultural species. NIST will support complementary biotechnology work on plant metabolism and carbon use.

CROSSCUTTING ANALYSIS AND RESEARCH

- ***Emissions credits, incentives, and trading.*** EPA will lead an effort, assisted by DOE, to evaluate options for a domestic trading system and early reduction program in industry. The Federal government will work with stakeholders to understand their views and interests, and to build the institutional capacity needed to implement a carbon emissions credit and trading system.

- ***Program and science assessments.*** DOE will lead efforts to assess the implications of new research results produced by the Global Change Research Program, in order to determine what geographic and technological responses may be appropriate.

Position Paper
Climate Technology Initiative Meeting
February 19-20, 1998

Background:
The Climate Technology Initiative (CTI) was created by the Annex II Parties to the Convention at the first Conference of the Parties in Berlin. After a shaky start, the CTI made progress over the last year and a half in developing partnerships with private sector and quasi-private organizations and in implementing work programs in some of the task forces. It has become apparent to the participants however, that after Kyoto a redirection and reorganization of the CTI was necessary.

This need for refocusing its efforts was first formally acknowledged by the CTI through a non-paper circulated by the U.S. and discussed by the CTI about a year and a half ago.

The U.S. assumed the chair of the CTI after Kyoto. A meeting of the CTI has been scheduled for February 19-20. This meeting is for the purpose of considering proposals for redirection and reorganization of the CTI. To lay the foundation for this meeting, a strategic planning session was held in Albuquerque, New Mexico on January 20-21, 1998. The minutes of that meeting are attached. The planning session proposed a reorganization of the CTI and a clarification of its mission and function. The reorganization streamlines the task force structure into three core groups: Research and Development; Technology Assessment, Analysis, and Strategy, and Capacity Building. The two task forces that had been chaired by the U.S. are incorporated in a broader Capacity Building Task Force. The new structure also could potentially accommodate existing proposals by AID to develop cooperative framework agreements with developing counties.

U.S. Position:
The USDEL will support the redirection and reorganization of CTI efforts reflected in the minutes of the Albuquerque meeting. The reorganization should focus CTI work and incorporate similar activities within each task force. The USDEL will also support the draft terms of reference developed for the task forces which are part of the attached minutes of the meeting.

With respect to the development of cooperative framework agreements, the USDEL will identify potential legal issues associated with the creation of certain types of legal agreements when the CTI has limited international legal status. The U.S. will propose the creation of a small informal group to investigate this issue and to propose an institutional means for accomplishing the laudable purposes behind the cooperative agreements proposal.

It is expected that the topic of developing country participation will be discussed. The U.S. is supportive of increasing developing country involvement in the CTI, in particular, through the work of task forces.

At the Albuquerque meeting, the issue of CTI serving as a "technology broker" was raised. The scope of this discussion was not well focused, being largely theoretical in nature. It was agreed that the topic would be revisited at the next CTI meeting. The USDEL will discourage CTI activities which could place the CTI in the role of financial intermediary.

It is expected that the topic of overall CTI management will be discussed. Previous CTI discussions over the past year have considered the establishment of an industry advisory group. It is the USDEL position that this issue be studied, but no conclusion reached until the implications are more fully assessed.

The U.S. will work with other countries to identify chairs for the task force on Technology Assessment, Analysis, and Strategy and the task force on Capacity Building. The U.S. will support the development of a working bureau, functioning as an executive management committee, that is composed of the chairs of the three task forces and two vice chairs, in addition to the chair. The USDEL will work to ensure regional balance in the selection of the bureau.

or Hill Huntington

ask John Weyant for EMF 13

paper in Energy Policy by S&J on
En.eff gap.

TERMS OF REFERENCE

Capacity Building

The Task Force on Capacity Building will seek to enhance countries' capacity to diffuse climate-friendly technology and practices in all sectors and for all gases. Activities could involve:

a) promoting the training and exchange of technical experts;

b) establishing and implementing climate technology framework agreements (in all sectors identified in the Kyoto Protocol) that lead to diffusion of climate-friendly technologies . The technology co-operation agreements being pursued by the IEA could form the 'energy component' of such agreement (i.e. the CTI would create an umbrella structure for such agreements).

c) assisting with national climate change action plans and national communications

d) developing networks for information sharing

e) assisting the UNFCCC Secretariat to co-ordinate bilateral/multilateral technology activities

f) promoting and co-ordinating climate-friendly technology policy and practices, for example, government procurement , increasing the use of standards to increase diffusion, [international financial institutions] .

The Task Force on Capacity Building will develop work plans describing its activities. These work plans will identify deliverables, objectives, issues, resources, clients and time frames. The work plans will be developed in close cooperation with stakeholders, partners and clients, particularly developing countries and involve them in the work, as appropriate.

The Task Force will expand the participation of developing countries, environmental and developmental NGOs, and industry in its activities and planning.

The Task Force will seek to communicate to a broad audience its activities and accomplishments and in general extend the understanding and recognition of the CTI.

Technology Assessment, Analysis and Strategies

The task force on Technology Assessment, Analysis and Strategies would seek to assess and analyze technology needs and ultimately to develop a strategy for accelerated diffusion of technology in all sectors and for all gases. Activities would involve:

a) case studies and indicators of performance with respect to barriers to diffusion of technologies

b) conducting technology assessments with special emphasis on the role of governments to advance diffusion of climate-friendly technologies (co-ordination versus competition)

c) developing long-term technology strategies and scenarios.

d) coordinating technology issues with the UNFCCC.

The Task Force on Research and Development will develop work plans describing its activities. These work plans will identify deliverables, objectives, issues, resources, clients and time frames. The work plans will be developed in close cooperation with stakeholders, partners and clients, particularly developing countries and involve them in the work, as appropriate.

The Task Force will expand the participation of developing countries, environmental and developmental NGOs, and industry in its activities and planning.

The Task Force will seek to communicate to a broad audience its activities and accomplishments clients and time frames. The work plans will be developed in close cooperation with stakeholders, partners and clients, particularly developing countries. and in general extend the understanding and recognition of the CTI.

Research and Development

The Task Force on Research and Development would seek to promote the development of new climate friendly technologies through the establishment of a broad network of technology experts, to concentrate on concrete Research and Development projects on technologies with high potential impact, and to collaborate with (provide synergy with) existing bilateral and multilateral Research and Development agreements. Activities could involve:

a) developing selection and evaluation criteria for R&D projects (e.g. cost benefit analysis) in order to determine the amount of impact of particular projects.

b) establishing a CTI research network for collaborative R&D into medium and long-term technology options. This would be coordinated with existing collaborative research and development programmes of the IEA and other organisations.

c) increasing the awareness of Research and Development efforts.

The Task Force on Research and Development will develop work plans describing its activities. These work plans will identify deliverables, objectives, issues, resources, clients and time frames. The work plans will be developed in close cooperation with stakeholders, partners and clients, particularly developing countries and involve them in the work, as appropriate.

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The Task Force will seek to communicate to a broad audience its activities and accomplishments and in general extend the understanding and recognition of the CTI.

Aviation - 2.5% of fossil fuel combustion. of CO_2

- NO_x emissions may have equivalent GHG potential when considered as an ozone precursor

contrail effect could be much higher than CO_2 effect by seeding cirrus clouds

Int'l Civil Aviation Org. - UN subsidiary body
- New emissions standards
- new " regime

Aviation Rep

airspace is constrained
need to modernize air traffic control
have reached limit of Nox efficiency
1/2 of delays occurs on ground
1/2 " " " in air

* no resolve to get it done soon
* money limitations
* FAA budget
* planes need retrofit
* partnership establishment

20% delayed by ≥ 15 min.
17% fuel could be saved by more modern air traffic cont'l
About 12% worldwide fuel could be saved

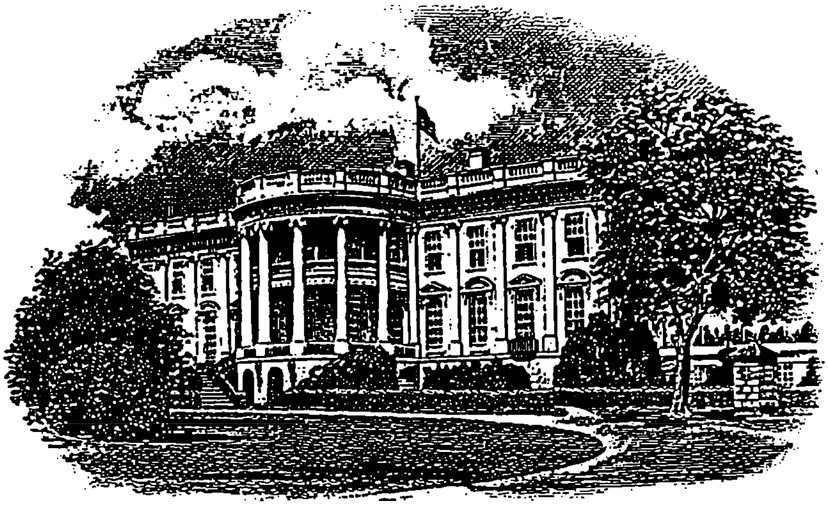
→

Tradeoff btwn CO_2 & NO_x - higher efficiency ⇒ ↑ NO_x

- ATA & airlines are prepared to move quickly
Rio Conference, Congress, Aviation trust fund

EXECUTIVE OFFICE OF THE PRESIDENT

Office of Management and Budget



Natural Resources, Energy and Science

FAX TRANSMITTAL COVER SHEET

*umber of pages (including cover sheet)*________

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*Phone:*________ ________ *Fax:*________

From: Alecia Ward, Confidential Assistant to the Associate Director

Comments: Revised Papers for the 2PM GCC mtg tomorrow 7/16/97 Rm 324.

Phone: (202) 395-4561 Fax: (202) 395-4639

Transportation: Light Duty Vehicles and Carbon Emissions

Key Findings

- Based upon data from AEO97, the transportation sector used 24.4 quads of energy in 1995, about 27 percent of the nation's total energy requirements. Because of its almost total dependence on petroleum fuels (accounting for 97 percent of total energy use), the transportation sector was responsible for 33 percent of the overall U.S. greenhouse gas emissions. By 2010 transportation energy use will grow to 31.4 quads, a 29 percent growth over 1995 levels. In energy terms, this is the fastest growing end-use sector, significantly above the 19 percent growth of the economy as a whole. Carbon emissions will follow a similar pattern, increasing from 465 to 598 MMT in the years 1995-2010. Emissions in 1990 were 432 MMT.

- Light duty vehicles, including automobiles and light trucks, accounted for 58 percent of the nation's total transportation energy requirements in 1995. In contrast, freight trucks used only 22 percent of the transportation energy in 1995. The remaining 19 percent of the transportation share was used by air, rail and marine travel, pipeline fuels and lubricants. The share of light duty vehicles will fall to 55 percent by 2010.

- The transportation sector as a whole has the potential to reduce energy use and carbon emissions by 15-20 percent over 2010 baseline forecasts through cost-effective investments in energy efficient technologies, and in some cases, low-carbon technologies. This will not be enough to reduce carbon emissions to 1990 levels, but the savings can be achieved without significantly affecting either comfort, safety or travel.

- The anticipated 2010 energy and carbon savings could be achieved in the case of automobiles, for example, if new car sales in that year achieve one-third of the fuel economy gains represented by the PNGV goal of 80 MPG (i.e., moving from a fuel economy of 28 to 45 MPG).

- Assuming that PNGV cost goals are not met, and that the price of new vehicles in 2010 reflect current estimates of new technology costs, a 45 MPG car will cost between $800 and $1,200 more than a 28 MPG car (in 1995 dollars). Assuming 13,600 vehicle miles traveled for new vehicles and a gasoline price of $1.23 in 2010 (also in 1995 dollars), this implies a roughly 3.5 to 5.3 year simple payback for a car that has an expected 14-year lifetime.

Background

By 2010 transportation energy use will grow to 31.4 quads, a 29 percent growth over 1995 levels. In energy terms, this is the fastest growing end-use sector, significantly above the 19 percent growth of the economy as a whole. Carbon emissions will follow a similar pattern, increasing from 465 to 598 MMT in the years 1995-2010. Emissions in 1990 were 432 MMT. In the case of light duty vehicles, the growth in energy consumption is driven by increases in the vehicle miles traveled (VMT), and the significant growth of light trucks (including vans, sport cars and recreational vehicles) which have a substantially smaller fuel economy. The sales of light trucks have grown from a 20 percent market share in 1975 to a 44-percent market share in 1996. Whereas new cars are rated at 28 MPG, light trucks enter the market with a rating of only 20.5 MPG.

CO_2 Reduction Potential and Scenarios

Despite the significant growth in energy use by light duty vehicles, the technology exists to increase the average fuel economy of new vehicles by 40 percent or more in the year 2010 — without the need for reduced travel or increases in the cost of travel. This is true in both the movement of people and freight. This success would be achieved in the case of automobiles, for example, if new car sales achieve one-third of the fuel economy gains represented by the Partnership for a New Generation Vehicle (PNGV) goal of 80 MPG.

Major technologies for near-term light duty vehicle improvements include, for example, material substitution, reduced aerodynamic drag, improved automatic transmissions, reduced engine friction, variable valve timing, and advanced tire designs. Many of these technologies have already emerged in the market, lacking only appropriate policy signals to accelerate their diffusion, or to redirect their use toward fuel economy instead of improving other vehicle attributes. Honda, as one example, employs a system of variable valve timing that is used to boost power and improve fuel economy. General Motors has one vehicle that has already achieved a low aerodynamic drag. On the other hand, lean-burn engines which increase engine thermal efficiency are a low-risk technology that should be readily available by 2010.

barriers + policy

Work developed for the "Car Talk" advisory committee[1] resulted in estimated reductions of both energy use and carbon emissions (measured in million metric tons of carbon, or mmMTCe) through a variety of both technology and policy options. Summarized in the table below, and generally covering the period 2005 through 2025, the options include improved land-use planning, higher fuel prices, fuel economy standards and feebates, the PNGV vehicle, and the use of low life-cycle carbon fuels.

Modeling a different set of technology assumptions showed a significantly different set of results. DRI focused on largely behavioral response to reduce transportation energy consumption, while Markal-Macro had a larger technology bent. The table on the following page highlights these differences for automobiles. (Note: the reference to CCAP is the so-called Case Two scenario which moved toward but did not necessarily hit a rate of decline in E/GDP of 1.25 percent. This compares to an assumed 1.00 percent decline in the base case. The Case two scenario includes both the full set of CCAP programs as well as "announcement effect." Case three, the Technology Case formerly described as the 1.75 Case, assumes a higher level of investment potential for cost-effective energy efficient/low-carbon technologies.)

In case two (with stabilization), DRI forecasts a 9 percent reduction in VMT with an 8 percent increase in MPG for new automobiles. DRI's case three (with stabilization) forecasts a 5 percent VMT reduction with a 10 percent increase in new car MPG. MM shows a seven percent drop in VMT for the CCAP scenario. This rebounds, however, to nearly base case levels with better assumptions about improved levels of technology. Although new cars in MM enter the market in 2010 with a high EPA-rated fuel economy (again, with about one-third of the improvements of the PNGV goal), the entire fleet of automobiles show an on-road MPG of only 30 MPG because of the

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1. The "Car-Talk" committee is the *Policy Dialogue Advisory Committee to Assist the President in the Development of Measures to Significantly Reduce Greenhouse Gas Emissions from Personal Motor Vehicles* formed in 1993 to see whether a consensus set of policies could be developed to return personal transport GHG emissions to 1990 levels by 2005, 2015 and 2025. The committee failed to agree on such policies, but substantial analytic results were developed by a team of government analysts working with several expert committee members.

what does this mean?

time needed for fleet turnover. Hence, it is the on-road change in fleet fuel economy — moving from 24.2 to 30 MPG — that drives much of the transportation energy and carbon savings.

Costs

In the Markal-Macro assumptions, a new vehicle at 45 MPG would cost an estimated $1,200 above new cars in the base case. This assumes the PNGV cost goals are not met by the year 2010. The newly released *Energy Innovations* study suggests an added cost of about $800 dollars (in 1995 dollars). However, owners of the new vehicles would save about $225 per year in avoided gasoline costs (also in 1995 dollars, assuming an average driving range of 13,600 miles per vehicle and a cost of gasoline of $1.23 per gallon). Simple payback for this technology improvement would range, therefore, from 3.5 to 5.3 years. In comparison, the average life of a new car would be about 14 years.

Car-Talk Summary Table of Policy Options[2]
(mmMTCe)

Policy Measure	Policy Type	2025 Annual Emission Reduction
Land Use and Transit Policy Package	Less VMT	25
Fuel Price Increases ($0.50/gal.)	Less VMT	120
Parking Tax ($2.00 nationwide)	Less VMT	25
Road Pricing	Less VMT	25
Fuel Economy Standards, "Feebates"	More Fuel Efficiency	90
PNGV	More Fuel Efficiency	60-200
Bio-Ethanol Subsidy	Low Emission Fuels	100
GHG Savings Needed to Return Personal Transport Emissions to 1990 Levels by 2020-2025		200-260

Key Automobile Indicators in 2010

	DRI			Markal-Macro		
	Base	CCAP	Technology	Base	CCAP	Technology
VMT	1526	1403	1450	1619	1509	1597
MPG New Car (EPA)	29.2	31.4	32	30.7	43.4	44.7
MPG Car Fleet (EPA)	24.7	26.5	30.6	29.3	32.7	35.7
MPG Car Fleet (On-Road)	23.3	24.5	26.9	24.4	27.3	30
LDV (MMT)				342	293	259

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2. Emission reductions may not be added since the impact of implementing multiple policies may be significantly less than is implied by adding up the individual estimates. However, the motor vehicle GHG model used to develop most of these estimates can be used to forecast the effect of multiple policies.

The Problem of Allocating Carbon Savings

Comparing the savings from MM Case 3 using three different accounting methodologies └ 1.75 case

Methodology One:

All electric DSM and Fuel Switching options are allocated to the electric utility sector

	Fuels (MMT)	Electric (MMT)	Total (MMT)
Bldgs	36	0	36
Industry	36	0	36
Trans	116	0	116
Utilities	0	239	239
Total	188	239	427

Methodology Two: lab study approach

All electric DSM savings allocated to end-use sectors while change to low carbon fuels on utility side of meter allocated to the electric utility sector

more support for 2

do final D Δs first, then fuel switching

similar to MM acctng framework

	Fuels (MMT)	Electric (MMT)	Total (MMT)
Bldgs	36	112	148
Industry	36	58	94
Trans	116	0	116
Utilities	0	69	69
Total	188	239	427

X **Methodology Three:**

All savings allocated to end-use sectors

	Fuels (MMT)	Electric (MMT)	Total (MMT)
Bldgs	36	151	187
Industry	36	88	124
Trans	116	0	116
Utilities	0	0	0
Total	188	239	427

Eric Peterson – #s don't add up w/ their M-M runs

Key Industrial Indicators for 2010 and 2020

Indicator	Markal-Macro							DRI						
	1995	2010			2020			1995	2010			2020		
		Base Case	Case 2	Case 3	Base Case	Case 2	Case 3		Base Case	Case 2	Case 3	Base Case	Case 2	Case 3
Output (1995=1.000)	1.000	1.408	1.400	1.412	1.544	1.531	1.551	1.000						
Energy (Quads)	19.6	22.8	19.3	20.2	24.3	19	20.1	22.8	25	21.9	22.3	26.4	21.9	22.4
Emissions (MMT)	466	563	421	465	592	407	456	472	521	436	445	542	419	422
10-Year Rate of Annual Efficiency Improvement	n/a	1.1%	2.6%	1.7%	0.8%	1.5%	1.4%	n/a	1.5%	2.6%	2.7%	0.9%	1.5%	1.4%

Note: Because of differences in accounting between the MM and DRI models, and because the energy totals do not include chemical feedstocks, the energy and carbon savings are somewhat understated. The overall magnitudes are in the right direction, however.

Freight, Aircraft and Rail
Emissions Projections and Potential for Reduction

Julie Fox Gorte, U.S. EPA

try to make this section fit on 1st page

Key Findings

Current and Projected Emissions from Commercial Transport 1990-2010 and Beyond

	1990	1995	2010 base[1]	2010 with advanced technology[2]
Total Emissions, MMTC	185[3]	195	276-295	244-266
Freight Truck Emissions	60	63	92-130	54-116
Aircraft Emissions	64	68	90-110	75-130
Rail Emissions	9	9	10	7
Other Emissions (marine, pipeline, other)	51	55	64	63

- Total carbon emissions from the transportation sector in 1995 were nearly 470 MMT. The freight, aircraft and rail sectors accounted for over 130 MMT of carbon emissions, or 28 percent of all transport emissions.
- All modes of freight transport, including trucks, rail, pipeline, shipping, and air, have improved their energy efficiency. However, intermodal shifts to more energy-intensive trucking and air transport has meant very little change in the amount of energy used to haul freight from 1972 to 1995. Because of increasing efficiency, however, three times as much freight was hauled in 1995, for about the same amount of energy, as in 1972.
- Energy use and carbon emissions from non-personal vehicles may surpass energy use and emissions from automobiles shortly after the millenium.
- Opportunities to reduce carbon emissions or energy use in commercial transport before 2010 will likely come mainly from trucking and air transport. Analysis of possibilities in a study by 5 DOE laboratories estimated that roughly 20-45MMT could be saved by new technologies, increased use of cellulosic ethanol fuel, and improved traffic flows. About 10 MMT in reduced emissions come from trucking, 10-15 come

[1] This range expresses forecasts of both Markal Macro and the 5-lab study. Sector figures may not add to totals due to rounding and to the fact that the range bounds four different projections, two in Markal Macro and two in the labs study.

[2] This range expresses forecasts of both Markal Macro and the 5-lab study. Sector figures may not add to totals due to rounding and to the fact that the range bounds four different projections, two in Markal Macro and two in the labs study.

