MEMORANDUM

TO: Bob Tuccillo
OMB

FROM: Joe Aldy
CEA

DATE: March 14, 1999

RE: Comments on LRM EHF30: EPA Report on Climate Change Activities

We appreciate the opportunity to review the EPA Report on Climate Change Activities. We have several major points and then a series of specific comments and edits.

Major Comments

The Report Must Be Credible. Since this analysis will be reviewed by GAO, it is critical that the Administration provides a credible accounting of the climate change programs operated by EPA. Some of the numbers in this report will draw attention, especially from skeptics. For example, it is difficult to believe that $1 of EPA expenditures results in $70 of energy savings and reduces 2.5 MMTCO2 (0.7 MMTCE). Since EPA claims cumulative emissions reductions of 70 MMTCE over 1995-1998 (we believe, but the report is not explicit about the time period for aggregation) this would imply that over this four-year period EPA only spent $100 million on climate change. While we are not familiar with the specifics about EPA climate change funding for 1995-1997, we understand that the Agency was appropriated $90 million for FY98 alone for climate change activities. Unless EPA spent $10 million over FY95-FY97 on climate change, there is a an apparent inconsistency in the claims of emissions reductions and cost-effectiveness.

Regarding the cumulative emissions reductions, we are somewhat puzzled by the magnitude. It appears in Figure 1 that total emissions reductions over 1995-1997 were about 150 MMTCO2 (or 41 MMTCE). In August 1997, OAR staff estimated for CEA that total emissions reductions from CCAP through that date to be about 9 MMTCE. It is not clear how emissions reductions improved by 32 MMTCE by December of 1997.

The estimates of reduced energy consumption and energy-savings do not appear to be consistent throughout the report. On pages v and 12, the energy-savings and reduced electricity consumption appear to imply an average electricity price of 13.6¢/kwh, will pages 5 and 8 imply an electricity price of about 9¢/kwh. What is assumed about electricity prices in calculating energy-savings? This should be consistent throughout.

If numbers provided in this report are larger than what would reasonably be expected or would be found by an objective researcher, or if numbers within the report are not internally consistent, then much of the benefit that could be achieved by publishing this report would be foregone because it

would lack credibility. We strongly recommend that this report be reviewed in this light, and that it be edited accordingly.

Anyway Tons and Double-Counting. Throughout the report, there are claims of how technologies are already cost-effective (pages vi, vii, 1, 4, etc.) and can provide a profit to businesses and consumers (page 14). If this is the case, then government programs are not necessary to stimulate adoption. Many of the adoption decisions then that are claimed as emissions reductions, would have occurred anyway. This risks inflating emissions reductions estimates. This claim has been made previously to the Green Lights program, and could apply to several other programs discussed in this report. For example, claiming every Energy Star product sale as a source of an EPA-related emission reduction may not be appropriate, especially in cases where virtually every product in a specific category carries the Energy Star label. In addition, several of the programs appear to overlap in terms of effort and goals, and could risk double-counting emissions reductions. It is important that auditing emissions reductions across programs is done to eliminate double-counting.

Specific Comments

1. Page iii: We are unaware of any studies that have evaluated Federal government climate change and energy-efficiency programs and found that they increase productivity, economic output, employment, and consumer income. Bottom-up analyses, such as the 5 Labs Study, should not serve as the basis for such claims in the first paragraph of the Overview section because of economic methodological flaws in these studies. If there are studies that make these points available, we would appreciate an opportunity to review them. Otherwise, we would prefer to have these claims removed from the report. (This also applies to the similar claims on pages 1, 4.)

2. Page iv: The first paragraph describes a principal-agent market failure (owner-tenant split incentives). It would be useful to describe how a specific CCAP or CCTI program addresses this market failure.

3. Page iv: The claim that EPA does not provide subsidies is based on a very narrow definition of the term subsidy. Since EPA provides information that presumably has value to private firms, the Agency does subsidize these firms. We suggest either removing this explicit claim or modify subsidies so that it is clear that EPA does not subsidize firms financially. (This also applies to a similar claim on page 2.)

4. Page iv: The text of the third barrier in the box is cut-off in this draft.

5. Page v: The text noting that "through 1998" EPA programs has generated a set of results is not clear about the starting point for aggregating these emissions reductions and energy-savings. Do they start with 1995 CCAP funding, or earlier (since some of the programs discussed in this report pre-date CCAP)?

6. Page v: The first bullet point claims 250 MMTCO2 while Figure 1 claims 260 MMTCO2. These should be modified so they are clearly consistent.

7. Page viii: In the first full bullet, it is unclear if the emissions reductions in the industrial sector are an annual number expected in 2010 or a cumulative number expected by 2010. Please clarify.