[3] 1990 emissions numbers are estimates. True figures will be in the next draft.

from air transport, and 7-10 from rail.[4]

- Significant reductions in emissions from commercial vehicle transport are possible beyond 2010 with an aggressive R&D program and coordinated public sector efforts to diffuse very low emission or zero emission technologies like fuel cell/fuel cell hybrid powertrains in rail and truck freight transport. In aircraft, significant improvements in energy use and carbon emissions are possible beyond 2010 with designs that promote laminar (e.g. non-turbulent) flow of air over the airframe, and continued work on energy efficient propulsion in subsonic jet engines.
- Achieving these savings in emissions by 2010 will require a more aggressive program of research and development in conventional powertrains and propulsion. The DOE five-lab study stipulates that carbon emissions reduction at the low end of the ranges in the last column of the table above are likely, so long as the government institutes appropriate policies and research efforts are intensified. They do *not* depend on fundamental technical breakthroughs, and do not require stepped up capital turnover.
- Substantially greater opportunities to reduce emissions in commercial transport are apparent by 2015 than in 2010, primarily because most commercial transport capital is long-lasting. By 2015, the DOE labs study estimates that it would be possible to reduce emissions to 1997 levels (about 5 percent above 1990 levels) in its most optimistic scenario, which requires some luck in achieving technical progress as well as the appropriate policy environment and increased support for research and development on the order of two to ten times current levels [add numbers].
- DOE estimates that the annual costs to achieve emissions reductions are $25-20 billion, and would save $35-40 billion annually in energy costs. On balance, this level of investment could either break even or save up to $10 billion.
- [Bullet on current technology programs: put in the investment in PNGV and USABC and applicable NASA aeronautics programs. Add comparison numbers on industry R&D in motor vehicles and commercial subsonic aircraft.]

barriers & policy

Background

The transportation sector, which includes both personal transportation (cars and light trucks, rail and air) and freight (heavy trucks, rail, aircraft, pipeline, and ships) accounts for almost 11 percent of U.S. GDP. The freight sector accounts for about a third of that.

Total emissions from freight and aircraft wereabout 185 MMT, with heavy trucks and aircraft each accounting for about one-third of the total. Aircraft emissions account for all aviation, including freight, passengers, and military, with the lion's share of aviation carbon emissions coming from passenger travel. Air freight was estimated at 1% of all air transport in 1989, and while it is the fastest-growing mode of non-local freight transport, it probably only accounts for a few percent of all freight transport in 1997. The share of emissions due to freight alone is unavailable, as many commercial flights carry both passengers and freight.

The U.S. economy moves more ton-miles of freight every year, on every mode. All modes of non-local freight transportation increased between 1970 and 1994. Air freight increased the most (434%), followed by trucks (210%), rail (57%), pipeline (41%), and water (37%). Water, rail, and trucks are each responsible for about 25% of freight movement, measured in ton-miles.

Truck use for freight has increased dramatically in the last 15 years. In recent years, however, trucking loads have grown heavier; between 1982 and 1992, mileage traveled by trucks with operating weights above 80,000 lbs. increased193%, and 120% for trucks below 33,000 lbs. *The average length* of haul increased from 224 miles in 1994 to 817 miles in 1994.

All modes have consistently improved their energy efficiency. Improvements have come from both technology and operational efficiencies. Between 1984 and 1994, heavy truck energy use per vehicle mile decreased 0.4% per year, and 1.6% annually per ton-mile. In rail, energy use per car-mile dropped 0.9% per year,

[4]These figures still do not match adequately with numbers in the table above. DOE and EPA are working to understand the differences in numbers from the labs study and Markal Macro, and develop crosswalks.

and 2.7% annually per ton-mile.

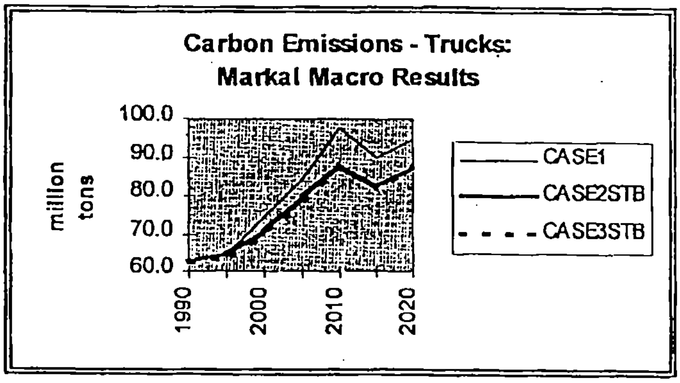
Between increasing efficiency and the shift to more energy-intensive modes (trucks and air), the net energy effect is about a wash: if energy intensities of 1972 still prevailed, 1994's energy bill for freight movement would be treble [check this] the actual number.

Improvements in fuel efficiency improvement have slowed in personal vehicles, but continue in other modes of transport. In freight, the weight and cost of fuel carried has a direct effect on the amount of freight that can be carried, so there are incentives to improve fuel efficiency even when fossil fuel prices are low. Nevertheless, commercial transport is substantially more energy intensive per mile than light duty vehicles; truck fuel efficiencies range from about 5.5 mpg to over 7-8 mpg for heavy- and medium-weight trucks, while automobiles average nearly 22 mpg. With freight transport growing faster than personal transport [check this], energy use and emissions from freight and commercial travel could outstrip energy use and emissions from personal vehicles by shortly after the turn of the century, according to Argonne National Laboratory.

Confirm w/ other transportation paper

Trucks and aircraft are expected to continue as the fastest-growing forms of non-personal transport, and will account for the greatest increases in emissions. The airline industry, since deregulation, operates close to maximum efficiency, and opportunities to use alternative fuels in aircraft are limited for the foreseeable future. Therefore most of the opportunities to reduce emissions from aircraft are in development and deployment of more fuel-efficient engine and airframe technology.

Reducing emissions from surface freight, on the other hand, is possible through both technological improvement and progress in reducing inefficient use of trucks (e.g. continued reduction in empty backhauls, more efficient routing, intrastate warehousing) and shifting from trucks to rail.



Model Results and Potential for Reducing Emissions

SGM does not include technological advances that affect emissions, or energy consumption, in the freight sector. DRI assumes modest advances in truck fuel efficiency—from 5.0 to 5.2 mpg in heavy trucks[5] by 2020, with no improvement by 2010. DRI also assumes that fuel efficiency of medium trucks[6] will increase from 6.5 mpg between 2010 and 2020, but no increase between now and 2010 [check].

Markal Macro includes several advanced technologies to improve the energy and carbon efficiency of freight, most of them fairly conservative projections of current trends. All three cases (base, stabilization with a rate of improvement in the energy/GDP ratio of 1.25%/year, and stabilization with E/GDP improvement of 1.75%/year) bring in more fuel-efficient diesels, with faster rates of introduction in the 1.25 and 1.75 cases. In addition, both advanced technology cases phase out existing gasoline trucks, and penetration of trucks LPGfuel. The 1.75 case shows very rapid penetration of diesel trucks that are 20% more efficient than current diesel trucks, starting in 2010 and accounting for well over 95% of vehicle miles traveled by 2020. Fuel efficiency of heavy trucks increases to 6.9 mpg in the 1.25 case and 7.3 mpg in the 1.75 case of Markal Macro. Carbon emissions in 2010 are forecast to be nearly 98 MMT in the base case, 88 MMT in the 1.25 case and 18 MMT in the 1.75 case (see figure above).

Emissions from rail, freight, air freight and pipelines were specified exogenously for the IAT, since none has more than a marginal impact on energy use and carbon emissions as a whole. The forecast shows emissions

[5]Heavy trucks are those greater than 33,000 lb.

[6]Medium trucks are those between 10,000 lb. And 33,000 lb.

from rail freight at 10.5 MMT in the base case, and 9.7 and 9.8 MMT, respectively, in the 1.25 and 1.75 cases. Emissions from shipping are reduced from 8.5 MMT currently to about 7.6-7 for all cases in 2010.

Overall, the IAT model runs could be described as technologically conservative in the freight area. Foreseeable technologies could make more significant reductions in emissions, particularly with more aggressive efforts to develop and diffuse the technologies. Programs to develop transportation technologies such as PNGV and NASA programs on energy efficiency and aerodynamics could probably bring these new technologies to proof of concept or demonstration before 2010, and several, particularly in truck componentry and efficiency, could be well established in the market. Energy experts at DOE's multiprogram laboratories point out, however, that current levels of funding for PNGV are probably inadequate to achieve the program's technical goals.

Technology Options: Trucks. There are many opportunities to improve energy efficiency and carbon dioxide emissions in freight. Improved aerodynamic design that reduces drag, advanced engines (the Turbocompound Diesel Engine and the Advanced LE-55 Heat Engine), vehicle weight reduction through materials substitution, improved tires, and electronic engine and transmission controls can achieve fuel economy improvements ranging from 2 to over 20 percent in heavy trucks, as can advances in computational methods (hardware and software) aimed at understanding turbulence both for aerodynamics and within fuel chambers. The lab study assumed that these new technologies could be cose effective at a fuel equivalent price of $8/million Btu, less than the $9/MMBtu assumed in the base case. Moreover, the lab study assumed that all energy-efficient truck technologies could achieve 99 percent of their maximum market penetration (which, for most technologies, is less than 100 percent) in 20 years, compared with a base-case value of 99 years for a few of the technologies (e.g., the advanced heat engine).

Rail. The fuel efficiency of rail transport has increased at a healthy clip--nearly 3 percent per year--for 25 years, far higher than the 1%-per-year improvement assumed in energy modeling [and likely the IAT, since base case was based on NEMS--check this]. Improved operational efficiency accounts for the great preponderance of this improvement; one estimate is that 85% of the increase in energy efficiency of rail transport is attributable to improved scheduling and operations management. However, we have not yet wrung all the energy efficiency these changes are capable of making from the system, so it is likely that rail's energy efficiency will continue to improve at rates closer to those of the last two decades for a while. Other advanced technologies that could reduce energy use in rail include flywheels, to store the energy given up when trains go downgrade for use in propulsion; oxygen enrichment in locomotive engines; and alternative fuels, including natural gas.

Technology Options: Aircraft. In aircraft, energy efficiency is a perennial concern primarily because reducing the weight of fuel is one way of reducing aerodynamic drag, a central and constant concern of aircraft and engine designers. NASA programs aimed at achieving greater fuel efficiency in engines were both technically and economically successful in the 1980s, improving the efficiency of existing engines as well as producing new, more efficient jet engine cores and components. NASA and industry (principally GE and Pratt and Whitney) also produced advanced turbofan and unducted fan engines that achieve significant gains in energy efficiency, but have not been commercialized primarily because falling fossil fuel prices reduced the payoff to greater efficiency in the late 1980s. These engines, however, are still available and could be incorporated into aircraft designs with less expense and development expense than clean-sheet designs would entail should they become more attractive options in the future.

Ongoing NASA/DOD/industry work on energy efficiency continues, under the Integrated High Performance Turbine Engine Technology program, aimed at achieving a 40 percent improvement in energy efficiency by 2003. It is well to note, however, that even if this ambitious technical goal is met, it will be many years before engines that incorporate the new turbine technology are incorporated into engines, and still more before they appear on aircraft, making significant penetration of the aircraft engine market by these technologies unlikely before 2010. However, NASA's earlier engine efficiency projects of the 1970s and 1980s are still yielding benefits in commercial engine technology, including the GE-90, the most energy-efficient engine of its type [check the bypass ratio of GE-90].

Intermodal Switching. Intermodal shifting, or switching from truck to rail haul or air transport, has been underway for some time. Intermodal transportation of freight, or using both trucks and rail or aircraft, cuts emissions by relying on more energy-efficient modes (rail and air) rather than trucks for part of the trip. The Department of Transportation estimates in its 1996 annual transportation statistics report that intermodal freight hauls meant 1.5 million fewer large trucks on the highways. A simulation done in Markal Macro shows that diverting 10 percent of truck ton-miles of freight to rail could save 4.3 to 4.7 MMT of carbon. Whether such a shift would be operationally feasible is unknown. Markal Macro includes no cross-elasticities to optimize intermodal shifts, and while DRI does, no shifts occurred in IAT runs of DRI's energy model.

Long Term Opportunities

Trucks. More revolutionary technological advances, including the use of fuel cells in powertrains, are possible with an aggressive program to develop fuel cells for motor vehicles, along with the storage devices (batteries and ultracapacitors), fuel storage, and infrastructures supporting increased use of hydrogen fuel. With such a program, it might be possible to introduce hybrid fuel cell/electric powertrains into trucks before 2010, though significant market penetration is very unlikely by then.

Rail. Fuel cell/electric powertrains may be somewhat more likely to happen in locomotives than trucks, though significant market penetration of fuel cells in rail before 2010 is doubtful. The cost of fuel cell power is still prohibitive in rail, but with further development and expansion in the use of fuel cells for other applications (light duty motor vehicles and terrestrial power generation, e.g.) the economics may become more favorable. While widespread use of fuel cells for any kind of transport poses some significant infrastructural, maintenance, and technical problems, there has been significant progress in fuel cell and other hybrid powertrain technology over the past several years, with significant contributions from PNGV, and NASA and DOD programs. With increased spending on hybrid powertrain development and the appropriate incentives to develop infrastructure and support for operation and maintenance, fuel cell applications may be possible, though at no significant scale, by 2010.

Air. NASA research on computational fluid dynamics and numerical simulation is also showing promise for modifying the skins of aircraft to include tiny, micron-thin riblets that could decrease turbulence, and thereby, drag, by 5 or 6 percent, increasing fuel efficiency and airlines' profit margins. It is quite likely that some of these improvements could show up on commercial aircraft before 2010, although full market penetration will take decades due to lengthy capital life.

Costs and Benefits

DOE estimates that the annual costs to achieve emissions reductions in transportation (including personal vehicles) are $25-20 billion, and would save $35-40 billion annually in energy costs. On balance, this level of investment could either break even or save up to $10 billion. Another caveat of the DOE lab study is that, to achieve the emissions targets in either the efficiency or efficiency/low carbon scenarios, R&D programs would have to be increased by 2 to 10 times [add investment number].

is the $10b value a NPV?

In the models, costs of faster introduction of new technology were handled by proxies. Most of the models were made to hold multifactor productivity constant, so that investments in energy efficiency are compensated for by reductions in the productivity of labor and capital. These cannot be assigned to specific sectors [or...can they? Check.].

[Add section on theco-control effects of these reductions in GHG to criteria air pollutants. Controlling CO2 emissions by improving energy efficiency gives a much bigger co-control benefit than the NAAQS does for carbon dioxide...]

Current Federal Programs and Funding

[Add section briefly describing PNGV, USABC, other DOE programs in fuel cells and transport, and relevant NASA aeronautics programs and their funding.]

Technical success in research and development does not assure adoption or diffusion of new technology. Successful completion of the technical program of PNGV and NASA's engine and laminar flow programs must also be followed by investment in commercial development and marketing by industry in order to achieve market penetration. Moreover, capital in the freight sector tends to be turned over quite slowly; with maintenance and overhauls, trucks can last a couple of decades and locomotives and aircraft even longer. Incentives to hasten capital turnover, such as accelerated depreciation programs or investment tax credits, would also help to achieve stabilization. Finally, improving energy and carbon efficiency can also pay off in terms of improved

barriers + policy

competitiveness of efficient engines and powertrains on international markets.

The Carbon Reduction Potential in the U.S. Buildings Sector

July 14, 1997 Draft

Key Findings

Substantial reductions in greenhouse gas emissions are possible in residential and commercial buildings through greater use of cost-effective energy efficiency technologies that not only cut energy use, but also save consumers and businesses money.

- Estimated potential carbon emissions savings in the residential sector are 13-40 million metric tons (MMT) in 2010 and 30-70 in 2020.
- Commercial sector potential emissions savings are 13-40 MMT in 2010 and 30-70 in 2020.
- Realizing these potential savings is dependent upon the effectiveness of policies in removing key market barriers to energy efficiency investments in buildings.
- These emissions savings are estimated to require investments of $7-$14 billion per year and result in annual energy bill savings in 2010 of $18-33 billion - for a net savings in 2010 of $10-19 billion. 11?

Background

Energy is used in buildings to provide a variety of services such as space heating and cooling, lighting and refrigeration and to power a broad array of appliances and equipment. U.S. buildings energy consumption accounts for nearly one third of total primary energy consumption and related greenhouse gas emissions. The 1996 bill for these energy services was over $200 billion.

Energy intensity in buildings has declined substantially over the past twenty years. Primary energy use (including losses from electricity generation) per square foot of commercial space declined by 22% between 1979 and 1992, while residential primary energy use per square foot dropped by 15% since 1978. However, during this time, buildings became increasingly electrified - driven by major growth in office equipment, small appliances and other devices collectively know as "plug loads". Commercial electricity consumption grew by 37%, while residential electricity grew by 36%. Driven by small appliances and home electronics, household electricity intensity *increased* 9% over that period. Largely because of expected continued electricity growth, the latest EIA business-as-usual forecast projects that commercial energy intensity in the future will decline by only 0.2% per year, and residential energy intensity by 0.5% per year. However, numerous studies (National Academy of Sciences, 1991; Office of Technology Assessment, 1991; and Energy Modeling Forum 12, 1994) have indicated that a substantial potential remains for cost-effectively reducing U.S. energy consumption and greenhouse gas emissions - particularly in buildings.

Despite the large opportunity, there is clear evidence that many of the potential reductions are not being realized in the current market system because of a number of institutional, organizational, and other barriers that impede the diffusion of energy-efficient technologies. These barriers include lack of appropriate and reliable product information; up-front costs of identifying efficiency opportunities in a particular building, split incentives between efficiency purchasers and those receiving benefits; extremely short payback requirements by some decision makers; local building codes that discourage efficiency measures; lack of expertise for design, installation and operations; and few low cost sources of capital. However, in the last few years changes in building codes and the emergence of the energy services industry have begun to ameliorate several of these barriers. barriers

CO2 Reduction Potential and Scenarios

Analysis results of the IAT indicate that large reductions in future greenhouse gas emissions could be realized through the use of more energy-efficient technologies at a net reduction in the total cost of energy services in residential and commercial buildings. The table below shows the baseline EIA projections of primary energy consumption in a future without a global climate treaty, any market signals to reduce carbon emissions or substantial technological advances in these areas.

	1995	2010	2020 [1]
Residential total (quads)	10.5	11.9	13.8
Commercial total (quads)	7.1	8.1	8.9
Buildings total (quads)	17.6	20.0	22.7

[1] IAT Base Case

The potential energy use reductions indicated by the IAT analysis are shown below. These results assume a binding international climate treaty leading to increased emphasis on U.S. carbon emissions reduction as well as federal and State policies to accelerate the use of existing cost-effective energy efficient buildings technologies.

barriers + policy

	Markal Model		DRI Model		Labs Study
	2010	2020	2010	2020	2010
Residential total (quads)	1.2-2.5	3.4	1.4 1.5	1.6-2.1	0.5-1.1
Commercial total (quads)	1.1-1.2	1.4	1.0-1.2	1.6-1.7	0.6-1.1
Buildings total (quads)	2.3-3.7	4.8	2.4-2.7	3.2-3.8	1.1-2.2

The IAT number translate into carbon savings of 26-33 MMT in 2010 and 35-44 MMT in 2020. A complementary bottom-up analysis is contained in the forthcoming study by five national laboratories, Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Technologies. This study, which is a much more detailed sectoral analysis, indicates a lower overall energy savings potential, but a significantly higher electricity savings potential. As a result, estimated potential carbon emissions savings are 25-50 MMT. The major sources of reductions include residential miscellaneous uses, commercial other uses (such as office equipment), lighting and space conditioning.

The IAT analysis results are rather difficult to place in context because of the top-down method of analysis. The National Laboratories study, however, is quite clear on what is required, as it is based on a technology-by technology and end-use by end-use analysis. In order to achieve the lower end of the range, the equipment that naturally turns over in about 35% of buildings is replaced with the most cost-effective technologies by 2010. The high end of the range assumes the equipment that naturally turns over in 65% of buildings is replaced with the most cost-effective technologies by 2010. Building shells are also renovated, but the average commercial shell is assumed to last 50 years and the average house 100 years, so shell retrofits are a minor contributor. Efficiency gains could be higher, but would require lower technology capital costs and more rapid shell renovations than those assumed in the analysis. It is very important to note that the estimated savings do not require premature retirement of capital stocks - equipment is only replaced at the end of its useful life.

The key opportunities for efficiency gains in residential buildings include miscellaneous electrical appliances such as electronic equipment and small appliances, lighting, water heating, space heating, air conditioning and refrigeration. Primary energy savings in the top three areas - miscellaneous electrical appliances, lighting and space conditioning - are estimated to be 1.9, 0.5 and 0.4 quads, respectively. Overall, these results require the average energy efficiency of residential equipment in the affected buildings to improve by 12% over the next 13 years. An efficient home in 2010 will feature lighting 50% more efficient than the average today, major appliances that are 15-30% more efficient, heating and cooling 10-15% improved, miscellaneous small devices that are 33% more efficient and a building envelop that is 4-14% more efficient. All these improvements are based on currently available technologies.

The opportunities for efficiency improvements in commercial buildings include miscellaneous electrical and natural gas uses (such as telecommunications equipment, medical equipment, pumps, light product assembly and many other activities not easily categorized), lighting, space heating and air conditioning. Primary energy savings in the top three areas - miscellaneous uses, lighting and air conditioning - are estimated to be 1.2, 0.8 and 0.4 quads, respectively. These results require the overall energy efficiency of commercial equipment in the affected buildings to improve by 18% over the next 13 years. A commercial building in 2010 will feature heating and cooling systems 25-50% more efficient than the average today, lighting 25% more efficient, office equipment and miscellaneous plug loads 33% more efficient, and management control systems that result in less energy use through better systems integration. As in residential, all these improvements are based on currently available technologies. how?

The potential for energy efficiency gains in residential and commercial buildings is not limited by technology but rather by market barriers that impede the rapid market penetration of these cost-effective measures. The probability of realizing the potential savings estimated thus is largely dependent upon the effectiveness of policies in removing the barriers to these investments. barriers + policy

Costs
The investments required to achieve the savings in the National Laboratories study are estimated to have a annualized cost of $7-$14 billion and result in annual energy bill savings in 2010 of $18-33 billion - for a net savings in 2010 of $10-19 billion. The average return on investment is about 20%.

Current Federal Programs and Funding
Realizing the potential savings above requires a proactive set of federal, state and local policies that accelerate technology deployment, energy efficient building design and construction and energy efficient building operations. This is critical because most of the carbon savings by 2010 will result not from new technologies, but rather from increased market uptake of existing and near-term technologies. Maintaining carbon emissions stabilization or cutting emissions further will also require continued technology improvement. Federal agencies, State governments and many local organizations already conduct some programs to move the buildings sector toward a lower carbon future. However, the challenge in implementing such policies is considerable since the industry is so fragmented - there are hundreds of thousands of builders, designers and suppliers. Federal programs at the Department of Energy and the Environmental Protection Agency seek to reduce buildings energy use through diverse means.

- DOE and EPA work with state and local partnerships to improve efficiency of existing buildings through information, demonstrations, technical assistance (e.g., Green Lights, Rebuild America, Energy Star).
- EPA and DOE facilitate the manufacture and purchase of high-efficiency equipment and appliances.
- DOE and EPA work with insurance industry, the financial community, utilities and other market intermediaries to remove barriers to investments in energy efficiency.
- DOE conducts research and development of a portfolio of advanced buildings technologies - such as fuel cells in buildings, reflective surfaces and materials, and advanced windows.
- DOE works with State and local partners to improve efficiency of low income housing.

The total current budget for these programs is about $300 million per year - of which $150 million per year is for low income weatherization and State grants. The Administration has requested additional funding for these efforts.

Electric Power

Key Findings

- Emissions from this sector, which were 481 MT in 1990, are forecast to increase from 506 MT in 1995 to 626 MT in 2010. Potential reductions from this sector (250MT+) will make up a substantial portion (25-50% or more) of the total needed to stabilize national emissions.

- Increased use of natural gas, demand-side efficiency and renewable power are the main means of reducing emissions. Natural gas use could increase in this sector by 15-50% depending on the relative economics of these options. Renewable power will increase by about one-third above baseline levels. Coal use will decline by 25-60%. According to the IAT, average electricity prices will rise by about 25%. Capital investment costs of $3-5 billion/year compare with baseline forecasts of $10 billion/year, but fuel and operating costs will also increase by a similar amount.

- No major technology breakthroughs are needed to achieve GHG emissions goals. Incremental improvements in combined-cycle turbines, renewable energy (particularly wind turbines and biomass fuel and gasification systems), and transmission systems will lower the cost of emissions reductions. Demand reductions through end-use technology development and adoption will also lower costs.

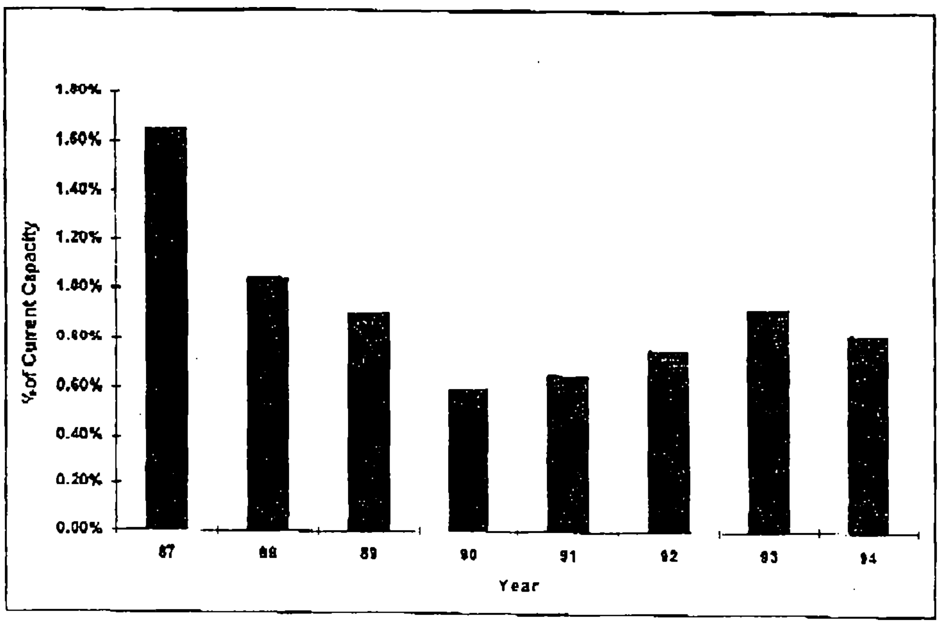
- Competitive trends and air pollutant regulation will need to be integrated with climate policy.

Background

Electric power meets just over 30% of US energy demand. Electric power generation continues to grow in tandem with economic growth, unlike most other forms of energy consumption. Electric power sales of roughly $200 billion represented 3% of US GDP in 1995. Despite advances in the efficiency of fuel use, US electric power supply maintains an historic reliance on coal and (increasingly) natural gas, leading to an upward GHG emissions trend that is expected to continue in the absence of climate policies.

The critical role of capital turnover is demonstrated by the near-absence of power plant retirements in the 1990s (See Figure 1 below). Access to new markets, regulatory uncertainty and regional conditions have all contributed to the slowdown of plant replacement, with planned 10-year retirement rates falling below 1% in 1989 and holding at low levels through the 1990s. This implies a 1,000-year period to turn the entire stock over once, an extraordinary (and presumably temporary) situation.

Fig. 1: 10-Year Plant Retirement Forecasts, 1989-1994



Coal will continue supplying more than half of the Nation's electric power through 2010. Coal consumption, of which 90% is in the electric sector, will reach 1 trillion tons in 1997, and by 2010 is expected to reach 1.1 trillion tons. Natural gas supplies 15% of US power, near its historic peak share, and is growing most rapidly today. Nuclear power, currently 20% of the US power supply -- an historic high -- will decline as plants age and face increased competition.

Most renewable power is currently hydroelectric, supplying 9% of US electricity. The potential for hydro expansion is limited. Non-hydro renewables currently account for about 2.7% of the US power supply. Some renewable technologies, such as wind and geothermal, are rapidly becoming economic and could grow quite rapidly between 2000-2010. Co-firing of biomass with coal at existing power plants also has a large potential for reducing emissions by 2010. To be commercially viable, costs of renewable technologies, which are declining from current levels of around $0.05/kWh, need to reach below $0.03-0.035/kWh (in the absence of high fossil fuel prices). Wind power may reach this goal by 2005.

CO2 Reduction Potential and Scenarios

This sector will be a key contributor to any GHG emissions reduction strategy. The IAT results show this sector reducing emissions by 20-33%. Because there are no direct emissions control technologies, achieving reductions relies on reducing demand or changing fuels. The rate of turnover in the capital stock becomes an important factor in determining both the means and the cost of GHG emissions control in the electric power sector.

The dominant emission reduction option is to use natural gas in place of coal, either through co-firing or repowering in existing coal units, or through increased use of new high-efficiency gas plants. Baseline (AEO97) coal capacity is forecast to increase from 315 GW in 1995 to about 330 GW in 2015 (including 40 GW of new plant and 25 GW of retirements) with virtually no coal-gas switching in existing plants. GHG policy will lead to less new coal capacity, more retirements, and some fuel switching at existing units. By 2015, coal *capacity* will fall to 275 GW, a drop of 55 GW or 15%. About 10-20 GW of coal-gas conversions are forecast, consistent with the Interlab study. Coal use (both in the electric sector and nationally) will decline by 25-60% if a stabilization target is met. Fuel use is affected more than installed capacity, because of resulting changes in dispatch. Competitive responses by coal producers and coal-fired generators can be anticipated, but most models already assume rapid gains in mining productivity and additional gains in coal plant efficiency. Economic options for life extension and repowering are also considered.

Stabilization will result in very large increases in gas combined-cycle generation. In some cases, natural gas becomes the dominant fuel in the power sector, tripling from base case levels to around 40% of all power produced. Natural gas use is affected by several sectors and competing fuels and is very sensitive to assumptions. IAT models project increased net gas demand in the electric power sector of 15-50%, but this could be offset by declines in other sectors (some models indicate net declines in US natural gas demand under a GHG stabilization policy). Most models show a small increase (about 5%) for a limited period. If electricity demand is reduced through efficiency, however, all of these fuel impacts could be considerably lessened.

Nuclear power tends to be unaffected by climate policy because the trends in the nuclear industry are dominated by other regulatory and market factors. No economic options for nuclear plant life extension have been demonstrated, and the possibility for large amounts of economic early retirements is taken into account in some models. Five to ten plants, with a capacity of 7.2 GW, are economically retired prior to 2010 in the DRI model, for example. Nuclear life extensions in the NEMS model are assumed and are not economically selected.

As part of a GHG emissions reduction strategy, generation from non-hydro renewables will increase. Some models indicate that wind and biomass may become cost-effective options as more emissions reductions are called for. For example, MARKAL-MACRO and DRI both indicate a 35% increase in non-hydro renewable use in 2010 under GHG stabilization. Models may understate the potential of renewables because they do not consider 'green power' demand from consumers, niche markets or dispersed power (small scale production scattered throughout the system).

Further electricity supply options include increasing the efficiency of existing fossil plants, and improving other parts of the power system (mainly the transmission grid) to minimize losses. Impacts on the industry are sensitive to demand responses. Demand reductions of up to 15% of US electric use in 2010 (600 billion kWh) have been studied. When end-use demand is lowered, fewer new high-efficiency natural gas power plants are built and less gas and renewable power is used. Coal use is relatively less affected. Overall costs in the utility sector are lower, with total costs affected much more than the marginal (permit) cost. Electricity sector total costs may be as much as 50% lower under high demand reduction cases, even though permit prices are only 15% lower. Combining end-use efficiencies with new supply technologies yields the lowest cost estimates for achieving substantial emissions reductions in the power sector.

Costs

Physical responses are generally similar between models, but the estimated costs of reducing emissions vary. The cost of replacing power from an existing coal plant with a new natural gas plant may appear similar between models (see box), given assumptions for fuel and equipment costs in 2010. The recent Interlab study, along with other engineering cost studies, point to very large emissions reductions available for around $50/ton C.

However, the modeled costs of reducing emissions are quite different, ranging up to $100/ton or more in some analyses. These differences largely result from assumptions about capital replacement decisions and cost allocation. For example, current ratemaking practice often requires 'front-loading' of capital payments for new plants, but this may change with increased competition in favor of 'levelized' or constant capital recovery. Another reason for differences in cost estimates is the response of fuel prices to the climate policy. As coal use begins to decline, coal prices may fall, requiring larger incentives to achieve further emissions reductions. Similarly, natural gas prices may rise if net US consumption increases. These fuel price dynamics are important drivers of overall policy cost.

Other factors include some early coal-coal switching as more efficient coal plants replace less efficient ones, and assumed limits on the rate of capital turnover. As a result, estimates of delivered (weighted average) electricity price impacts vary: +25% in DRI, +40% in NEMS. If a simple $50/ton carbon value is applied, as in the Interlab study, delivered prices may only rise by 15-20%.

Fuel switching cost analysis, costs in cents per kWh

Assumes baseloaded units at 70% capacity factor, capital recovered over 30 years (levelized)

Year=2010

	DRI	NEMS	IPM
Non-fuel costs (capital plus O+M)			
Old coal	0.55	0.76	0.55
New gas	0.5	0.74	0.5
Fuel costs—without C tax (2010 baseline)			
Coal	0.89	1.14	0.72
Nat. gas	1.61	1.62	1.39
Total production costs--without C tax			
Old coal	1.44	1.9	1.27
New gas	2.11	2.36	1.89
Split	0.67	0.46	0.62
$/ton C	54	31	50

Total costs of GHG policy in the utility sector will be in the $5-15 billion/year range, compared to 2010 baseline (incremental) production costs of about $70-75 billion per year. Of this, about half is due to capital investment and half to increased fuel and other operating costs. Increased capital expenditures of $3-6 billion/year compare to 2010 baseline levels of around $10 billion per year, while baseline fuel and operating costs are about $65 billion per year. The bottom line financial outlook is uncertain because of changes in the electric power industry itself. Changes in production costs have not reduced profits under regulated ratemaking. The effects of such changes in a competitive market depend on the structure of the market and the distribution of costs among competing producers. Some renewable technologies, for example, have very low variable costs because they do not buy fuel. Such plants, once built, can actually reduce market prices, depending on the bidding or dispatch rules. State and federal policy towards new entrants, cleaner suppliers, or pollution credits are also important (as noted below).

Current Federal Programs and Funding

Although the technology and know-how to reduce GHG emissions exists today, several related challenges must be met in order to reduce costs and integrate climate policy with increased competition and more stringent air quality standards. Federal research and development, partnership programs, and policy decisions can all contribute to success.

The success of energy research and development can be measured by the performance of currently available power plants. Natural gas combined cycle systems have a combination of decreasing cost and increasing performance that has changed the industry. Renewable energy cost and performance goals have also been met, but the decline in fossil fuel prices has moved the goalposts. More aggressive goals are now in place for the 2005 time frame. Achieving these goals will require ongoing support for R&D and pilot plant deployment cost-sharing. Less mature or broadly applicable technologies, including solar photovoltaic and fuel cell systems, are vulnerable to R&D shortfalls in the near to mid term. R&D on power delivery systems, including transmission efficiency, is also a needed investment. Programs to market these technologies for export will improve their viability in the US through experience and expanded production capacity.

A carbon constraint will be introduced at the same time as a competitive restructuring of the industry and the implementation of the NAAQS. The combination of open power markets and market-based air regulation (i.e. a set of cap-and-trade systems for SO2, NOX and CO2) will likely make climate-related policy incentives work faster and more effectively. At a minimum, there will be interactions between these changes which will alter the emissions profile of the sector.

For air regulations, early analysis using IPM and NEMS indicates that although new ozone and particulate matter rules will have a limited effect on CO2 emissions (a reduction of approximately 5% from 2010 baselines), GHG limits could induce significant reductions in the criteria pollutants, on the order of 5-10% for SO2 and 25-35% for NOX.

Initial work on competitive power markets indicates that the ongoing restructuring of the power industry may have important effects. GHG emissions may increase in the near term (by perhaps 5-7% in the first ten years), due to increased sales by the cheapest coal units and higher demand. But competition may prove helpful in the long run if new technologies can readily enter markets, and if market-based incentives are a part of climate policy. One great unknown is the potential demand for cleaner power on the part of consumers, who will have new information and choices.

Combining market-based environmental policy, consumer choice, and new technologies may offer greater efficiency and enable the power sector to provide electricity that is both cleaner and higher-value. The technologies and physical changes needed for large-scale GHG emissions reductions appear to be reasonably achievable, although the costs of reductions are less certain. Industry restructuring, air regulations, and climate policy can work together, if closely integrated to achieve the best fit.

Industrial Emissions and Economic Impacts

Key Findings

- Based upon data from AEO97, the industrial sector used 33.8 quads of energy in 1995, about 37 percent of the nation's total energy requirements. This includes both process energy and chemical feedstocks. The sector was responsible for 33 percent of the overall U.S. greenhouse gas emissions in 1995. By 2010 industrial energy use will grow to 39.7 quads, a 17 percent growth over 1995 levels. In energy terms, this is the second fastest growing end-use sector, just below the 19 percent growth in energy consumption for the economy as a whole. Carbon emissions will follow a similar pattern, increasing from 464 to 549 MMT in the years 1995-2010. Emissions in 1990 were 452 MMT.

- The industrial sector has the potential to reduce energy use and carbon emissions by 10-15 percent over 2010 baseline forecasts through cost-effective investments in energy efficient technologies, and in some cases, low-carbon technologies.

- The annual investment necessary to achieve this level of carbon reduction is on the order of $2.3 to $3.8 billion per year through 2010. This is about 2-3 percent of the investments made by the manufacturing sector in 1995. Such investments should have only a small impact on the rate of capital stock turnover compared to a base case — accelerating the depreciation rate, for example, from a 30-year to a 29-year average life of equipment and structures. For the energy-intensive industries such as petroleum refining and chemicals, capital stock turnover will have to increase at a quicker rate than for industry as a whole.

- Many of the most successful technologies have multiple benefits, including environmental- or productivity-enhancing features. Since these new technologies tend to lower the overall cost of doing business, investments in energy efficient technologies may actually improve the competitive position of many industries.

- These energy savings and reduction in carbon emissions are unlikely to happen without policy measures driving the improvement in the industrial capital stock. barriers + policy

Background

The industrial sector has made important strides in reducing overall energy intensity over the past 25 years. However, there are still readily-available but underutilized technologies with two and three-year paybacks that can reduce industrial energy use by 10 percent or more. The use of heat recovery and combined heat and power (i.e., cogeneration) systems, for example, can save 10 percent of energy use with an internal rate of return of 30-60 percent. Better maintenance of compressed air systems can save 40 percent of the energy used in such systems. And more energy-efficient motor systems can also provide a significant source of electricity savings.

Broadly speaking the industrial sector includes farming and ranching, agricultural services, fisheries, forestry, mining, construction and manufacturing. While many policy analysts think of "industry" as a homogenous set of economic activities, it embraces an incredibly diverse set of processes ranging from the growing and processing of food products to the production of paper, plastic resins, cars and computers. The process and energy requirements of each of the individual industries that are within the industrial sector are as different as the products that they produce. While many products have similar uses, the processes involved in making them may be vastly different. For example, plastic drink bottles, glass drink bottles, and aluminum cans all are similar products; however, they share almost no processes in common. For this reason, it is important to develop climate policies which reflect these important differences among the industrial sectors.

Based upon data from the Energy Information Administration, the industrial sector uses 37 percent of the nation's energy in 1995, or 33.8 out of a total 90.9 quads. Carbon emissions were at 32 percent or total emissions in the United States, or 464 of 1424 MMT. With normal rates of capital stock turnover, the industrial energy intensity is expected to decline at a rate of 1.2 percent in base case forecast for the period 1995-2015 (*Annual Energy Outlook 1997*). Industrial carbon emissions are expected to climb to 549 MMT by 2010.

Savings Potential

The DOE National Lab study (*U.S. Carbon Reductions by 2010 and Beyond, 1997*) suggests that by 2010, the technology exists such that overall energy consumption can be reduced by 2.0 to 3.8 quads over the baseline forecasts. The level of energy savings are roughly the same for both electricity and fossil fuels. Carbon savings of a high efficiency/low carbon scenario are on the order of 125 MMT when electricity savings are credited to the industrial sector. A new study published by a consortium of non-governmental organizations suggests an overall energy savings potential of 3.75 quads of energy and 136 MMT of carbon in the year 2010 (*Energy Innovations*, 1997). Most analysts agree that in the period 2010, this is a reasonable level of savings — given available technology and reasonable rates of capital stock turnover. By 2030, however, the *Energy Innovations* study suggests carbon emissions can be lowered by as much as 41 percent below 1990 levels (again with electricity savings credited to the industrial sector based upon kilowatt-hours sales).

The table on the following page summarizes key indicators for the industrial sector for the years 2010 and 2020. The Markal-Macro simulation for 2010 suggests a potential carbon savings of 17 percent compared to baseline projections. The DRI model suggests a similar level of savings, estimated to be 15 percent of the base case forecast in 2010. Savings of this magnitude suggests that industry may be able to stabilize close to its 1990 levels of carbon emissions by 2010 without reducing industrial output.

Costs

In the Lab study a combination of energy efficiency investments and low-carbon are used to reduce carbon emissions. The incremental investment costs are estimated to be $11.60 to $13.88 per mmBtu. Based upon the AEO97 energy costs for the year 2010, this reflects a payback period of 1-4 years. According to the Lab study, the cumulative investment requirements are between $23.2 and $47.2 billions of 1995 dollars in the period 1998 through 2010. If the cumulative investment is averaged out over the 13 years of analysis, this is about 2-3 percent of the investments made by the manufacturing sector in 1995. The energy-intensive industries will have to invest at a higher rate. On the other hand, according to the Lab study, more energy savings can be obtained in the faster growing and less energy-intensive light manufacturing sectors.

Many of the most successful technologies have multiple benefits, including environmental- or productivity-enhancing features. A technology that reduces product loss or increases process throughput, for example, will often reduce labor and other material costs as well as energy costs (See, for example, the variety of papers contained in the proceedings from the *1997 ACEEE Summer Study on Energy Efficiency in Industry)*. These additional co-benefits are generally not reflected in the results of either the MM or the DRI models. Hence, the benefits to the industrial sector may be somewhat understated. Stated differently, the competitive position of many industrial sectors may actually be strengthened — depending upon the type and flexibility of the climate policies that are actually implemented. These energy savings and reduction in carbon emissions are unlikely to happen at this level, however, without additional policy measures to drive the needed improvements in the industrial capital stock.

if it's a win-win then why the need for policy

Adele C. Morris [redacted]

Record Type: Record

To: daniel.reicher @ hq.doe.gov @ inet, mijujo @ computer.org @ inet

cc: Jeffrey A. Frankel/CEA/EOP, Joseph E. Aldy/CEA/EOP
Subject: comments on DOE's "Challenge" document

We don't have a strong opinion about what initiatives go on the preliminary list or how they're organized. I'd like to emphasize three things for us to keep in mind during this whole process:

1. Let's choose initiatives as efficiently as possible, given our best estimates of costs and benefits, starting with the most carbon reductions per dollar (Federal and private combined). We should hold regulatory initiatives (and we hope these can be put off indefinitely) to the same or better cost/performance standard that applies to direct and tax expenditures. Even given the time constraints, I think more analysis is appropriate before we can efficiently choose amongst these projects. What ever happened to those charts with dollars and tons of carbon?

2. We should insist on regular and rigorous program evaluation, including expeditious assessment of a reasonable and consistent baseline against which to measure progress. Maybe this evaluation should be Phase V in the document. We should specify concrete performance measures for each initiative and reallocate resources based on which programs actually work. Our ability to convincingly evaluate a program with an appropriate metric should seriously factor into whether we fund it.

3. Let's drive this package carefully through Congress so that it doesn't turn into pork on the way.

1999 Budget - plan for climate change program
btwn Thxgiving & Xmas will decide what gets added to budgets:
1) add to base programs
2) add to budget outside base programs

DOE.
President announced 9-point action plan
- R&D
- consultations w/ industry
- energy efficiency
- procurement by Fed govt.

Focus -
1) effective to reduce carbon tonnage
2) susecptible to Fed influence
3) build on base programs

Other gases -

Dan Reicher 586-9220 fax 586-9260
cc TJ & Peter
fax: 395-4639 voice 5-4561
Comment on Structure by Friday

Who is agency rep for steering committee?
Tell TJ

DOE Handout 11/17/97

The Challenge

(of converting the President's speech into action)

Problem is complex:

- many actions
- many actors
- diverse stakeholders
- interdependent actions
- long time period

Plan must be understandable to:

- agencies
- partners
- stakeholders
- general public
- Congress
- international community

Plan must be synergistic:

- actions are interdependent and should be designed accordingly
- actions having broad effects should be coordinated with others
- different skills of agencies and partners should be used in harmony

Plan must be dynamic:

- market conditions will change
- technologies will change
- performance of actions will vary
- economic conditions may change
- appropriations support uncertain

Lessons from CCAP

Critical Success Factors

- Vision-based strategy understandable to partners and stakeholders (not myriad of independent, competing parts) ← CCAP now
- Extensive external input in design stage
- Effective coordination among agencies
- Actions fully integrated with "base" programs
- Vigorous and sustained support of partners
- Active Presidential support in appropriations and legislative process —

What we learned from CCAP

Proposal Details

Phase I: Establish Strategic Framework

- Establish implementation framework that shows interrelationships among actions and provides strategic foundation for development of detailed plans

November

Phase II: Develop detailed plan and launch early actions

- Develop detailed draft plan for broad external review - focusing on "signature actions"
- Seek targeted external input
- Launch early actions that have solid plans and partner input

November-January

Phase III: Engage industry and public

- Conduct extensive industry and public consultations to finalize plan and maintain public dialogue on climate mitigation
- Finalize and distribute plans

February-April

Phase IV: Seek Congressional support and launch remaining actions

- Launch remaining early actions
- Obtain Congressional appropriations and tax code changes
- Launch actions that require new funding

April-October

Phase V - Evaluate actions ← (Adele's note)

Draft Climate Change Strategy Framework

Components	Clusters	Signature Initiatives	Agencies
Energy Efficiency	Buildings	Energy Star Equipment	DOE, EPA
		Partnerships for the 21st Century	DOE, HUD, DOC, EPA
	Industry	Industries of the Future	DOE, DOC
		Efficiency Incentives	DOE, DOC, EPA
	Transportation	PNGV - Cars & Trucks	DOC, DOE, DOD, ETC.
		Advanced Aircraft	NASA, DOT, DOD
	Electricity	Voluntary Emissions Reductions	DOE, EPA
		Power Plant Efficiency	DOE, EPA
Electricity & Low Carbon Fuels	Buildings	Million Roofs Program	DOE, ETC.
	Industry	Combined Heat & Power	DOE, EPA, FERC
		Credit for Early Action	DOE, EPA
	Transportation	Low Carbon Fuels	DOE, USDA
	Electricity	Renewables R&D and Accelerated Deployment	DOE, EPA
		Optimize Existing Nuclear Power	DOE, NRC
		Advanced Natural Gas Generation	DOE
		Emissions Trading	EPA, DOE, DOC, ETC.