8. Page viii: The second bullet claims that a 3X PNGV car will decrease emissions by 2/3 and energy bills 2/3. However, consumers will drive more with more energy efficient vehicles. While this rebound effect is less than 1, some of the environmental gains from improving vehicle efficiency will be offset by an increase in vehicle miles traveled. This sentence should be modified to reflect this.

9. Page viii: We are unfamiliar with EPA's programs in international capacity building. Moreover, this report does not provide details on this program (such as the countries the Agency is working in). Since the bottom of page vi claims that cumulative U.S. GHG emissions reductions will total 1300 MMTCO2 (about 350 MMTCE), and making the simple assumption that emissions reductions in 2010 are equal to the average of the decade's reductions, it appears that EPA would be achieving much more in 2010 outside of the U.S. (150 MMTCE) than in the U.S. (35 MMTCE). Is this the case, or have we misinterpreted the presentation of the expectations for the U.S.? This could raise issues regarding cost-effectiveness of domestic versus international programs, as well as the cost-effectiveness of EPA versus DOE and AID programs abroad.

10. Page viii: The simple average of the cumulative emissions reductions over the next decade in the previous comment (35 MMTCE) does not appear to be consistent with the goal of the buildings sector programs (70 MMTCE in 2010) or the 2000 U.S. estimate (58 MMTCE). Are emissions reductions from EPA's programs projected to fall over the coming decade? If so, this would cast doubt on the likelihood of achieving the buildings sector goals. A clarification would be useful.

11. Page 7: The note in Figure 3 makes a claim that had climate change programs not reduced these SO2 emissions, then it would have cost $200 per ton to abate them under Title IV. For a variety of reasons, we recommend that this claim be removed. First, assuming that the allowance price and the marginal cost of abatement are equivalent, then the price used should not be the present allowance price, but the price at the time of these reductions. Since allowance prices were well below $200 for much of the first 3 years of the program, different prices should be used. Second, it is not clear from the figure that all of these emissions reductions occurred in Phase I facilities. Since only Phase I facilities need allowances to cover emissions before 2000, emissions reductions in Phase II facilities would not reflect avoided costs of abatement.

12. Page 14: The report claims that overall program effectiveness is expected to increase over time, however there is no justification provided. It would be useful to understand why program effectiveness will improve. This should also be reconciled with the claim that average annual emissions reductions appear to only be 35 MMTCE over the next decade (see comment 10).

13. Page 16: Given the present effort in the Senate to develop an early action credit program, we recommend deleting the reference to credit for early action.

14. Page 18: The International Capacity Building paragraph claims "roughly 135 MMTCE avoided annually" in targeted countries. This estimate is 10% lower than in the executive summary (150 MMTCE on page viii). We suggest modifying these so that they are consistent.

15. Page 23: We suggest adding "equivalent" after "81 million metric tons of carbon dioxide", since this refers to methane emissions reductions.

U.S. Environmental Protection Agency

Report to:

The Senate Appropriations Committee
Regarding
EPA's Climate Change Activities

DATE

Table of Contents

Executive Summary

Last year Congress requested key information on EPA's Climate Change Technology Initiative (CCTI). Last June, during markup in the Senate Appropriations Subcommittee on VA, HUD and Independent Agencies, Senator Craig offered, and the Committee accepted, an amendment directing EPA to:

> "provide the Committee with a detailed plan for implementing the President's proposal, which would include an annual performance goal for the reduction of greenhouse gases that has objective quantifiable, and measurable target levels . . . The Agency shall submit this plan to the Committee by December 31, 1998."

This language was modified by a colloquy between Senators Byrd and Bond. Senator Bond agreed that EPA could submit the report with the submission of its FY2000 budget and that the provision is only meant to ask for:

> "a more comprehensive explanation by the EPA of its energy and environment programs, justifications for funding increases, and a clear definition of how these programs are justified by the EPA's goals and objectives independent of the implementation of the Kyoto Protocol."

This report addresses the request of the Appropriations Committee as it relates to EPA's climate change activities. The report provides the following information:

- Overview of EPA climate change programs,
- Key accomplishments, performance measures and program effectiveness,
- Program goals and objectives,
- Justification of funding increase,
- Detailed program descriptions.

Overview of EPA Climate Change Programs

The core of EPA's climate change efforts are government/industry partnership programs designed to overcome barriers in the marketplace that limit investments by consumers, businesses and other organizations in more efficient or clean technologies. Energy-efficient technologies provide a sizable opportunity to limit emissions of greenhouse gases while simultaneously improving local air quality, saving money for consumers and businesses and enhancing overall economic productivity. However, to capitalize on this opportunity, the U.S. needs to overcome market failures that have directed the country along a less-than-optimal energy-efficiency path to date. EPA's programs seek to unleash more of the potential of energy-efficient technologies to enhance environmental protection.