Components	Clusters	Signature Initiatives	Agencies
Carbon Capture	Sequestration	Sequestration R&D	DOE, NAS
	Closed Loop Energy Systems	Energy Plexes R&D	DOE
Foundation Research, Science & Analysis	Climate Change Science	Adaptation Research	USGCRP
		Global Environmental Science	USGCRP
	Basic Energy Research	Cross-Cutting Energy Technology Research	DOE
	Economic Analysis	Program Evaluation	ALL
Public Sector	Buildings	Innovative Financing	DOE
	Transportation	Efficient/Alternative Fuel Vehicles	DOE, ALL
	Military	Efficient/Alternative Fuel Vehicles	DOD
		Facility Efficiency	DOD

Comparison: President's Action Plan and the Draft Climate Change Strategy Framework

President's Action Plan	Draft Climate Change Strategy Framework
$5 Billion in Tax Cuts and Federal R&D	Energy Efficiency; Electricity & Low Carbon Fuels; Carbon Capture
Credit for Early Action	Electricity & Low Carbon Fuels
Industry-by-Industry Consultations	All Components
Encouraging the Use of Energy Efficiency Products	Energy Efficiency
Federal Procurement and Energy Use	Public Sector
Electricity Restructuring	Electricity & Low Carbon Fuels
Setting Concentration Goals	Foundation Research, Science & Analysis
Bilateral Dialogues	Foundation Research, Science & Analysis
Economics and Science Reviews	Foundation Research, Science & Analysis

Getting the Job Done

- Feedback and modification of proposal

- Establishment of interagency working group

- Develop detailed plan

  - Goals
  - Approach
  - Milestones/schedule
  - Metrics
  - External coordination
  - Resources

DOE handout 11/12/97

(example of action plan pursuant to President's speech)

Expand Use of Combined Heat and Power

Preliminary Draft Action Plan

Note: The milestones, schedule and other details below are based on ongoing deliberations of a recently established working group and have not undergone any agency review. As such, they could change substantially and appear here for illustrative purposes only.

Goals Increase the use of efficient combined heat and power systems to improve overall efficiency of fuel utilization in the U.S.

Approach Specific actions to overcome impediments to greater use of CHP systems will be designed and implemented and actions that accelerate deployment of those systems in federal facilities will be undertaken. Impediments to be addressed include:

- environmental permitting of new equipment is complex, costly and time consuming and discourages retrofitting of new, more efficient equipment.;
- tax treatment of CHP is less favorable than other alternative on-site investments;
- infrastructure for purchasing and selling power and connecting to the grid is in flux and may be subject to prohibitive costs; and
- CHP use is not encouraged in federal facilities and military bases - despite often favorable physical infrastructure.

Milestones/Schedule

10/97	DOE, EPA and CHP community establish working group to formulate draft plan, identify market impediments and formulate draft actions	
11/97	Working group findings transmitted to DOE and EPA management and CHP community and formal interagency group established to formulate detailed action plan	
1998	Submit Administration legislation on electricity restructuring	
1998	Develop streamlined permitting process for CHP systems -Allow permit by rule for systems that meet efficiency/emission standards -Pre-certify qualifying standard package systems as compliant	[EPA]
1998	Incorporate off-site emissions reductions created by CHP in local CAAA decisions	[EPA]
1998	Reduce tax depreciation life to 7-10 years for CHP projects to be comparable to other industrial investments and recognize equipment turnover due to changing technology and environmental requirements	[Treasury]
1998	Recognize CHP as an efficiency measure and exempt CHP from exit fees as some states have done	[FERC]
1998	Allow expedited access to open market power for back-up	[FERC]
1998	Convene an expedited utility/non-utility process to develop appropriate and interconnect standards for all generators	[FERC]
1998	Issue Executive Order to promote CHP use throughout government	[DOE]
1999	Promote CHP through funding demonstration projects in State capitals	[DOE]
2000	Shift CAAA implementation to output-based and market-based cap systems without prescriptive technology requirements	[EPA]

2000 Develop information, training and assistance to help agencies implement CHP systems in federal facilities [DOE, DOD]

2001 Accelerate fuel cell technology development and deploy in federal buildings [DOE, DOD]

Metrics

1998 Streamlined EPA permitting process for CHP

1998 Flexible implementation of CAAA in EPA regions to foster low emissions facilities

1998 FERC rulings on to remove regulatory impediments to CHP

2002 X CHP systems in federal facilities, reducing emissions by Y mmt
X CHP systems in private industry, reducing emissions by Y mmt

2005 X CHP systems in federal facilities, reducing emissions by Y mmt
X CHP systems in private industry, reducing emissions by Y mmt

2010 X CHP systems in federal facilities, reducing emissions by Y mmt
X CHP systems in private industry, reducing emissions by Y mmt

External Coordination

Initial working group includes representatives from DOE, EPA, NGOs and the CHP industry.

Formal interagency group will include broader representation from government and industry - including DOE, EPA, FERC, Treasury, DOD, DOC, OSTP, additional NGOs, the utility industry and the CHP industry.

Ongoing reviews of the business plan and its implementation will be conducted in collaboration with appropriate partners.

Specific actions will be implemented in close collaboration with appropriate partners.

Resources

TBD

POSSIBLE CLIMATE CHANGE TAX CUT PACKAGE

1. **Expanded tax credits for biofuels.** The alcohol fuels tax credit and corresponding excise tax exemption provides a significant advantage for these fuels (54 cents per gallon or about $23 per barrel) compared to gasoline. The tax subsidy already applies to ethanol made from biomass and for methanol made from sources other than fossil fuels. The plan would include a temporary (e.g., 5 year) additional tax credit of 10 cents per gallon for non-corn ethanol.

2. **Extend and expand tax credits for renewables.** Tax credits are currently available for investments in solar and geothermal energy facilities and for electricity production from wind and closed-loop biomass projects. These credits could be extended for another 10 years, and the solar and geothermal credits could be transformed from investment credits to production credits.

3. **Faster depreciation for certified energy-efficient transportation vehicles.** Under current law, cars used by businesses are depreciated over 5 years, using an accelerated depreciation schedule. Certified energy-efficient vehicles (based on something like the Energy Star program for appliances) could be depreciated over a shorter period (e.g., three years).

4. **Extend deduction for clean fuel vehicles and tax credit for electric car.** Under current law, taxpayers are allowed a deduction for the incremental cost of a vehicle designed to be propelled by clean fuels in excess of the cost of a fossil-fuel powered vehicle. Purchasers of electric vehicles are allowed a 10 percent tax credit (limited to $4,000) instead of the clean-fuel vehicle deduction. These tax benefits are reduced over 2002-2005, when they are completely phased out. The tax benefits could be extended for an additional 5-10 years.

5. **Shorter depreciable life for energy-efficient buildings/rehabilitations.** Under current law, commercial buildings have a depreciable life of 39 years. Significant rehabilitations are treated the same as new construction and also have 39 year depreciable lives. The depreciable life for energy-efficient building and rehabilitations (e.g., those certified by the Energy Star program) could be assigned shorter depreciable lives (e.g., 30 years) to provide an incentive for adopting these energy-efficient building technologies.

6. **Incremental tax credit for qualified energy-efficiency research.** Current law provides a 20 percent tax credit for incremental research and experimentation (R&E) above a threshold level. If a taxpayer's overall R&E is not increasing relative to its sales, however, the tax subsidy may not be fully available. A separate energy-efficiency R&E "basket" could be created, where energy-efficiency R&E above a threshold amount would generate a separate tax credit. This would permit firms who shift their R&D focus toward energy-efficiency, without increasing overall R&E spending, to receive a tax credit for their energy-efficiency R&E.

7. **Tax credits for purchases of certified energy-efficient appliances (washers, dryers, etc.).** Under current law, utilities may offer tax-free rebates to customers who purchase certain energy efficient property, such as designated appliances. This provision could be supplemented with a tax credit for similar purchases. The certification of energy-efficient units could be modeled on the Energy Star program.

The tax cuts could be financed through moving a few pennies of the gas tax from the Highway

Industries of the Future

The Industries of the Future strategy creates partnerships between industry, government, and supporting laboratories and institutions to accelerate technology research, development, and deployment. Led by the Office of Industrial Technologies within the Department of Energy's Office of Energy Efficiency and Renewable Energy, the Industries of Future strategy is being implemented in the seven energy- and waste-intensive industries listed below.

These industries use more than 80 percent of the energy consumed in all U.S. manufacturing. Two key elements of the strategy include an industry-driven document outlining the industry's vision for the future and a technology roadmap to outline the technology that will be needed in order to reach their goals. Through this process, government-funded research is brought to a sharp focus to benefit U.S. industry. To the extent that visions and technology roadmaps have been completed, OIT has outlined research needs.

Industries of the Future Overview Briefing

Aluminum - Works in the refining of alumina to the fabrication of a broad range of products from beverage cans to aircraft and construction materials.

Chemicals - Produces over 70,000 different products ranging from basic commodity chemicals, such as sulfuric acid and plastics, to mass-marketed consumer goods such as drugs, detergents, and paints.

Forest Products - Produces wood and paper products for a wide variety of consumer goods, such as stationery and paper tissues, and industrial products, such as cardboard packaging and paper for newsprint.

Glass - Produces and fabricates a diverse set of products: flat glass, largely used for windows; glass containers, such as for bottles; fiberglass for insulation and structural applications; and specialty glass, such as optical fibers.

Metalcasting - Melts and casts mostly scrap metal into literally tens of thousands of intricately shaped metal parts that are used in the assembly of over 90% of all durable goods and in virtually 100% of machine tools, manufacturing machinery, and similar capital goods.

Petroleum - Converts crude oil into fuels and feed stocks used in a wide range of products for transportation, industry, electrical generation, and heating.

Steel - Makes, shapes, and ships steel products, one of the most basic and widely used metals, to many markets such as construction, automotive, and machinery.

Agriculture - New team which is focusing on renewable bioproducts and the food processing industries

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Please send any comments, questions, or suggestions to webmaster.oit@hq.doe.gov.

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Last revision date: February 10, 1997

OFFICE OF INDUSTRIAL TECHNOLOGIES
Productivity through Technology

Research Needs of Energy Intensive Industries

It is widely recognized that a critical and pervasive issue for the 21st Century will be the balancing of industrial activity and environmental stewardship, and that more knowledge is needed to make effective choices to achieve that balance. The Department of Energy has worked closely with the seven industries that consume 80 percent of the energy and produce over 90 percent of the wastes in the manufacturing sector to define their research needs. These seven are: steel, aluminum, forest products, glass, metalcasting, chemical, and petroleum refining.

DOE facilitates a process whereby the industry creates an industry-wide vision, followed by the creation of a technology roadmap which charts the research needed to achieve the vision. Through this process, government-funded research is brought to a sharp focus to benefit U.S. industry. The following list shows the research needed by the seven industries, to the extent that the visions and respective technology roadmaps have been completed.

- Forest Products Industry
- Steel Industry
- Metalcasting Industry
- Glass Industry
- Petroleum Refining Industry
- Chemicals Industry

Aluminum

Industry of the Future

DOE/Idaho Operations Office Seeks Applications for Cost-Shared Aluminum R&D Projects

Aluminum Technology Roadmap Workshop Report - PDF file

Fall/Winter 1996 Aluminum Update

Spring/Summer 1996 Aluminum Update

The U.S. aluminum industry provides raw materials for the manufacture of numerous consumer goods (e.g., automobiles, cans, structural materials, packaging). U.S. aluminum industry shipments in 1993 were 8.2 million metric tons, valued at about $31 billion, and the industry employs about 134,000 people. Through the Aluminum Industry of the Future strategy, the U.S. aluminum industry and the Department of Energy are creating a partnership to spur technological innovations that will reduce energy consumption, pollution, and production costs.

Today, the principal forces driving the industry are worldwide competition, energy costs, and compliance with domestic environmental regulations. The industry is responding by:

- Reducing primary aluminum production
- Investing in recycling facilities
- Investing in aluminum fabrication
- Developing more flexible processing technologies
- Building new primary production facilities outside the U.S.

Through the Aluminum Industry of the Future strategy the industry and the Nation can benefit significantly:

- Improved production processing technologies can significantly lower costs while improving product quality
- Higher efficiency and resource productivity can lower emissions, thus improving air and water quality while reducing the need for more costly "end-of-pipe" control technologies
- Energy consumption can decrease by 30 percent.

Ongoing Federal R&D related to the Aluminum Industry

- Industrial Projects Locator - Descriptions of on-going industrial-related research and development projects sponsored by the Department of Energy.
- Federal Agency Activities in Aluminum Related R&D

Please send any comments, questions, or suggestions to webmaster.oit@hq.doe.gov.

Last revision date: February 10, 1997

Chemicals

Industry of the Future

The chemicals industry is one of seven energy- and waste-intensive industries that participate with the Office of Industrial Technologies' Industries of the Future initiative to maximize economic, energy and environmental benefits through research and development of innovative technologies. In December 1996, the chemicals industry -- represented by the American Chemical Society, the American Institute of Chemical Engineers, the Chemical Manufacturers Association, the Council for Chemical Research, and the Synthetic Organic Chemical Manufacturers Association -- published a report articulating its vision of the future.

Technology Vision 2020: The U.S. Chemical Industry helps establish technical priorities in areas critical to improving the chemical industry's competitiveness; develops recommendations to strengthen cooperation among industry, government, and academia; and provides direction for continuous improvement through step-change technology in four areas: new chemical science and engineering technology, supply chain management, information systems, and manufacturing and operations.

The OIT Chemical Industry Team (CIT) continues OIT's mission of creating partnerships among industry, trade groups, government agencies, and other organizations to research, develop, and deliver advanced energy efficiency, renewable energy, and pollution prevention technologies for the chemical industry. These advanced technologies will help the chemical industry to save energy and cut waste, lower operating costs, boost productivity, and prevent pollution.

To foster cooperation on *Technology Vision 2020*, the sponsors signed a Memorandum of Understanding with the U.S. Department of Energy establishing a framework for identifying appropriate areas of joint research, development, and technology demonstration. The event took place on February 26, 1997 during the 2nd Industrial Energy Efficiency Symposium and Exposition in Arlington, VA.

This page contains resources for and about the chemicals industry and the Office of Industrial Technologies' Chemical Industry Team.

What's New

- New! Solicitation for Chemical Industry to be Issued on or about July 30

Team Status - March 1997
Los Alamos and Hughes Win Award from Popular Science
Electroplating Waste Minimization wins R&D 100 Award

Industry Profile

The chemical industry is more diverse than virtually any other U.S. industry. Its products are omnipresent. Chemicals are the building blocks for products that meet our most fundamental needs for food, shelter, and health, as well as products vital to the high technology world of computing, telecommunications, and biotechnology. Chemicals are a keystone of U.S. manufacturing, essential to the entire range of industries, such as pharmaceuticals, automobiles, textiles, furniture, paint, paper, electronics, agriculture, construction, appliances, and services. More than 70,000 different products are registered. More than 9,000 corporations develop, manufacture, and market products and processes. The industry includes, but is not limited to, those identified in the U.S. government's Standard Industrial Classification 28 (SIC 28):

- industrial organic chemicals
- plastics, materials and synthetics
- drugs
- soaps, cleaners and toilet goods
- paints and allied products
- industrial organic chemicals
- agricultural chemicals
- miscellaneous chemical products

In short, a world without the chemical industry would lack modern medicine, transportation, communications, and consumer products.

[Dimensions] [Energy] [Employment] [Environmental] [Economics] [Data Sources]

Industries of the Future Process

Industries of the Future is a fundamentally different approach to the development of new industrial technologies. For the chemical industry, the process aligns federal investments in research, development, demonstration and deployment with the needs of the technology users. Technology Vision 2020: The U.S. Chemical Industry represents the dynamic impact of market, business, regulatory, and social drivers. The industry is using the vision to help it define the technology roadmaps that describe the pathways that will lead to achieving their vision. DOE helps to facilitate the process and collaborates with the industry, academia, and other governmental and non-governmental organizations. The identification of the critical technology needs enables the focusing and leveraging of scarce public and private sector R&D resources. DOE will implement R&D programs that support broad objectives of national interest, its mission, and the speci fic needs of the industry.

Advanced Technologies

- Chemical R&D; Projects in OIT
  - 1996 Chemicals Team Annual Report (928k Acrobat file that requires Adobe Acrobat Viewer)
  - 1996 Chemicals Team Annual Report (HTML version)
  - 1995 Chemicals Team Annual Report (HTML version)
- Federal Agencies Active in Chemicals Industry-Related R&D;
- DOE Locator of Industrial-Related Projects -- database and locator for DOE and DOE Laboratory projects related to industry
- National Technology Transfer Center Databases -- national network linking U.S. companies with federal technologies
- Annotated Bibliography -- technical reports related to the Chemicals Industry
- Full Bibliography -- technical reports related to the Chemicals Industry

For More Information

- OIT Chemicals Team Brochure (75k file that requires Adobe Acrobat Viewer)
- OIT Chemicals Team Contacts
- DOE Laboratory with Test Sites/User Facilities
  - National Renewable Energy Laboratory

- DOE Laboratories with programs relevant to the chemical industry
  - Argonne National Laboratory
  - Lawrence Berkeley National Laboratory
  - Lawrence Livermore National Laboratories
  - Oak Ridge National Laboratory
  - Pacific Northwest National Laboratory
  - Sandia National Laboratory
  - Savannah River National Laboratory

Related Industry Links

- Chemical Industry
- Energy Information
- Environmental Information

Please send any comments, questions, or suggestions to webmaster.oit@hq.doe.gov.

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Energy Efficiency and Renewable Energy Network (EREN)

| DOE Home Page | Related Industry Links |

Last revision date: July 23, 1997

Chemicals Industry

Reference: ***Technology Vision 2020: The U.S. Chemical Industry***

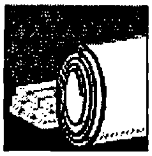
- **New Chemical Science and Engineering Technology**
  - Chemical Synthesis
    - New synthetic techniques incorporating the disciplines and approaches of biology, physics, and computational methods
    - New catalysts and reaction systems to prepare economical and environmentally safe processes with lowest life-cycle costs
    - New chemistry for use of alternative raw materials
    - New synthesis tools to efficiently create multifunctional materials that can be manufactured with attractive economics
    - Techniques for stereospecificity or precision in spatial arrangements of molecules
    - New cost-effective techniques to create a broader variety of molecular architectures in alternative reaction media
  - Bioprocesses and Biotechnology
    - Improved performance of biocatalysts
    - Improved biochemical processing
  - Materials Technology
    - Prediction of materials properties
    - Synthesis technology for precise manipulation of material structures
    - Enhanced performance in materials
    - Routes for step change improvements in performance of material systems with the use of new additive technology
    - Technology in integrated materials and processes for disassembly and reuse
  - Process Science and Engineering
    - Design principles, tools, systems, and infrastructures to accommodate a variety of improvements to meet current and emerging needs
    - Knowledge of particulate processes
    - Improved manufacturing flexibility
  - Chemical Measurement
    - Highly sensitive, precise, and accurate measurement technology needed to probe molecular processes in the laboratory
    - Robust measurement techniques for real-time, highly reliable analyses in practical environments
    - Theoretical models for guiding and optimizing chemical analysis in laboratory and plant-process environments
    - Collaboratory concepts so that scientists and engineers at one location can do experiments on the best equipment even if it is located at a physically remote site
  - Computational Technologies
    - Improvements to make computational molecular science tools more useful in modeling
    - Computational fluid dynamics programs with readily adaptable architectures that better model complex systems (coupling chemical reactions with multiphase, multidimensional, simultaneous fluid, heat, and mass transfer dynamics) and incorporate emerging advances in physical models and property databases
    - Modeling of complex, multi-site, multi-product, global environments
    - Large-scale integration of smart systems with operations, using advances in artificial intelligence to move beyond the small scale or limited scope of current advisory systems

- **Supply Chain Management**
  - Market Globalization
    - Compatibility of supply chain inventory and information systems among trading partners
  - Regulatory Restrictions

        - Consistencies in packaging materials and design and labeling
        - Testing methods for certifying materials
    - Transportation
        - Harmonization of international transportation regulation schemes
    - Information Processing
        - Efficient information flow among parties interconnected to the global supply chain

- **Information Systems**
    - Infrastructure and Open Systems
        - Improvements in hardware and software that include interfaces, gateways, data compression technologies, automated data collection/scanning devices
        - Improvements in networking, communications and data exchange
    - Business and Enterprise Management
        - Improvements in hardware and software systems that provide business information and analysis
        - Changes in networking, communications and data exchange for plant floor and production planning systems
    - Product and Process Design and Development
        - Improvements in modeling and application of information technology, e.g. simulation and modeling techniques, chemical properties prediction, reaction and separation dynamics
        - Improvements in hardware and software to integrate safety and regulatory information with design tools, to expand the use of property prediction databases, statistical analysis and neural network technology
    - Computers in Manufacturing
        - Open systems and integrated applications
        - Advanced process control technology
        - Equipment monitoring systems
        - Process modeling and advisory systems
    - Computers in Plant Engineering and Construction
        - Engineering automation
        - Robotics for plant construction
        - Advanced computer-aided design tools

- **Manufacturing and Operations**
    - Production Capability
        - Reduced manufacturing variability
        - Improved Impact of manufacturing processes on the environment
        - Agile responses to unexpected or anticipated change
        - Manufacturing reconfiguration
        - Integration of production capability
    - Information and Process Control
        - Operations of the make-and deliver system
        - Use of data and integrated systems to allow the rapid development and implementation of new product and process technology globally
        - Real-time availability of global transactional information
    - Building New Plants
        - Use of standard, prefabricated modular components
        - Design and construction processes of shorter duration
        - Centrally stored and available plant designs
        - Electronic footprints of existing plants for use in design



Forest Products

Industry of the Future

Vision

By the year 2020, the United States forest products industry envisions itself as the world's leading provider of essential wood and paper products. The industry plans to manufacture these products in leading-edge, low-cost manufacturing facilities manned by highly skilled employees, and to conduct all operations in harmony with the environment.

AGENDA 2020– A Technology Vision and Research Agenda for America's Forest, Wood and Paper Industry - This document presents the forest, wood and paper industry's perspective of where the industry stands today, a desired state for the industry twenty-five years into the future, and the technology-related issues that must be addressed to accomplish the industry's vision of the future.

Download **Agenda 2020** from the American Forest & Paper Association in Word Perfect format

Collaborative Effort Compact - cooperative agreement between DOE and the Forest Products industry

New! **Call for Forest Products Technology Proposals** - The American Forest and Paper Association, in cooperation with the Department of Energy and the National Council for Air and Stream Improvement, issues a **request for forest products related proposals** in six key technology areas:

- Environmental Performance
- Recycling
- Sustainable Forestry
- Sensors and Controls
- Energy Performance
- Improved Capital Effectiveness

Cooperative Research Areas - projects being funded by OIT Forest Products:

- Energy Performance
- Environmental Performance
- Improved Capital Effectiveness
- Recycling
- Sensors and Control
- Sustainable Forest Management

Technology Access - OIT deployment programs and information which can improve productivity:

- NICE 3 (economic, energy, and environmental technology demonstration

grants)
- Motor Challenge(improving motor efficiency)
- Climate Wise (recognition of corporate energy efficiency, pollution prevention)
- Industrial Assessment Centers (productivity, energy, waste assessments for small manufacturing facilities)
- Inventions and Innovation (tools and services for inventors)
- Commercially Available Technologies (fact sheets on available technologies and emerging advanced technologies developed in partnership with OIT)

Team Status - Spring/Summer 1997

Ongoing Federal R&D related to Forest Products

- Industrial Projects Locator - Descriptions of on-going industrial-related research and development projects sponsored by the Department of Energy.
- Federal Agency Activities in Forest Products Related R&D

Industry Profile - energy, environment and economic data related to the Forest Products industry

Links related to the Forest Products Industry

For further information contact Valri Robinson, OIT Forest Products Team Leader.

Forest Products Industry

- **Sustainable Forest Management**
  Valri Robinson, (202) 586-0937
  - Biotechnology Research
    - Determine and locate gene sequences for important growth traits and model
    - Manipulate genes to control: resistance to stresses; wood quality; tree growth
  - Integrated culture research
    - Characterize fiber genetics to produce needed wood structure and pulping qualities
    - Develop high yield genotypes through breeding and testing
    - Develop fertilizers, irrigation systems and pest resistance technologies for healthy tree growth
  - Long-term site productivity
    - Investigate effects of forest management practices on water quality and wildlife
    - Quantify effects of soil nutrients and water availability on plantations
    - Determine the relationships among site source availabilities, gene attributes, carbon gain, allocation and fiber production
- **Improved Capital Effectiveness**
  Charlie Sorrell, (202) 586-1514
  - Develop lower cost, safer and more efficient alternatives to the kraft chemical recovery process.
  - Develop lower cost, more energy efficient forming, pressing and drying technologies for paper and wood products.
  - Develop methods for constructing large and small facilities at lower costs .
  - Develop new materials for the industry's processing equipment which are cheaper to use, less expensive to maintain, and stand up to the harsh nature of the many chemical processes used.
- **Energy Performance**
  Stanley Blazewicz, (202) 586-4679
  - Evaluate forest, wood and paper products for life cycle energy efficiency.
  - Develop technologies that support life cycle energy efficiency assessments of wood and paper products.
  - Establish fundamental relationship between wood and paper drying and product quality and uniformity.
  - Develop combined cycle cogeneration technologies to extract the maximum useable energy from biomass, waste, and fossil fuels.
  - Demonstrate black liquor and biomass gasification technologies.
  - Evaluate new technologies that integrate the production of wood-based chemicals with current wood and paper processes.
- **Recycle**
  Simon Friedrich, (202) 586-6759
  - Establish innovative collection techniques, systems and equipment to improve the economics of recovering materials.
  - Evaluate new separation technologies to allow for more specific separations between desirable recycled components and unacceptable contaminants.
  - Determine the relationship between recycled fiber surface chemistry and product strength.
  - Develop new technologies for deinking plant sludge use and disposal.
  - Establish statistical characteristics of incoming recycled raw material streams.
  - Develop technologies for recycling of wood currently going to landfills.
- **Sensors & Control**
  Theodore Johnson, (202) 586-6937
  - Investigate the environmental implication of promising new delignification and bleaching technologies in terms of atmospheric emission, effluent quality and treatability, and solid waste generation.
  - Fiber characterization.
  - Recycle fiber quality.
  - On-line chip characteristics' determination.

  - Three-dimensional mapping of fiber properties, real time, inside the digester.
  - Three dimensional characterization & controls of internal tree structure and its relation to final product properties.
  - Automated sorting of recycled raw material.
  - Multiple species stack emission monitoring.
  - Recovery boiler (100%) tubes wall integrity measurement (during operation).
- **Environmental**
  Merrill Smith, (202) 586-3646
  - New delignification and bleaching technologies to improve atmospheric emissions, effluent quality & treatability and solid waste generation.
  - Examine environmental implications of anticipated improvements in energy efficiency, reduced fossil fuel use, and reduced fresh water use.
  - Substance & source identification from effluents and emissions testing using newly developed protocols for assessments of possible human health, wildlife & aquatic community health effects.
  - Reduction of impacts of gaseous discharges
  - Removal of non-process elements in pulp and paper operations.
  - Examine atmospheric emissions and solid wastes resulting from minimization of bleach plant and pulp mill effluent discharges.
  - Study new commercially viable control technologies applicable to forest products industry emissions and discharges.
  - Investigate the environmental implications of new wood drying technologies, VOC control technologies, resin formulations, and engineered wood products manufacturing processes.
  - Develop appropriate methods for conducting life cycle analyses of forest products, including proper accounting for carbon cycling, product recycling, a use of renewable resources.
  - Characterize emissions and solid wastes resulting from black liquor gasification, non-sulfur chemical pulping processes, and improved mechanical pulping processes.
  - Evaluate environmental questions related to use of pulp mill residuals as beneficial amendments to forest soils.
  - New treatments for durability of wood products.

Glass

Industry of the Future

- Fall/Winter 1996 Glass Update
- Spring/Summer 1996 Glass Update
- Fall/Winter 1995 Glass Update

The glass industry strategy is composed of a balance of long, medium and short term research and development projects that reflect glass industry identified priorities. In the current economic environment, this competitive energy- and material-intensive industry can benefit from participation with the federal government in defining and implementing future technology advances to maintain its share in the market place. Demonstrations in oxygen-enriched air staging and cullet/batch preheating have been initiated. Current research and development efforts include work in advanced industrial materials and combustion efficiency.

- New! Partner with DOE in glass research and development (R&D). Submit an application for R&D for the Glass Industry Initiative to improve efficiencies of production, energy, environment, and innovative types or uses of glass.
- Use market data and studies to make better business decisions. See what industry impacts have resulted from OIT's technologies that assist the glass industry, (i.e. Oxy-Fuel Firing, Glass Feedstock Purification Using Advanced Optical Sortation)
- Learn about OIT's mission, strategy, organization, and budget, or get an on-line briefing of programs.
- Discover News: recent announcements, upcoming events, and highlights including:

  2nd Industrial Energy Efficiency Symposium & Expo February 25-27, 1997
  17 Firms Receive Demonstration Grants; one is a fiberglass/resin recycler.
  National Materials Advisory Board Reviews
- Learn how OIT's program Industries of the Future focuses on six other industries: forest products, steel, aluminum, metalcasting, chemicals, and petroleum refining,.
- Learn how a glass company can improve productivity by participating in one of OIT's Technology Access programs:
  - NICE^3 (economic energy and environmental technology demonstration grants), 1997 Solicitation
  - Motor Challenge (improving motor efficiency),
  - Climate Wise (recognition of corporate energy efficiency, pollution prevention),
  - Industrial Assessment Centers (productivity, energy, waste assessments for small manufacturing facilities),

- Inventions and Innovations (tools and services for inventors), or
- Adopt new technologies to save money.

- Research and Development
  - Abstracts of Small Business Innovation Research (SBIR) Phase I feasibility projects for the Glass Industry
    - High temperature **forming material**,
    - Laser ultrasound on-line **viscosity sensor**, and
    - Laser Phase Doppler **fiber diameter sensor**.
  - **Ongoing Federal R&D related to the Glass Industry**
    - Industrial Projects Locator - Descriptions of on-going industrial-related research and development projects sponsored by the Department of Energy.
    - Federal Agency Activities in Forest Products Related R&D
    - Research needs - Learn about research needs of the Industries of the Future.

- Links Related to the Glass Industry

- For further information contact one of OIT's staff or one of the Glass Team Members:

  Theodore Johnson, OIT Glass Team Leader. 202-586-6937
    Rolf Butters, Technology Access, SBIR Program
    Larae Dudley, Contract Management
    Deidre Jacobs, Administrative
    Ramesh Jain, Glass/Combustion Program
    Merrill Smith, Continuous Fiber Ceramic Composites Program
    Charles Sorrell, Advanced Industrial Materials Program

Please send any comments, questions, or suggestions to webmaster.oit@hq.doe.gov.

Last revision date: June 9, 1997

Glass Industry

Susanne Leonard (202) 586-6108

- **Production Efficiency**, including manufacturing processes and new techniques that maximize glass strength and quality.
  - Sensors for temperature and physical properties to improve fabrication.
  - Coatings to maximize glass strength.
  - Alternate glass compositions that eliminate hazardous materials.
  - Equipment that eliminates glass surface damage.
  - Improved gas and electric furnaces.
  - Computer models simulating manufacturing processes.
  - Six sigma qualities during processing.
- **Energy Efficiency and Conservation**
  - Optimize electric boosting.
  - Improving furnace design and operation to maximize efficiency.
  - Recovering and reusing waste heat from oxy fuel furnaces.
  - Producing oxygen more efficiently for oxy fuel firing.
- **Recycling**
  - Recycling of post consumer fiberglass insulation.
  - Separation of recycled glass by color.
  - Beneficiation of cullet for recycling.
  - Removal of non glass contaminants.
- **Environmental Protections**, including control of Nitrogen Oxides, sulfur oxides and particulate; solid waste reductions; and wastewater reuse.
  - Combustion processes that reduce air emissions.
  - Expanded use of 100 percent oxygen combustion.
  - Materials or furnace designs to significantly reduce particulates.
  - Manufacturing processes that generate less solid waste.
  - Refractories that do not generate hazardous materials.
  - Elimination of Halide emissions.
- **Innovative Uses for glass technology.**
  - Create new uses for glass and enhance existing materials.
  - "Smart Windows" that react to lighting and temperatures.
  - Lighter weight, impact resistant container and flat glass.
  - Fiberglass that compacts and rebounds easily.
  - New optical fiber designs and components.

Metalcasting

Industries of the Future

The DOE Metalcasting Partners

The metalcasting industry is one of seven energy- and waste-intensive industries t participate with the Office of Industrial Technologies' Industries of the Future str

The metalcasting industry--represented by the American Foundrymen's Society (American Die Casting Association (NADCA), and the Steel Founder's Society of (SFSA) has prepared a document *"Beyond 2000"* which provides a vision of what metalcasting industry could be like in the year 2020. To implement this strategy, t Metalcasting Vision Team at OIT partners with representatives of metalcasting c national laboratories, universities, and various trade/environmental/technical ass organizations to develop and implement energy efficiency technologies that will b the industry and the United States.

This page contains resources related to the metalcasting industry and the Office o Technologies' Metalcasting Team.

[Whats New!] | [Metalcasting Profile] | [Partnership Status] | [Advanced Technologies] | [Hot Links]

What's New

Collaborative effort compact signing by the Secretary of Energy and industry represent

Spring 1996 Metalcasting Update!

Metalcasting Competitiveness Research Act - 1995 Annual Report

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Industry Profile

The metalcasting industry melts and casts mostly scrap metal into literally tens of thou intricately shaped metal parts. In 1996, the U.S. metalcasting industry produced castin value exceeding $29.3 billion, and employed nearly 217,000 people which is dominate business. Of the 3,100 metalcasting establishments in this country, 79% employ fewer people.

[Dimensions] [Energy] [Employment] [Environmental] [Economics] [Data Sources]

Metalcasting Vision Process

DOE is doing business in a new way. The Industries of the Future is a fundamentally d approach to the development of new industrial technology. The process aligns federal i technology research, development, and deployment with the needs of the technology u metalcasting industry. Based on the vision document *"Beyond 2000"*, American Found (AFS), Steel Founder's Society of America (SFSA) and North American Die Casting (NADCA) is leading the development of a technology roadmap that describes what is accomplish the vision. Today, some specific accomplishments include the following:

- **Vision Developed:** In September 1995, chief executive officers and presidents fr foundry, die casting, and foundry supply industries developed *Beyond 2000: A V American Metal Casting Industry*.

- **Compact Signed:** During October 1995, the American Foundrymen's Society (Founders' Society of America (SFSA), and North American Die Casting Associa (NADCA), signed a Compact establishing a voluntary collaborative effort betwe and the U.S. Department of Energy. The Compact provided the framework for id appropriate areas for joint research, development, and technology demonstration

- **Technology Roadmap:** Currently, the CMC is working toward developing a tec roadmap which sets out a strategy for pursuing and achieving the goals set out in and carrying out the cooperative agreement with the U.S. Department of Energy is working with industry and research institutions, including universities and nati laboratories to develop this roadmap.

- **Vision Implementation:** The CMC also manages R&D activities through the M Industries of the Future program. Through an Executive Board and Technical Co CMC operates with input and guidance across the metal casting industry, drawin metalcasting Industrial Advisory Board (IAB) and numerous technical committe metalcasting associations as well as relying on the input and advice from corpor academia, and government agencies. The CMC Technical Committees select can based on the goals and objectives identified in the metalcasting Vision. The CM Board, composed of representatives from the three associations, OIT, and the me IAB, work together to ensure that the candidate R&D projects correspond to the objectives and goals, and make the final project selection.

Advanced Technologies

Ongoing Federal R&D related to Metalcasting

- Industrial Projects Locator - Descriptions of on-going industrial-related research development projects sponsored by the Department of Energy.
- Federal Agency Activities in Metalcasting Products Related R&D

For More Information

- PDF OIT Metalcasting Team Brochure
- OIT Metalcasting Team Contacts
- *"Beyond 2000:" A Vision for the American Metalcasting Industry*
- *Draft* U.S. Metalcasting "Roadmap"
- Metalcasting Competitiveness Research Act - 1995 Annual Report
- DOE Laboratories with programs relevant to the metalcasting industry:

Under Construction

Related Industry Links

Under Construction

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Metalcasting Industry

- **Market (Applications Development)**
  Sara Dillich (202) 586-7925
  Harvey Wong (202) 586-9235
  - Improved lost foam casting technology
  - Semi-Solid & Squeeze Casting technology
  - New Casting Alloy developments
  - Cast Metal Matrix Composites developments
  - Process Variables Control Improvement
- **Materials Technologies**
  Larry Boxall (202) 586-6436
  - Improved dimensional control of Castings.
  - Elimination of Casting defects such as porosity and inclusions.
  - Clean cast metal technology.
  - Castings with thinner walls.
  - Identification and standardization of cast metal properties.
  - New casting alloys.
- **Manufacturing Technologies**
  Doug Gish (202) 586-1741
  Bill Obenchain (202) 586-3090
  - Control and interaction of process variables.
  - Automated finishing equipment.
  - Breakthroughs in affordable automated equipment.
  - Improved core removal methods.
  - Extended diecasting die life.
  - Lead time compression.
  - Waste heat recovery and re use.
  - Cupola furnace modeling and control using neural networks.
  - Advanced sensors and process controls.
  - Melting and holding furnace optimization.
  - Solidification Modeling
  - Fluid Flow Modeling
  - Metal/Material Properties Modeling
  - Alternative Methods of Tooling
  - Rapid Prototyping
  - New Binder Substitutes
  - Casting Consistency In-Process Testing
  - Improved Refractories Lathe Design
- **Environmental Technologies**
  Bill Obenchain (202) 586-3090
  - Complete characterization of waste streams for process modification.
  - Advanced waste treatment technologies.
  - Environmentally benign sand binders and additives.
  - Improved methods of sand reclamation.
  - Beneficial re use of foundry sand and other solid waste products.
  - Alternative processes or materials for reduced waste generation.
- **Human Resources, Education, and Training**
  Gobind Jagtiani (202) 586-1826
- **Profitability and Industry Health**
  Sara Dillich (202) 586-7925
- **Partnerships and Collaborations**
  Joe Bryson (202) 586-3604

Petroleum Refining

Industry of the Future

Fall/Winter 1996 Petroleum Refining Update

The petroleum refining industry is critical to the economic stability and energy security of the U.S., meeting energy demands for more than 190 million automobiles, trucks, and buses as well as aircraft. The industry supplies 97 percent of the energy for the travel and freight needs of the nation. In 1992, the refining industry shipped products valued at over $141 billion and employed more than 74,000 people.

However, increasingly complex processes have become necessary in the last decade because of lower quality crude, volatility in the cost of crude, and environmental regulations that require higher quality and reformulated products.

The Department of Energy and the U.S. petroleum refining industry are discussing the establishment of a partnership to develop new process technologies that will improve the industry s global competitiveness while helping to achieve the government s broad national goals of energy efficiency and environmental improvement. The Refinery of the Future strategy will be based upon an industry-generated vision of the industry s future.

Cost-shared projects are concentrated in just five areas:

- Novel process development
- Process modeling, analysis, and simulation
- Fundamental catalysis
- Gaseous emissions
- Component development

Ongoing Federal R&D related to the Petroleum Refining Industry

- Industrial Projects Locator - Descriptions of on-going industrial-related research and development projects sponsored by the Department of Energy.
- Federal Agency Activities in Petroleum Refining Related R&D

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Last revision date: February 10, 1997

Petroleum Refining Industry

For further information in all topic areas in this industry, contact Dan Wiley at (202) 586- 2099

- Developing new approaches to refining heavy feedstocks.
- Improved energy efficiency of processes and equipment
  - New energy efficient separation technologies.
  - Alternatives to olefin alkylation process.
- New catalysts with improved selectivities, yields and lifetimes.
  - Manufacturing technology.
  - Solid acid catalysts.
- Relating chemical composition to performance of processes/equipment.
- Plant & process reliability.
  - Improved on-line non-destructive evaluation (nde) inspection technology.
  - Predicting useful remaining lifetimes of aging equipment.
  - Robotics for safety operations.
- Environmental and performance characteristics of new hydrocarbon fuel compositions.
  - Minimize particulate emissions (of particle size less than 10 micron) from conbustion source.
  - Understand the effect of multiple burner arrays on process heater efficiency and emisions.
  - Identify reasons for combustion air toxics formation and approaches to minimize toxic formation.
  - Develop low cost, real time mthods for air toxics speciation, characterization and quantification at the ppb level.
- Hydrogen production & recovery.
- Unconventional process technology.
- New materials of construction.
- Integration of environmental solutions into process and plant design.
- Advanced computational modeling of processes and reactions.
- Processing of synthetic fuels.

Steel

Industry of the Future

Fall/Winter 1996 Steel Update

The steel industry recently signed a collaborative effort compact with the U.S. Department of Energy. This compact was signed by the Secretary of Energy and representatives of the industry.

Steel is the most basic and widely used metal in industry, and is vital to the economic and national security of the U.S. The steel products industry is a $57 billion industry employing over 235,000 workers and shipping nearly 80 million tons of steel per year. The steel industry is the fourth largest energy consuming industry in the U.S. and generates 3 million tons of solid waste. To achieve greater energy efficiency, reduce pollution and wastes, and maintain the competitiveness of the U.S. steel industry, the Steel Industry of the Future strategy will build on existing government/industry collaborations to improve the steelmaking processes. The Secretary of Energy and the Chairpersons of the two leading trade groups have signed a Compact that documents the Department of Energy's and the industry's committment to the strategy.

The U.S. steel industry, with about 8 percent of worldwide steel production, competes in an environment where world capacity, some 900 million tons, exceeds actual annual production by nearly 200 million tons. Central to sustaining the industry's competitiveness are efforts to reduce costs and improve quality through fewer processing steps, better yields, greater energy efficiency, and better environmental performance.

The Steel Industry of the Future strategy benefits the industry in two ways: it helps to define and focus research, development, and deployment support as well as to streamline interactions with government agencies. The strategy is being developed by the Office of Industrial Technologies' Steel Vision team with guidance from a May 1995 document -- Steel: A National Resource for the Future produced by the American Iron and Steel Institute and the Steel Manufacturers Association.

Many of the research products that are targeted towards the steel industry are performed as part of the Metals Initiative. A Summary of Steel Projects Performed Under the Metals Initiative for FY94 provides a status report of those projects.

Ongoing Federal R&D related to the Steel Industry

- Industrial Projects Locator - Descriptions of on-going industrial-related research and development projects sponsored by the Department of Energy.
- Federal Agency Activities in Steel Related R&D

Steel Industry

For further information in all topic areas in steel industry, contact Scott Richlen (202) 586-2078

- Production Efficiency
  - Develop a totally continuous steel production process to allow optimization of the overall steelmaking system, including advanced process controls.
  - Develop improved rolling/forming processes which will produce steels with superior properties.
  - Improve coating and painting technology to optimally tailor products to specific applications.
  - Commercialization of a cokemaking technology to ensure a pollution-free process.
  - Continuous improvements in environmental performance via programs with equipment suppliers to develop processes designed for pollution prevention.
  - Reducing the cost of oxygen via programs with oxygen suppliers and with the Electric Power Research Institute (EPRI) to raise the efficiency and bring down the cost of oxygen production. (With the introduction of smelters, consumption per ton of steel produced will continue to grow).
- Energy Performance
  - Improved iron units for EAF and BOF charge, and other steelmaking processes (including reducing residuals in scrap and a coal-based direct reduction process).
  - Develop new flexible steelmaking processes which can optimize sources of iron units and energy.
  - Commercialization of cleaner, energy-efficient, alternate iornmaking processes.
  - Non-intrusive furnance sensors to determine combustion/heating levels at burners when using a number of different fuels, single or combined (e.g. natural, gas, coke oven gas). Needed for heating uniformity and efficiency.
  - Novel combustion meterials to reduce air pollutants with various fuels in a simple, cost effective manners.
  - Nox generation from by-product fuels used in steel making (e.g. blast furnace gas, coke oven gas) is higher than predicted and not well understood. This area should be investigated to provide the foundation for developing lower polluting burners or operating procedures.
- Recycle
  - Commercialization of processes to recycle in-plant wastes (in particular, BF, BOF and EAF dusts).
  - Continuous improvements in waste recycling and resource recovery via research on new approaches and technologies, including biotechnology, to address process waste.
  - Research on recycling and disposal of low-level radioactive mixed waste.

Record Type: Record

To: See the distribution list at the bottom of this message

cc: See the distribution list at the bottom of this message
Subject: GCC comment process -- DEADLINE: COB (read 5pm) FRIDAY and Monday Mtg at 4pm in 324 OEOB..

As you know this GCC process tends to get a little messy. In an attempt to control that , I just wanted to clarify the process for commenting on the DOE structure for analyzing the Interagency GCC effort.

Each agency is expected to provide a set of detailed comments (in hardcopy or electronically) to Dan Reicher by 5pm on Friday (11/14). In addition, Peter Orszag and TJ Glauthier should receive a faxed version of those comments (also by 5pm Friday). Judi Greenwald has been charged with producing a summary of agency comments. Please send an electronic version of agency comments to Judi at **mijujo@computer.org**. If your comments are not received by the deadline, it is likely that they will not be incorporated into the summary materials used in Monday's discussion.

The next meeting of the Glauthier/Orszag GCC Interagency Steering Group will take place at 4pm on Monday (11/17) in Room 324 of the OEOB. As discussed, this group should be considerably SMALLER than the Wednesday meeting, so the invitee list reflects that desire. If you need to substitute someone please let me know. The agencies NOT included in the Monday meeting are: Transportation, Labor, State, USDA, Interior, so it is especially important that their comments be received by 5pm on Friday.

Invitees for the MONDAY, 4pm mtg ARE:

DOE	**Reicher & Moniz**
EPA	**Gardiner & Doniger**
NEC	**Orszag**
OSTP	**Kelly or Bierbaum**
DOD	**Potochney or Salomon (insubstitute for the Goodmans)**
Treasury	**Scholz or Gerardi**
CEA	**Frankel or Morris**
WHCCTF	**Greenwald or Forrister**
DOC	**Hunker**
CEQ	**Lance**
OMB	**Glauthier & Minarik**

I have all of the clearance information for those listed above, but if you choose to substitute a person, please call in your date of birth and SSN to 395-4561.

THANK YOU for your patience as this process continues.
Alecia Ward
395-4561

Message Sent To:

Summary of Comments

q: what corresponds best to budget organization?

1. Comments on overall structure

a. <u>EPA</u> suggests an alternative structure that is organized by sector.

--The sectors are: Buildings, Industry, Transportation, Energy Supply, Agriculture/Forestry, Non-CO2. gases, Infrastructure and Capacity Building, International, and Federal.

--Within each of these sectors, the signature initiatives are categorized as either Deployment or R&D. (DOC also commented that it is important to distinguish between technology development and technology diffusion.)

--Within the Deployment category, there are Market Enhancement Programs (the signature initiatives), Financial Incentives (tax credits and credits for early action), and Other Key Policies (NAAQS and Restructuring).

--Within the R&D category are programs to Develop Advanced Technologies (the signature initiatives) and Financial Incentives (tax credits).

--In their cover memo, they say that it will be important to include foundation work (such as science R&D and economic analysis) but this does not show up on their chart.

b. --<u>DOD</u> suggests the terms "Goals," "Objectives," and "Tasks" in lieu of "Components," "Clusters," and "Signature Initiatives.

--DOD does not want to be a separate "cluster" under the Public Sector Component.

c. -- <u>CEA</u> suggests that regular and rigorous program evaluation against a reasonable and consistent baseline should be Phase V.

d. <u>WHCCTF</u> suggests:

-- that there should be a separate, high priority component for Credit for Early Action/Industry by Industry Consultations/Voluntary Emission Reductions/Cap and Trading Program. We need to consult with industry and determine credit under many individual programs, but someone needs to be in charge of ensuring that everyone is consulted, that we have a sensible system for calculating credit that applies to all voluntary programs, and that we are headed toward a workable binding cap and trade program. This should not be buried under one or two individual programs. Credit for existing CCAP programs need to be simplified and standardized.

--that under "Foundation Research," "Science and Analysis," the Signature Initiatives should be changed to match the three initiatives from the President's Action plan--namely, "Setting Concentration Goals," "Bilateral Dialogues," and Economics ad Science Reviews."

--changing the term "Signature Initiatives," perhaps to "Program Highlights."

--There should be a strong public education component that focuses both on energy efficiency and climate change.

e. DOC suggests:

--To maximize the impact of the limited funding, new R&D funding should be concentrated into no more than two or three of the most promising areas.

--Several R&D areas need to be added: Blended cements, and improved energy efficiency of buildings, appliances, and electrical devices (under commercial and residential buildings); biotechnology for atmospheric CO2 mitigation (under Biotechnology/Forestry/Agriculture/Food Production); solar energy production, fusion energy, fossil fuel decarbonization, direct CO2 removal, and sequestration (under energy production); repairing the earth's atmosphere (under geoengineering); understanding the global climate system and measurement of whole-spectrum load on global climate (under environmental assessment and evaluation); fusion energy development (under international R&D).

f. DOI suggests:

--Consider broadening the PNGV category to include non-PNGV programs, including DOI's National Parks Energy Use Demonstration Project (which includes low or zero carbon emitting vehicles).

--Consider adding cluster and initiative categories entitled "Social Science--Public Education/Behavior Modification" to the existing Foundation Research, Science &Analysis component to make federal efforts more visible to the public.

g. DOT says:

--the list of Signature Initiatives is too long.

--there should be some attention to R&D in the behavioral sciences (e.g., better ways of understanding consumer preferences)

--Transit should be included as a Signature Initiative.

--DOT should be listed under Low Carbon Fuels and PNGV Signature Initiatives.

--The effort to gain Congressional support should start earlier, together with Phase iii (Engage industry and public)

2. *Comments on process*

a. Treasury suggests the following:

-- that tax proposals be reviewed by the Treasury Department before they are included in preliminary action plans;

--that a process be developed to resolve differences between Treasury and other agencies on tax matters;

--that action plans involving tax matters not go forward to Principals without Treasury's review and concurrence.

b. CEA wants:

--to prioritize initiatives based on carbon reductions per dollar expenditure (Federal and private combined). They would like to see charts with dollars and tons of carbon. They want to hold regulatory initiatives to the same standards that apply to direct and tax expenditures and they hope to put off regulatory initiatives indefinitely.

--to drive the package carefully through Congress so it doesn't turn into pork on the way.

c. WHCCTF suggests that:

-- in order to have an intelligent discussion about allocating the $5 billion, each program (or tax credit) description should include the following elements:

--Goals.
--Approach.
--Base program description.
--Potential greenhouse gas reductions
--Cost and Cost-effectiveness.
--External support.

--industry-by-industry consultations were promised by the President; background sheet says that over the next 9 months industries in key sectors will prepare plans on how best to reduce emissions. (See DOC comment). This would seem to mean that industry needs to be consulted on detailed plan regarding the $5 billion program.

d. DOT:

--also wants information on potential emission reduction and cost-effectiveness to help set priorities.

--wants to discuss relationship between tax credits and direct funding of R&D with respect to each initiative.

3. Comments on Overall Policy

a. DOC says that

--$5 billion is woefully inadequate.

--All US government climate change research, including monitoring and assessment, and energy technologies should be concentrated at a single DOE laboratory, with other functions moved to other laboratories.

--R&E tax credits are not recommended as the incentive mechanism for developing new technologies. Our policy needs to be consistent with whatever the Administration's position is for broader R&E tax credits.

--Narrowly targeted tax credits are okay for promoting diffusion of existing technologies that receive a US government stamped greenhouse gas reduction seal of approval.

--We should look at accelerated depreciation schedules and tax credits to encourage capital stock turnover.

--Each industry sector should set voluntary targets and timetables for greenhouse gas emissions reductions, and prepare "technology road maps" to help set goals for cooperative industry-government work.

--USDA:

--has identified $34.5 million (?--Cover letter says 34.5; attached chart says 55.5) for FY99 in additional critical research needs that will lead to the following: expansion of the use of agricultural biomass for energy; dramatic increases in the efficiency of energy use in the forest products and building industry; and improvements in forest management that could lead to greater forest health, reduce the risk of catastrophic fire loss with the attendant release of CO2, and expand economic opportunities for previously timber-dependent communities of the West.

4. Comments on the "Summary Description of Potential Signature Actions"

DOD suggests eliminating specific references to the military in three places, and clarifying that the alternative fuel vehicles program applies to purchase of new non-tactical vehicles.

5

DOE Carbon Management "Over Target" Budget Allocated to DOE or EPA "Components"		
DOE CATEGORY	OMB CATEGORY	$ Amount
Energy Efficiency	Energy Conservation minus FEMP	**111.5**
--Buildings	--Buildings	23
--Industry	--Industrial Sector	38
--Transportation	--Transportation	50.5
--Electricity	?	
Electricity and Low Carbon Fuels	Solar and Renewable	**45**
--Buildings	--Million solar roofs	11
--Industry		
--Transportation	--Biofuels	22
--Electricity	--Biopower	7
?	--Hydrogen	5
Carbon Capture	?	**5**
--Sequestration	--Non-geol. carbon seq (under Res)	5
--Closed Loop Energy Systems	?	
Foundation Resrch, Sci and Anal	Energy Research minus carbon seq	**45**
--Climate Change Science	?	
--Basic Energy Research	--Basic Energy Sci minus C seq	35
--Economic Analysis	?	?
?	--Bio and Enviro Research	10
Public Sector	FEMP (under Energy Conservation)	**10.8**
--Buildings	?	?
--Transportation	?	?
--Military	?	?
Total OMB increment		**217.3**

6

EPA CATEGORY	OMB CATEGORY	$AMT	$DEPLOYMENT	$R&D
Buildings	**Bldgs (EC) + mm sol rfs (S&R)**	34		
Industry	**Industrial Sector**	38		
Transportation	**Transportation (EC)**	50.5		
Energy Supply	**S&R minus roofs**	34		
Agriculture/Forestry	**?**			
Non-CO2 Gases	**?**			
Infrastructure & CB	**?**			
International	**?**			
Federal	FEMP (EC)	10.8	10.8	
Foundation Work	**Energy Research**	50		
Total OMB Increment		217.3		

Jeffrey A. Frankel
01/30/98 10:07:33 AM

Record Type: Record

To: See the distribution list at the bottom of this message

cc:
Subject: Pres. radio address on GCC

Look at the 2nd paragraph in the address (they want comments by noon). I think we probably need to weigh in (at least on the last sentence; I am trying to get someone at OSTP to weigh in on the first part of the paragraph).
JF

Message Sent To:

Janet L. Yellen/CEA/EOP
Michele Jolin/CEA/EOP
Joseph E. Aldy/CEA/EOP
Randall W. Lutter/CEA/EOP
Adele C. Morris/CEA/EOP

cc: JAF

Document No.

WHITE HOUSE STAFFING MEMORANDUM

DATE: 1/29/98 ACTION/CONCURRENCE/COMMENT DUE BY: 1/30/98 NOON

SUBJECT: RADIO ADDRESS - CLIMATE CHANGE

	ACTION	FYI		ACTION	FYI
VICE PRESIDENT	✓		McCURRY		✓
BOWLES	✓		McGINTY	✓	
McLARTY			NASH		
PODESTA	✓		RADD		
MATHEWS	✓		REED	✓	
RAINES			RUFF		
BLUMENTHAL	✓		SMITH		
BERGER			SOSNIK	✓	
ECHAVESTE			SPERLING	✓	
EMANUEL	✓		STREETT		
GIBBONS	✓		TARULLO	✓	
HILLEY	✓		VERVEER		
IBARRA			WALDMAN	✓	
KLAIN			YELLEN	✓	
LEWIS	✓		BEGALA	✓	
LINDSEY			JIM STEINBERG	✓	
MARSHALL			ELI ATTIE	✓	
			PETER ORSZAG	✓	

REMARKS: COMMENTS TO LOWELL WEISS (6-2734)

RESPONSE:

Staff Secretary
Ext. 6-2702

Draft 1/29/98 6:45pm

PRESIDENT WILLIAM J. CLINTON
RADIO ADDRESS ON CLIMATE CHANGE TECHNOLOGY INITIATIVE
THE WHITE HOUSE
January 30, 1998

Good morning. Today I'd like to talk to you about the challenge of climate change, and the steps we are taking to help American consumers and industries meet this challenge head on.

The vast majority of the world's climate scientists have concluded, unequivocally, that if we do not reduce the emissions of greenhouses into the atmosphere, the Earth will heat up, the seas will rise, and severe storms will threaten property and life. Fortunately, we can avert these dangers. Even more fortunately, we can do it in a way that creates jobs, saves money, and strengthens our economy.

This past December, America led the world to reach a historic agreement committing nations to reduce greenhouse gas emissions through market forces, new technology, and energy efficiency. We have it in our power to act right here, right now. In my State of the Union address, I called for an unprecedented commitment of $6 billion for research and tax incentives to mobilize cutting-edge technology in the fight against global warming.

Many of you, I'm sure, heard the encouraging news from Detroit earlier this month. Ford, GM, and Chrysler just unveiled prototypes of ultra-efficient cars that get more than twice the mileage as today's models, with no sacrifice in comfort, safety, or performance. We're proud to have supported research that led to these breakthroughs. And will now do even more.

As part of our tax cut package, we'll help move cars like these onto the roadway by offering incentives to all Americans shopping for cars. When these ultra-efficient cars begin to fill the showrooms, in the year 2000, we'll give you a rebate of $3,000 right off the top -- making it not only wiser but <u>cheaper</u> to buy ultra-efficient cars. It's a deal that will be very hard to pass up.

Our technology package also will help you turn your home into a model of energy efficiency. We'll offer tax credits that will give you a discount of 20% off the cost of energy-saving water heaters and air conditioners. We'll accelerate research into more efficient lighting, refrigerators, and other appliances that will lower energy bills for you.

Vice President Gore announced in California yesterday that we're also proposing a tax credit to help you pay for rooftop solar panels. We'll also step up research into solar and other renewable energy sources. And we will work with industry to cut their energy use -- protecting the environment, while enhancing the bottom line.

If we all commit to thinking just a little bit more about which products we buy, we can chart a more energy efficient future for America. Just ask Hector Ibarra's sixth grade science class, in TK, Iowa. They visited a local bank and obtained a $14,000 loan to put in storm windows and weather stripping throughout their school. They cut the school's energy use by 70%. The savings were so impressive, the bank decided to follow the sixth graders lead.

With the new incentives we will enact, we will make energy-efficiency an even better deal -- for business, for consumers, and for our economy. And most important, will make sure that we live up to our deep responsibility to pass on this home, without harm, to our children and generations yet to come. Thanks for listening.

- Unintended consequences
  - sinks (eg. clear cut & replant)
  - trading
  - JI

Talk to OTA about tax problems
Hudson Milner 622-1785
John McCleland new env. guy
Gerri Gerrardi 622-1782

ENZI Amendment
R - Wyoming

REQUIREMENTS FOR THE REPORTING TO CONGRESS OF THE COSTS TO THE FEDERAL GOVERNMENT ASSOCIATED WITH THE PROPOSED AGREEMENT TO REDUCE GREENHOUSE GAS EMISSIONS

SEC. 580. The President shall provide to the Congress a detailed account of all Federal agency obligations and expenditures for climate change programs and activities, domestic and international, for fiscal year 1997, planned obligations for such activities in fiscal year 1998, and any plan for programs thereafter in the context of negotiations to amend the Framework Convention on Climate Change (FCCC) to be provided to the appropriate congressional committees no later than November 15, 1997.

→ Linda
We're over due on this & we need to organize this w/ Domestic Agencies -
Mike

AUTHORITY TO ISSUE INSURANCE AND EXTEND FINANCING

SEC. 581. (a) IN GENERAL.—Section 235(a) of the Foreign Assistance Act of 1961 (22 U.S.C. 2195(a)) is amended—

(1) by striking paragraphs (1) and (2)(A) and inserting the following:

"(1) INSURANCE AND FINANCING.—(A) The maximum contingent liability outstanding at any one time pursuant to insurance issued under section 234(a), and the amount of financing issued under sections 234 (b) and (c), shall not exceed in the aggregate $29,000,000,000.";

(If Received INCOMPLETE call (202) 622-2222)

2355

unclassified

(CLASSIFICATION)

DATE: Dec. 17, 1997

TO:	(Name) Randy Lutter (CEA)	(Ofc Phone #) 202 395-3142 FAX Nr. 202 395-6870 (Verify)

FROM:	Gerry Gerardi	xaa	202 622-1782
	(Name)	(Office Symbol)	(Phone #)

HANDLE AS:

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PAGE 1 OF 13 PAGE(s)

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REMARKS/SUBJECT

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R & D - TOR

'97 DEC 17 15 57

SSN NUMBER:

DEPT OF THE TREASURY TELECOMMUNICATIONS

Department
of the Treasury

Office of
Tax Policy

Date: December 16, 1997

To: Distribution List

From: Gerry Gerardi (202) 622-1782

Subject: Meeting on tax incentive for fuel efficient vehicles

Date: Thursday, December 18, 1997

Time: 11 am

Place: Treasury, Room 1312

Agenda: Tax credit options (description attached)
Other issues (also described in the attachment)

Contact: If you wish to attend and did not attend the last meeting, please contact Donna Harrell at (202) 622-1783. She needs your date of birth to clear you in (if you attended before, she has the necessary information).

Distribution:

Baseline Options for Passenger Cars for PNGV Tax Credit Program

The goal is to establish a baseline methodology that is explainable, equitable, and that would promote radical improvements in automotive powertrains.

We began with the simplest baseline options, but found they are not workable.

- "One mpg credit level for all cars" would yield a credit program that would be either too easy for small cars or too difficult for large cars to meet
- "A model-specific baseline" would not address new models and could promote gaming associated with changing vehicle nameplates

We then realized that the baseline must rely on technical parameter(s) associated with the current vehicle fleet and that the baseline should meet several criteria.

- rely upon data that are readily available and easy to explain and understand
- use parameter(s) that correlate well with fuel economy
- use parameter(s) which reflect a "vehicle utility function" that is unlikely to represent a technology pathway for improving future vehicle fuel economy
- minimize opportunities to "game" the program via "high mpg outliers"

All of our initial ideas for parameters on which a baseline could be structured failed to pass one or more of the above tests.

- Neither total volume (as used in the Fuel Economy Guide for car categories), 0-60 time, nor engine displacement correlated well with fuel economy when plotted against the entire fleet on an individual model basis
- Weight is a prime technology pathway to improved fuel economy
- Good industry-wide data were not available for metrics such as number of passengers or vehicle frontal area

A final overriding problem with many of the parameters is significant "spread" between the lowest fuel economy vehicle and the highest fuel economy vehicle within a given class. With this spread, any credit scheme based on the average value yields vehicles which would not require leapfrog technologies to be eligible for the credit. DOE's suggestion of a manufacturer-specific total volume-based scheme helped but did not solve this problem.

As a result, we have examined several other options and have identified three alternative baseline methodologies that we believe are worthy of consideration. This package includes some detailed supporting documentation for the first two of these options, while we are still completing the analysis for the third option.

IMPORTANT NOTE: all of the analysis that we have done is based on the 1996 EPA fuel economy data base. This has the advantage of completeness, but the drawback of being somewhat outdated. This is particularly relevant with respect to manufacturer-specific analyses as some models have been discontinued, others have been added since 1996, and fuel economy values can change from year to year. As a first-order attempt to update the data base, we have deleted GM's large station wagon class from this analysis.

Option 1: Best-in-Class Fuel Economy by Modified Fuel Economy Guide Volume Class

Approach

- Compress the 8 Fuel Economy Guide vehicle classes into 4 classes based on total volume categories:
  - a) two-seaters, minicompact sedans, and subcompact sedans
  - b) compact sedans and small station wagons
  - c) midsize sedans and midsize station wagons
  - d) large sedans and large station wagons.
- Rationale: two-seaters and minicompacts serve the same basic functions as subcompacts, station wagons should be in the same classes as the vehicles with which they share platforms, and this compression greatly improves the correlation between fuel economy and total volume.
- While the compression into 4 classes greatly improves the correlation with fuel economy, the two-seater/minicompact/subcompact best-in-class value still represents a high fuel economy outlier. We therefore used the best-in-class fuel economy for each of the other three classes to define a linear relationship between total volume and fuel economy and extrapolated that line to determine the fuel economy value for the two-seater/minicompact/subcompact class. This is the bottom line in the chart in Figure 1.

Results

- The middle and top lines in Figure 1 represent the 2X and 3X credit lines for this baseline methodology. One could use the continuum represented by these lines for purposes of determining credits for individual models based on total volume, or continue to use the four total volume-based "bin" categories for determining credit values. Figure 1 also shows the credit mpg targets based on maintaining the total volume "bin" approach.
- For six manufacturers, Table 1 shows both models which we believe would be among the most likely candidates for tax credits (needing the lesser improvement or being low fuel economy vehicles which the manufacturer would be motivated to take out of CAFE) or the least likely (because of greater improvement needed). For each model, the values in the "unadjusted" columns reflect the improvement that would be needed to be eligible for the tax credit.

Pros

- fairly simple to explain and understand
- excellent correlation between best-in-class fuel economy and total volume
- by using best-in-class, eliminates the "high outlier" problem within a class
- probably promotes greater interest in converting low fuel economy cars which provides the greatest carbon reduction potential

Cons

- basing on best-in-class means that all others have to do more than 2X or 3X to get credit, this is most pronounced in the smaller vehicle classes where there is more "spread"
- best-in-class, a concept that EPA has described for years in its Fuel Economy Trends reports, has often been criticized as representing "low volume" or "unusual technology"

Figure 1: Basic "Four-Bin Best-in-Class" MPG Targets

Class	Bin Centerpoint (cu ft of total volume)	MPG Targets Base	2X	3X
Subcompact Sedans, Minicompact Sedans, & Two Sealers	92.5	48.3	96.7	145.0
Compact Sedans & Small Wagons	105.0	40.5	81.1	121.6
Midsize Sedans & Wagons	115.0	34.3	68.6	102.8
Large Sedans & Wagons	125.0	28.0	56.1	84.1

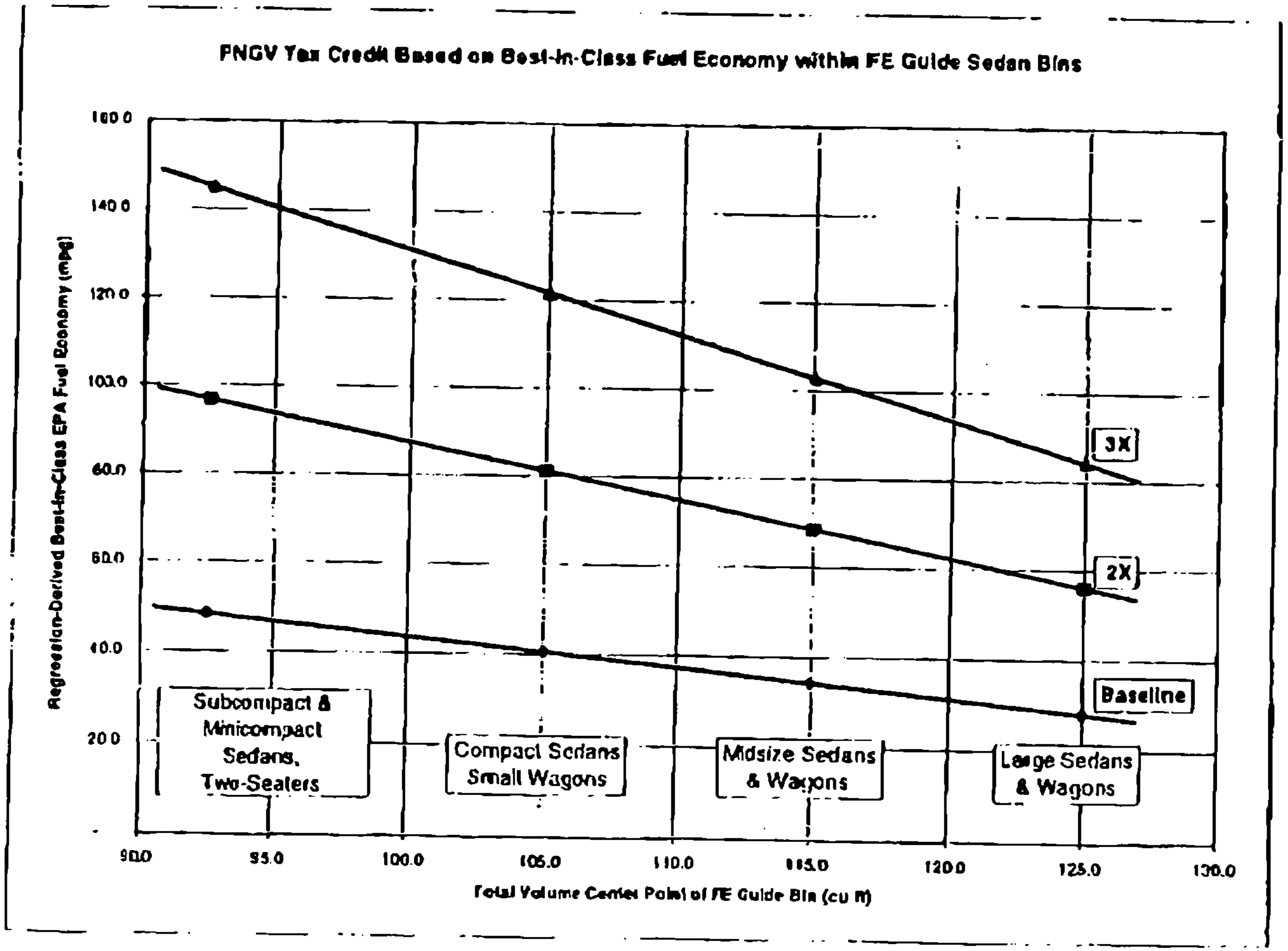


Table 1: Candidate PNGV Credit Vehicles By Manufacturer: Four-Bin Best-In-Class Approach

						Unadjusted		PNGV Adjusted	
Manf	Model	I/D*	FE Guide Subclass	Sales	EPA Fuel Econ(mpg)	Leg-Up from Base**	Stretch to 2X***	Leg-Up from Base**	Stretch to 2X***
GM	CUTLASS SUPREME, GRAND PRIX, LUMINA, MONTE CARLO	D	Midsize Sedan	38,800	23.1	0.7	3.0	0.9	2.3
	CUTLASS SUPREME, GRAND PRIX, LUMINA, MONTE CARLO	D	Midsize Sedan	53,327	23.2	0.7	3.0	0.9	2.3
	ELDORADO	D	Midsize Sedan	23,327	29.4	0.7	2.9	0.9	2.3
	DEVILLE, SEVILLE	D	Large Sedan	183,773	23.4	0.8	2.4	1.1	1.8
	PARK AVENUE	D	Large Sedan	15,126	24.3	0.9	2.3	1.2	1.7
	SATURN SL	D	Compact Sedan	45,898	38.5	1.0	2.1	1.2	1.7
	METRO	I	Subcompact Sedan	25,183	54.5	1.1	1.8	1.3	1.5
Ford	CROWN VICTORIA P	D	Large Sedan	32,440	22.2	0.8	2.5	1.1	1.9
	CONTINENTAL	D	Large Sedan	40,864	22.8	0.8	2.5	1.1	1.8
	CROWN VICTORIA, GRAND	D	Large Sedan	154,397	23.3	0.8	2.4	1.1	1.8
	SABLE, TAURUS	D	Midsize Sedan	120,612	26.9	0.8	2.5	1.0	2.0
	ESCORT, TRACER	D	Compact Sedan	53,457	39.6	1.0	2.1	1.2	1.7
	ASPIRE	I	Subcompact	31,235	43.6	0.8	2.2	1.1	1.9
Chrysler	INTREPID, VISION	D	Large Sedan	12,292	23.6	0.8	2.4	1.1	1.8
	CONCORDE, INTREPID, NEW	D	Large Sedan	154,162	23.8	0.9	2.4	1.2	1.7
	BREEZE, STRATUS	D	Midsize Sedan	28,682	34.3	1.0	2.0	1.3	1.6
	NEON	D	Compact Sedan	44,426	37.4	0.9	2.2	1.1	1.8
Toyota	GS300	I	Midsize Sedan	5,232	23.5	0.7	2.9	0.9	2.3
	AVALON	I	Large Sedan	68,307	27.4	1.0	2.0	1.3	1.5
	COROLLA	I	Compact Sedan	20,884	38.0	0.9	2.1	1.1	1.7
	TERCEL	I	Subcompact	11,700	42.6	0.9	2.3	1.0	1.9
Honda	3.5RL	I	Midsize Sedan	18,130	24.5	0.7	2.8	0.9	2.3
	ACCORD	I	Compact Sedan	38,359	24.6	0.8	3.3	0.7	2.7
	CIVIC HX	I	Subcompact Sedan	6,216	43.0	0.9	2.3	1.0	1.9
	CIVIC HX	I	Subcompact	6,216	48.6	1.0	2.0	1.2	1.7
Nissan	Q45	I	Midsize Sedan	6,208	22.3	0.7	3.1	0.8	2.4
	SENTRA/200SX	I	Subcompact Sedan	29,872	38.7	0.8	2.5	0.9	2.1
	SENTRA/200SX	I	Subcompact Sedan	22,610	39.8	0.8	2.4	1.0	2.1

*I/D = Classified as (I)mport or (D)omestic in CAFE calculations

**Leg Up = ratio of this model's starting fuel economy to the base value for its "bin"; or, the factor by which it already exceeds the base fuel economy

***Stretch = ratio of the 2X fuel economy target for this model's bin to the model's starting fuel economy; i.e., the improvement factor it faces to reach 2X

Option 2: Best-in-Class Fuel Economy by Modified Fuel Economy Guide Volume Class, Normalized to the PNGV Base Vehicle

Approach

- The methodology is the same as for Option 1 with one important difference: Option 1 would almost always require greater than 2X or 3X improvements to achieve the credit levels. Option 2 addresses this by normalizing the baseline credit curve in Option 1 for the base PNGV midsize family sedans.
- For purposes of this analysis, we used the Ford Taurus at 26.9 mpg to represent the base PNGV vehicles. The difference between 34.3 mpg, the best-in-class value for midsize sedans and station wagons under Option 1, and 26.9 mpg, the value for the Ford Taurus, is 7.3 mpg (though it rounds to 7.4 in the table). The baseline credit curve for Option 2 is then defined as the line in Option 1 lowered by 7.3 mpg at each and every point. This is the bottom line in the chart in Figure 2.

Results

- The middle and top lines in the chart in Figure 2 represent the 2X and 3X credit lines for this baseline methodology. As with Option 1, one could use the continuum represented by these lines for purposes of determining credits for individual models based on total volume, or continue to use the four total volume-based "bin" categories for determining credit values. Figure 2 also shows the credit mpg targets based on maintaining the total volume "bin" approach.
- For six manufacturers, Table 1 shows both models which we believe would be among the most likely candidates for tax credits (needing lesser improvement or being low fuel economy vehicles which the manufacturer would be motivated to take out of CAFE) or the least likely (because of greater improvement needed). For each model, the values in the "PNGV adjusted" columns reflect the improvement that would be needed to be eligible for the tax credit.

Pros

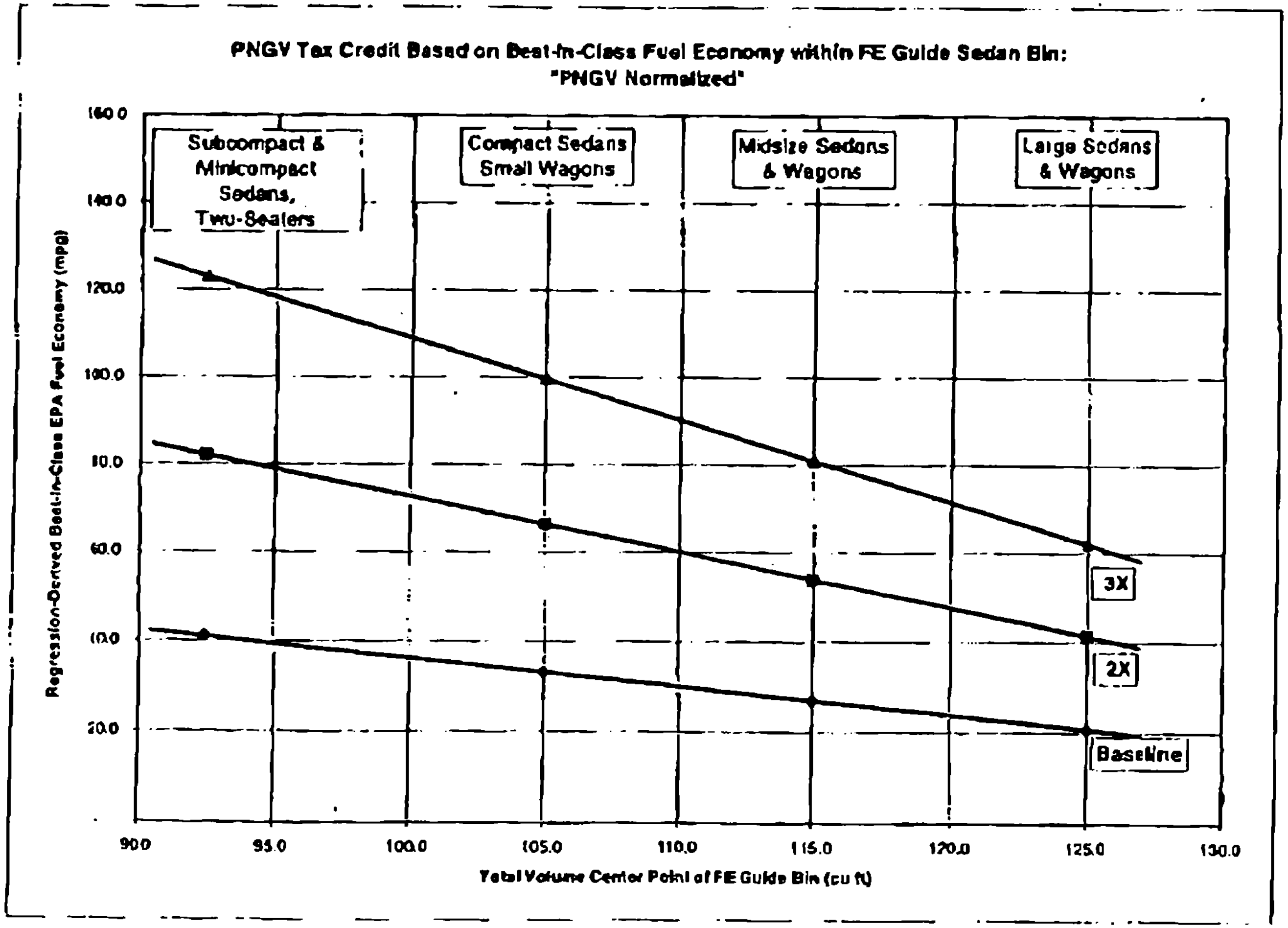
- fairly simple to explain and understand (though more complicated than Option 1)
- excellent correlation between best-in-class fuel economy and total volume
- more consistent with the 2X and 3X improvement goals than Option 1
- probably promotes greater interest in converting low fuel economy cars which provides the greatest carbon reduction potential

Cons

- the normalization process is slightly more complicated to describe (but is based on PNGV base vehicle)
- best-in-class, a concept that EPA has described for years in its Fuel Economy Trends reports, has often been criticized as representing "low volume" or "unusual technology" vehicles

Figure 2: "Four-Bin Best In Class" MPG Targets Reflecting Normalization to PNGV

Class	Bin Centerpoint (cu ft of total volume)	MPG Targets PNGV Adjusted Base	PNGV Adjusted 2X	PNGV Adjusted 3X
Subcompact Sedans, Minicompact Sedans, & Two Seaters	92.5	41.0	82.0	123.0
Compact Sedans & Small Wagons	105.0	33.2	66.4	99.5
Midsize Sedans & Wagons	115.0	26.9	53.9	80.8
Large Sedans & Wagons	125.0	20.7	41.4	62.0



12/16/97 9:42 AM

Option 3: Sales-Weighted Fuel Economy by Fuel Economy Guide Class and Normalized for 0-60 Performance

- We are currently analyzing an alternative approach based on a three-dimensional relationship between fuel economy, fuel economy guide class, and 0-60 performance time.
- Based on preliminary analyses, the primary advantages of this approach are that the two parameters of total volume and performance, by representing the important consumer attributes of size and power, appear to correlate well with fuel economy, would not be pathways that the manufacturers would likely choose to improve future fuel economy, and minimize the "high outlier" problem by adding a much greater number of "bins" into which all vehicle models are divided.
- At this time, the primary drawback is that this methodology would be more difficult to explain and understand. And further analysis of this methodology is necessary to ensure that we fully understand all the potential advantages, disadvantages, and implications of this approach.

Discussion Issue for PNGV Vehicle Purchase Tax Credit

Implications of Gasoline-Equivalent Emissions Requirement

The diesel emissions issue

- While diesel vehicles are currently a very small part of the personal vehicle market, manufacturers are considering increased use of conventional diesels in the future, particularly for larger light-duty truck applications for CAFE compliance
- Conventional diesels emit 10-100 times more particulate than comparable gasoline vehicles as EPA standards were based on diesel, not gasoline, feasibility
- Conventional diesels often emit higher NOx emissions as well, as diesel vehicles are allowed to meet weaker standards for certain subclasses (e.g., cars and the smallest light trucks) through 2003
- EPA will be revisiting the diesel emissions standards issue for post-2003 in the upcoming Tier 2 rulemaking

One option is an eligibility requirement to meet "gasoline-equivalent" emission levels

- Particulate: nominally, 0.01 gpm
- NOx: meet any and all NOX standards applicable to gasoline vehicles in each subclass

Implications of the "gasoline-equivalent" emissions requirement

- Conventional diesels with higher particulate and NOX emissions would not be eligible for the tax credit in the 1999-2003 timeframe. This could decrease the interest by some manufacturers in developing tax credit eligible vehicles in the near term.
- Of course, there are alternatives to conventional diesels for achieving major fuel economy improvements in the near term: newer, cleaner diesel technology, gasoline hybrids, etc.
- There is a strong consensus within the Administration (VP Gore at the recent PNGV Symposium) and the environmental community that clean air should not be compromised for carbon reductions and that diesels must be cleaned up if they are to increase market share. The environmental community would likely oppose government subsidizing the sale of "higher polluting" diesels.
- The PNGV R and D program has adopted "gasoline-like" emission goals for diesels and the federal government has pledged R and D support for clean diesel technology development.

Discussion Issue for PNGV Vehicle Purchase Tax Credit

How to Treat Fuels Other Than Gasoline for the Fuel Economy Improvement?

The "other fuels" issue

- Underlying goal is to promote radically more efficient (i.e., PNGV-type) powertrains
- The eligibility requirement for gasoline vehicles will be 2X and 3X miles per gallon values; the eligibility requirements for other fuels should be based on levels of improvement that require powertrains that provide similar efficiency increases to gasoline vehicles at 2X and 3X
- Miles per gallon is not a good measure of efficiency for fuels with different energy contents (e.g., higher energy fuels like diesel fuel would not require as efficient a powertrain to meet 2X mpg off a baseline, while lower energy fuels such as ethanol would require a more efficient powertrain to meet a 2X mpg requirement)

Preferred option would be to measure efficiency on a miles per equivalent gallon of gasoline, where the mpg value for non-gasoline fuels would be adjusted to an energy-equivalent basis with gasoline

- Consistent with the way this issue is treated within PNGV
- Targets improved vehicle efficiency as the goal of the program
- Example: diesel fuel has, on average, about 12% higher energy content than gasoline; if 20 mpg were the tax credit baseline value for a certain vehicle, a gasoline vehicle would have to achieve 40 mpg to meet the 2X credit level; a diesel vehicle with the same overall efficiency improvement would achieve a 12% higher value or 44.8 mpg.
- Allows easier calculations for electric vehicles as it avoids the complex issue of how the electricity is generated in different regions of the country

A second option would be to base the credit on "tailpipe carbon equivalency"

- Targets lower carbon emissions as the goal of the program
- Generally correlates well with efficiency except that fuels with lower carbon content (e.g., natural gas) would not require as efficient a powertrain and fuels with no "tailpipe carbon" content (electric or hydrogen) would not require any efficiency improvement

A third option would be to base the credit on "life-cycle carbon equivalency"

- Targets lower life-cycle carbon emissions as the ultimate policy goal of the program
- Big problem with this option is that it is impossible for the vehicle manufacturer or the government to know ahead of time how a fuel is going to be produced, e.g., whether the ethanol an ethanol vehicle would use would be corn-based or wood-based

Discussion Issue for PNGV Vehicle Purchase Tax Credit

Two Options for Start Year of Program

1999

Pros
- initial support from White House at Treasury meeting
- applicability in 1999 would maximize media attention which could send early signal to market that may influence manufacturer planning for future years
- putting credit in place, even if little chance of any use, provides link to 1999 budget process

Cons
- may look silly if credit is in place but no one claims it or if certain models meet levels through gaming
- import manufacturers (Toyota Prius) are in best position for credits in 1999-2000

2001/2002

Pros
- a much better fit, though still challenging, with respect to the leadtime necessary for a historical change in automotive powertrain technology
- given the PNGV schedule, domestic manufacturers have a chance to compete for credits

Cons
- may be harder to link to 1999 budget process

Discussion Issue for PNGV Vehicle Purchase Tax Credit

Two Options for Monetary Value of Tax Credits

<u>$3000 for 2X and $4000 for 3X</u>

Pros

- initial support from White House staff at Treasury meeting
- $4000 consistent with maximum amount from existing EV tax credit
- ratio between 2X and 3X credits exactly proportional to relative carbon benefits
- lower per vehicle credit allows greater number of vehicles within overall $ cap

Cons

- small delta between levels may yield little interest in 3X designs

<u>$4000 for 2X and $6000 for 3X</u>

Pros

- bigger credits maximize likelihood of jump-starting market ASAP
- provides more of a delta between 2X and 3X promoting greater interest in truly revolutionary powertrains

Cons

- fewer vehicles available within overall cap

NOTE: Still issue of whether to include a 2.5X credit level as well or to have a continuous function for determining the level of credit

Document No.

WHITE HOUSE STAFFING MEMORANDUM

DATE: 1-30-98 ACTION/CONCURRENCE/COMMENT DUE BY: Immediate

SUBJECT: Radio Address on Climate Change Technology Initiative

	ACTION	FYI		ACTION	FYI
VICE PRESIDENT	✓	☐	McCURRY	✓	☐
BOWLES	✓	☐	McGINTY	☐	☐
McLARTY	☐	☐	NASH	☐	☐
PODESTA	✓	☐	RADD	☐	☐
MATHEWS	✓	☐	REED	☐	☐
RAINES	☐	☐	RUFF	☐	☐
BLUMENTHAL	☐	☐	SMITH	☐	☐
BERGER	☐	☐	SOSNIK	☐	☐
ECHAVESTE	☐	☐	SPERLING	☐	☐
EMANUEL	✓	☐	STREETT	☐	☐
GIBBONS	✓	☐	TARULLO	☐	☐
STEIN	☐	☐	VERVEER	☐	☐
IBARRA	☐	☐	WALDMAN	✓	☐
KLAIN	✓	☐	YELLEN	✓	☐
LEWIS	✓	☐	BEGALA	✓	☐
LINDSEY	☐	☐	Steinberg	✓	☐
MARSHALL	☐	☐		☐	☐
				☐	☐

REMARKS: Comments to Lowell Weiss ASAP.

RESPONSE:

Staff Secretary
Ext. 6-2702

Draft 1/30/98 11:40am

'98 JAN 30 AM11:

PRESIDENT WILLIAM J. CLINTON
RADIO ADDRESS ON CLIMATE CHANGE TECHNOLOGY INITIATIVE
THE WHITE HOUSE
January 30, 1998

Good morning. Today I'd like to talk to you about one of the ways we are strengthening the nation for the 21st century: our bold new efforts to help head off the threat of global climate change through the power of the market and the force of American innovation.

The world's leading climate scientists have concluded, unequivocally, that if we do not reduce the emissions of greenhouses into the atmosphere, the Earth will heat up, the seas will rise, and severe storms will threaten property and life. Fortunately, we can avert these dangers -- and we can do it while maintaining our strong economy.

This past December, America led the world to reach a historic agreement committing nations to reduce greenhouse gas emissions through market forces, new technology, and energy efficiency. We have it in our power to act right here, right now. In my State of the Union address, I called for an unprecedented commitment of $6 billion for research and tax incentives to mobilize cutting-edge technology in the fight against global warming. Now I'd like to explain just what that means for you.

First, we will bring down the price of high-efficiency cars for every American. Last month, Ford, GM, and Chrysler unveiled prototypes of advanced-technology cars that get more than twice the mileage as today's models -- with no sacrifice in comfort, safety, or performance. When cars like these begin to fill the showrooms in the year 2000, we'll give everyone who buys one a $3,000 tax credit -- and it will apply to every size car. When these cars become even more efficient, we'll increase the tax credit to $4,000. We are committed to making it not only wiser but <u>cheaper</u> to buy highly efficient cars.

Second, we will help you turn your home into a model of energy efficiency. We'll offer tax credits that will give you a discount of 20% off the cost of energy-saving water heaters and air conditioners. And, as Vice President Gore announced in California yesterday, we will also offer a tax credit -- worth up to $2,000 -- to help you put solar panels on your roof.

Third, we will step up research on clean, renewable energy and energy-efficient technology. We'll help develop energy-saving lighting, refrigerators, and other appliances that will mean lower monthly bills for you. And we will work with industry to cut their energy use -- so they can protect the environment while enhancing their bottom line.

Whenever we act to heal our environment, the pessimists say it will hurt our economy. But today our economy is the <u>strongest</u> in a generation -- and our environment is the <u>cleanest</u> in a generation. Whether the problem was acid rain, deadly pesticides, polluted rivers, or the ozone hole, the ingenuity of the American people has always proved the pessimists wrong. And we will do it once again. Working together, we will overcome the challenge of global climate change. We will create new avenues of economic growth. And most important, we will honor our deepest responsibility to pass on this home, without harm, to our children, our grandchildren, and generations yet to come. Thanks for listening.

Peter R. Orszag 01/30/98 01:01:55 PM

Record Type: Record

To: Jeffrey A. Frankel/CEA/EOP, Lisa D. Branch/CEA/EOP

cc: from the
Subject: SOTU

Our overriding environmental challenge tonight is the worldwide problem of climate change, global warming, the gathering crisis that requires worldwide action. The vast majority of scientists have concluded unequivocally that if we don't reduce the emission of greenhouse gases, at some point in the next century we'll disrupt our climate and put our children and grandchildren at risk. This past December, America led the world to reach a historic agreement committing our nation to reduce greenhouse gas emissions through market forces, new technologies, energy efficiency. We have it in our power to act right here, right now. I propose $6 billion in tax cuts and research and development to encourage innovation, renewable energy, fuel-efficient cars, energy-efficient homes.

Proposed Interagency Implementation of Climate Strategy

Update Reflecting Agency Comments

The Challenge

Problem is complex:

- many actions
- diverse stakeholders
- long time period
- many actors
- interdependent actions

Plan must be understandable to:

- agencies
- stakeholders
- Congress
- partners
- general public
- international community

Plan must be synergistic:

- actions are interdependent and should be designed accordingly
- actions having broad effects should be coordinated with others
- different skills of agencies and partners should be used in harmony

Plan must be dynamic:

- market conditions will change
- technologies will change
- performance of actions will vary
- economic conditions may change
- appropriations support uncertain

Lessons from CCAP

Critical Success Factors

- Vision-based strategy understandable to partners and stakeholders (not myriad of independent, competing parts)
- Extensive external input in program design and subsequent stages
- Effective coordination among agencies
- Ongoing consultation with Congress
- Actions fully integrated with "base" programs
- Vigorous and sustained support of partners
- Active Presidential support in appropriations and legislative process

Proposal Details

Phase I: Establish Strategic Framework

- Establish implementation framework that shows interrelationships among actions and provides strategic foundation for development of detailed plans
- Assess potential of initiatives and assign priorities

November

Phase II: Develop detailed plan and launch early actions

- Develop detailed draft plan for broad external review - focusing on "signature actions"
- Seek targeted external input
- Launch early actions that have solid plans and partners

November-January

Phase III: Engage industry and public

- Conduct extensive industry and public consultations to finalize plan and maintain public dialogue
- Consult with Congress
- Finalize and distribute plans

February-April

Phase IV: Seek Congressional support and launch actions

- Launch remaining early actions
- Obtain Congressional appropriations and tax changes
- Launch actions that require new funding

April-October

Phase V: Ongoing evaluation and modification

Sequence of Plan

Fall 1997	Preliminary plan Increased FY1999 budget request Preliminary external consultations Launch of early actions
Winter/Spring 1998	Public dialogue Revised plan
Spring/Summer 1998	Multi-year budget proposal (FY2000+) Defense of FY1999 budget request
Fall 1998	Congressional appropriations Launch remaining actions

Draft Strategic Implementation Framework

Purpose: To provide an organizational structure that provides an effective and understandable means of implementing a complex strategy

Organization: Four tiers are proposed -

1) *Goals* - high-level strategic goals
2) *Objectives* - market segments in which initiatives will be implemented;
3) *Key Initiatives* - major actions or common sets of actions that define the strategy;
4) *Tasks* - specific actions that comprise key initiatives - each led by a specific agency or working group (individual tasks not listed in the following tables).

Key Initiatives

- initiatives organized by market or technology - not mechanism (e.g., tax incentive)
- some specific actions recommended by agencies subsumed in initiatives
- several of the 9 points in Presidential speech (e.g., industry consultations) cut across many initiatives, so not called out separately
- costs of initiatives vary substantially
- no attempt yet to prioritize initiatives

→ regulatory costs

Draft Climate Change Strategy Framework

Goals	Objectives	Key Initiatives Near-Term (1998-03)	Key Initiatives Mid-Term (2004-10)	Key Initiatives Long-Term (2010+)	Agencies
Increase Efficiency of Energy Use	Buildings	Energy Star Equipment & Appliance Standards			EPA, DOE
			New Buildings Equipment Development		DOE
			Partnerships for 21st Century Buildings		DOE, HUD, DOC, EPA
	Industry		Industries of the Future		DOE, DOC, EPA
		Accelerated Deployment of Industry Technologies			DOE, EPA, DOC
	Transportation		PNGV - Cars & Truck		DOC, DOE, DOD, DOT, EPA, etc.
		Transportation Deployment Partnerships			DOE, DOT, DOD, DOC, etc.
			Advanced Aircraft		NASA, DOT, DOD
	Federal Sector	Innovative Financing/Facility Efficiency Upgrades			DOE, ALL
		Efficient Vehicle & ATF Vehicle Procurement			ALL
	International	Accelerated Deployment of Energy Efficiency Technologies			DOE, State, DOC

Goals	Objectives	Key Initiatives Near-Term (1998-03)	Key Initiatives Mid-Term (2004-10)	Key Initiatives Long-Term (2010+)	Agencies
Increase Use of Low-GHG Electricity & Fuels	**Buildings**		Million Roofs Program		DOE, etc.
	Industry	Combined Heat & Power			DOE, EPA, FERC, Treasury
			Non-CO2 Gases Reductions		EPA, USDA, DOC, DOE
			Fuel Cells Development & Deployment		DOE, EPA
	Transportation	Low Carbon Fuels			DOE, USDA, DOT, EPA
	Electricity		Renewables R&D and Accelerated Deployment		DOE, EPA
			Optimization of Existing Nuclear Power		DOE, NRC
		High Effiency Fossil Electricity Generation			DOE
		Electricity Sector Restructuring			DOE, FERC, EPA, etc.
		Voluntary Emissions Reductions			DOE, EPA
	Agriculture & Forestry	Industry Partnership Programs			USDA, EPA, DOE, DOI
	International	Accelerated Deployment of Low GHG Technologies			DOE, State, DOC

Goals	Objectives	Key Initiatives Near-Term (1998-03)	Key Initiatives Mid-Term (2004-10)	Key Initiatives Long-Term (2010+)	Agencies
Develop Carbon Removal Technologies	Sequestration			Sequestration R&D	DOE, NAS
	Closed Loop Energy Systems			Energy Plexes R&D	DOE
Conduct Foundation Research & Science	Climate Change Science			Adaptation Research	USGCRP
		Global Environmental Science			USGCRP
	Basic Energy Science & Research		Cross-Cutting Energy Science & Technology Research		DOE, DOC
Implement Cross-Cutting Policies & Conduct Analysis	Market-Based Incentives	Credits & Incentives			EPA, DOE, DOC, Treasury
			Emissions Trading		EPA, DOE, DOC
		Credit for Early Actions			DOE, DOC, Treasury
		Flexible NAAQS Implementation			EPA, DOE
	Analysis	Program Evaluation			ALL
		Consumer Analysis			DOE, EPA, DOC, DOT, DOI

Getting the Job Done

- Feedback and modification of proposal

- Establishment of interagency working group

- Develop detailed plan

  - Goals
  - Approach
  - Milestones/schedule
  - Metrics
  - External coordination
  - Resources

Proposed Interagency Implementation of Climate Strategy

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Draft Climate Change Strategy Framework

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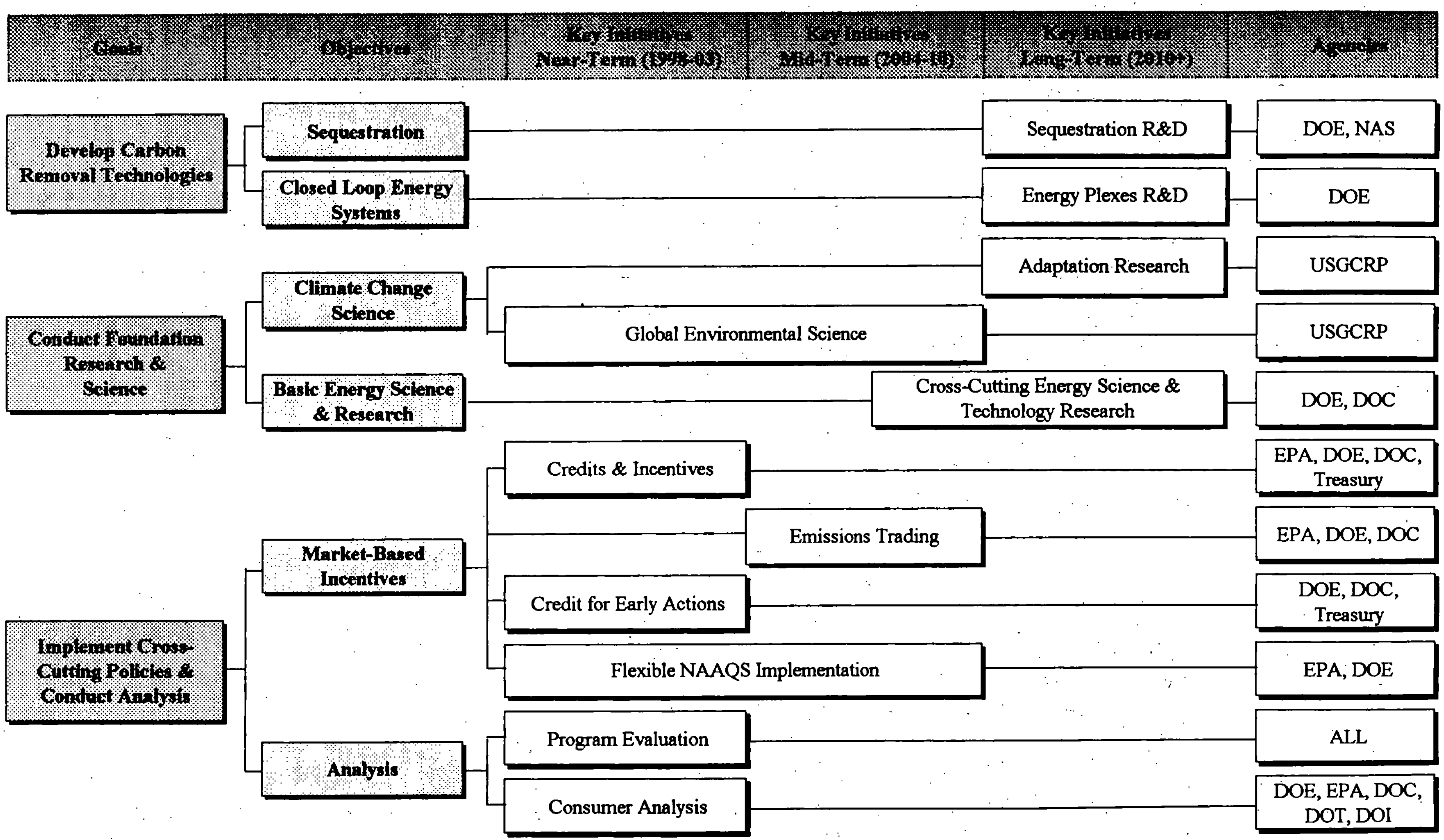
			New Buildings Equipment Development		DOE
			Partnerships for 21st Century Buildings		DOE, HUD, DOC, EPA
	Industry		Industries of the Future		DOE, DOC, EPA
		Accelerated Deployment of Industry Technologies			DOE, EPA, DOC
	Transportation		PNGV - Cars & Truck		DOC, DOE, DOD, DOT, EPA, etc.
		Transportation Deployment Partnerships			DOE, DOT, DOD, DOC, etc.
			Advanced Aircraft		NASA, DOT, DOD
	Federal Sector	Innovative Financing/Facility Efficiency Upgrades			DOE, ALL
		Efficient Vehicle & ATF Vehicle Procurement			ALL
	International	Accelerated Deployment of Energy Efficiency Technologies			DOE, State, DOC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Cross-Cutting Energy Science & Technology Research
DOE, DOC
Implement Cross-Cutting Policies & Conduct Analysis
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Credits & Incentives
EPA, DOE, DOC, Treasury
Emissions Trading
EPA, DOE, DOC
Credit for Early Actions
DOE, DOC, Treasury
Flexible NAAQS Implementation
EPA, DOE
Analysis
Program Evaluation
ALL
Consumer Analysis
DOE, EPA, DOC, DOT, DOI

Phone: 202 260-4332
Fax: 202 260-0780

EPA

Fax

To:	T.J. Glauthier	**From:**	David Gardiner
Fax:	395-4639	**Date:**	November 17, 1997
Phone:		**Pages:**	3
Re:	Climate Change Strategy	**CC:**	

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Attached is the complete set of EPA comments concerning the Climate Technology Program. It consists of a one page memo and a one page matrix.

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

MEMORANDUM

TO: Dan Reicher

FROM: David Doniger, David Gardiner

SUBJECT: Climate Change Strategy

DATE: November 14, 1997

CC: T.J. Glauthier, Peter Orszag

Thank you for your proposal to develop an updated, integrated climate change strategy. Such a strategy will be helpful in guiding not only our current efforts, but also the future evolution of U.S. climate change policy. We would like to suggest, however, a revised structure for the strategy. It is important that the strategy directly address the technology challenge that we confront -- the challenge to deploy today's efficient and low-carbon technologies in all sectors of the economy even as we work to develop more advanced technologies. As has been done in most of the Administration's efforts to date, a sector-by-sector structure will help give a clearer picture of federal efforts to reduce U.S. emissions. Further, distinguishing between efforts to deploy existing technologies and develop improved technologies is important, especially given the time frame for action that the President has proposed. With a reduction target set to begin in 10 years, many of the energy technologies being purchased today will still be in use during the first budget period. The structure of the climate change strategy should therefore be designed to clarify the government's efforts to deploy existing technologies in each sector. At the same time, it is critical that we work to develop improved technologies that offer even larger energy reductions. These advanced technologies will be necessary not only for the first budget period, but also for our long-term efforts to address the climate change threat and develop the technologies that can be used throughout the world. The proposed structure should also help clarify the government's efforts to develop key advanced technologies in each sector.

Our proposal for a revised structure is attached. In addition to helping ensure that the climate change strategy is comprehensive and complete, it should assist us in doing the supporting analysis. Most studies, including the 5 Lab Study, examine each sector separately, and are capable of distinguishing between the contributions of existing technologies versus advanced technologies. While the proposed structure focuses on technology policies, it will be important to include foundation work (such as science R&D and economic analysis) and infrastructure and capacity building (such as grants to state and local government). With regard to the specifics of the attached proposal, including the "signature initiatives," we are open to revisions and look forward to working with you and other agencies on determining what these core activities should be.

Draft Climate Change Strategy -- A Guide to Signature Initiatives by Sector

Sector	Deployment: Market Enhancement	Deployment: Financial Incentives	Deployment: Other Key Policies*	R&D: Develop Advanced Technologies	R&D: Financial Incentives	Binding Target
Buildings	*Energy Star Programs*[EPA,DOE] *Partnerships for 21st Century*[DOE,HUD,DOC,EPA] *Million Solar Roofs*[DOE,etc]	*Tax Credits* DOE,DOC,EPA, Treasury,etc	NAAQS	*Building Technologies*[DOE]		
Industry	*Voluntary Industry Plans*[DOE,EPA] *Combined Heat and Power*[DOE,EPA,FERC] *Waste Wise*[EPA] *Climate Wise*[EPA]		NAAQS	*Industries of the Future*[DOE,DOC]	*Tax Credits* DOE,DOC,EPA, Treasury,etc	
Transportation	*Transportation Partnerships*[EPA] *Sustainable Freight*[EPA, DOT] *Smart Growth Program*[EPA]	*Credits for Early Action* EPA,DOE,DOC, etc		*PNGV- cars & trucks*[DOC,EPA,DOE,DOD,etc] *Advanced Aircraft*[NASA,DOD,DOT,.etc] *Low Carbon Fuels*[DOE,USDA]		*Cap & Trade* EPA,DOE,etc
Energy Supply	*Voluntary Emissions Reductions*[DOE,EPA] *Green Power*[EPA, DOE, etc.] *Sustainable Electric Power Sector*[EPA, etc] *Climate Technology and Renewable Program*[EPA]		NAAQS Restructuring	*Renewables R&D*[DOE] *Advanced Natural Gas Tech*[DOE] *Optimized Nuclear Power*[DOE,NRC] *Energy Plexes R&D*[DOE] *Sequestration R&D*[DOE,NAS]		
Agriculture/ Forestry	*Industry Partnership Programs*[EPA, USDA] *Fertilizer Management*[EPA, USDA]					
Non-CO_2 Gases	*Methane Reduction Partnerships*[EPA] *Partnerships to Reduce HFCs,PFCs, and SF6*[EPA]					
Infrastructure and Capacity Building	*State Grants Program*[EPA,DOE] *Policy, Monitoring and Evaluation*[EPA, DOE] *Empowering Consumer Choice Campaign*[EPA, DOC]					
International	*Developing Country Innovator Program* *Developing Country Technology Transfer*					
Federal	*Federal Leadership*[DOE,EPA, DOD] *Military Buildings & Transportation*[DOD]					

Foundation work

Summary Descriptions of Potential Signature Actions

Preliminary Draft

Below are very brief descriptions of potential signature initiatives. They should be viewed as very preliminary and are provided to illustrate the basic thrust of each initiative.

Energy Star Equipment	Develop more advanced, low cost efficient equipment and accelerated deployment of equipment through Energy Star, partnerships and incentives
Buildings for the 21st Century	Develop improved building designs, materials and systems and accelerated deployment through State and local partnerships; establish partnerships with builders, suppliers, insurers, state and local governments, and federal regulators to develop and construct more efficient, attractive and affordable housing
Industries of the Future	Enhance industry/government research partnerships in energy intensive industries such as chemicals and forest products to develop and deploy technologies that cut emissions while improving productivity
Efficiency Incentives	Launch innovative technology deployment actions that accelerate the use of efficient motors, compressed air, steam and other common systems across industry.
PNGV for Autos and Trucks	Increase funding of PNGV to ensure development of an 80 mpg mid-size car by 2005 and development of PNGV light truck/sport-utility vehicles and PNGV heavy trucks for freight and military applications
Advanced Aircraft	Develop advanced aircraft technologies and air traffic control practices that will produce a 35% reduction in greenhouse gases per passenger miles traveled by 2020
Voluntary Emissions Reductions	Expand the current Climate Challenge effort that encourages electric utilities to reduce emissions on a voluntary basis so that gas utilities and others can participate
Power Plant Efficiency	Develop innovative incentives and technology development that allow existing fossil fuel power plants to increase electrical generation efficiency by as 5% over current levels
Million Solar Roofs	Establish partnerships with cities, communities, utilities and solar manufacturers to install one million solar rooftop systems by 2010 to provide energy and bring down technology costs
Combined Heat and Power	Accelerate development of advanced turbines, fuel cells and other technologies and streamline permitting and other statutory and regulatory reforms to accelerate use of highly efficient combine heat and power systems
Credit for Early Action	Establish a system through which the federal government provides credits to entities that take actions to reduce emissions before formal domestic emissions trading in order to motivate early emission reductions

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Low Carbon Transportation Fuels	Accelerate RD&D on energy crops, harvesting and fuel conversion processes to significantly expand use of biomass fuels for automobiles and other vehicles; develop low-carbon diesel fuels from natural gas
Renewable Energy R&D and Accelerated Deployment	Expand research partnerships for key renewable technologies such as wind, photovoltaics, geothermal, biomass and hydropower to accelerate cost reductions and performance improvements; coordinate demonstrations, incentives, State and local government partnerships and other deployment actions
Optimizing Existing Nuclear Power	Develop and deploy technologies to maximize efficiency of current nuclear plants
Advanced Fossil Energy Technologies	Develop of advanced gas generation technologies such as large combined cycle turbines and fuel cells; develop very efficient, very low carbon coal technologies
Emissions Trading	Design a domestic emissions cap and trading system that will enable private U.S. entities to trade permits; such a system would require Congressional approval and the resolution of a number of key administrative issues
Sequestration R&D	Research and develop technologies that enable separation of carbon from energy sources and long-term storage of that carbon
Energy Plexes R&D	Research and develop long-term technologies that will allow for the construction of "closed loop" energy complexes that integrate the production of power, fuels and chemicals that minimizes energy use and minimizes emissions
Global Environmental Science	Expand research on global climate science to better understand the long term effects on the biosphere of increased atmospheric concentrations of greenhouse gases
Cross-cutting Energy Technology Research	Conduct research on a wide array of subjects - including combustion, chemistry, materials, genetic engineering, geosciences and computation - that supports advanced technology development
Program Evaluation	Ongoing evaluation of actions performance with respect to established performance metrics
Innovative (Federal) Financing	Establish large, innovative financing mechanisms that enable federal facilities managers to "purchase" energy efficiency from private contractors, thereby improving facility energy performance
(Federal) Efficient/Alternative Fuel Vehicles	Purchase high efficiency and alternative fuel vehicles for federal civilian vehicle fleets
(Military) Efficient/Alternative Fuel Vehicles	Purchase high efficiency and alternative fuel vehicles for military vehicle fleets
Facility Efficiency	Provide information, tools, training and financing mechanisms that enable military facility commanders to reduce energy consumption emissions

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fuel cells hydrogen derives.

- Strategies for accelerating innovation
- Subsidies vs. taxes.

- Joe Stiglitz -

- Bob Watson
- Henry K ''