Numerous studies document the potential for greater investment in energy-efficient technologies to save money and cost-effectively limit emissions of greenhouse gases. Despite their financial attractiveness, many of these technologies have not penetrated into the market as far as their

financial returns would indicate. There is clear evidence that this potential is not being realized in the current market system because of a number of informational, institutional, organizational, and other barriers that work against the diffusion of existing, energy-efficient technologies and the development of advanced technologies. Information about these technologies needs to flow quickly through the marketplace and there are a variety of split incentives (i.e. buyer is not the builder or tenant is not the owner) that need to be effectively addressed. Programs like EPA's ENERGY STAR Buildings and Green Lights Partnership, the ENERGY STAR Labeling Program and the ENERGY STAR Homes Program are working with industry to overcome these market failures.

Removing the barriers to the diffusion of efficient products produces a substantial ripple effect that further increases the potential for energy-efficient technologies. First, overcoming barriers to diffusion of today's technologies improves the manufacturers' incentives to invest in R&D needed for the next generation of technologies. This leads to new technologies that expand the potential for future energy savings. Second, as sales and production experience increases for efficient technologies, costs of production generally fall, reducing the cost of the technology to the end-user. This "learning by doing" increases the cost-effectiveness of energy-efficient technologies and expands the potential for greenhouse gas reductions.

Under CCTI, EPA manages a number of technology deployment (or market transformation) efforts to remove barriers in the marketplace and deploy technology faster in the residential, commercial, transportation, and industrial sectors of the economy. EPA programs do not provide financial subsidies. Instead, they provide information to remove real barriers inhibiting attractive technology investments. EPA programs also build capacity in state and local governments and developing countries to enable them to take advantage of cost-effective opportunities for reducing emissions of greenhouse gases while simultaneously contributing to other air pollution goals and improving quality of life.

Examples of Current Programs Overcoming Barriers

Lack of Reliable Information. The ENERGY STAR® Consumer Labeling Program allows manufacturers to label qualifying, efficient products. Consumers are provided with unbiased information on their environmental and economic benefits. Through 1998, this young program has seen thousands of products labeled, billions of dollars invested in ENERGY STAR® products, and billions of dollars in consumer savings.

Low Incentive to Manufacturers for Efficiency R&D. Through the Partnership for a New Generation of Vehicles (PNGV), the U.S. has joined with U.S.-based auto manufacturers to develop new automotive technologies, with the goal of tripling the fuel efficiency of passenger cars.

Lack of Corporate Data. Due to the low cost of fuel, many companies don't even know how much energy they use in a year, let alone have a comprehensive view of the actions underway to reduce energy use and emissions. The Climate Wise program, in addition to providing information on industrial energy efficiency opportunities, has now developed a revolutionary new software tool that allows companies to track and report corporate energy use and emissions data, and to monitor and share information on successful reduction strategies across the corporation.

Key Accomplishments and Performance Measures

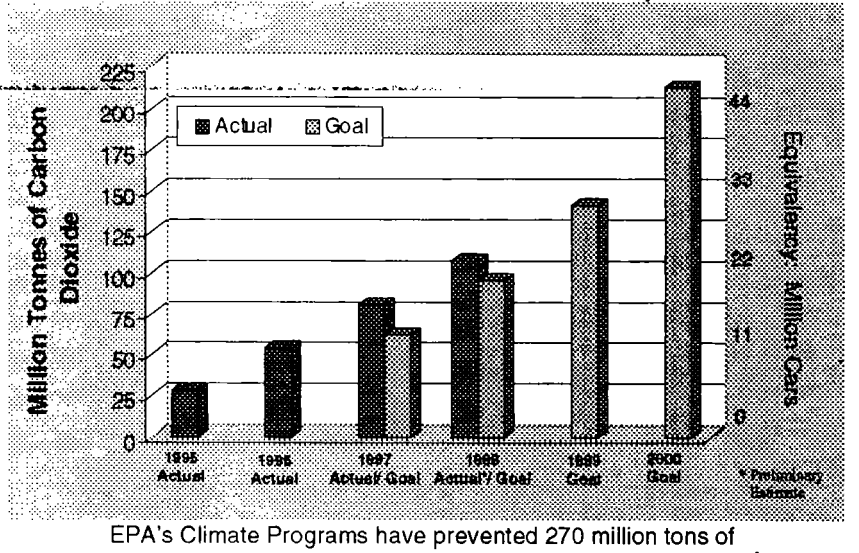
EPA has achieved substantial success across its climate change efforts. Although performance measures vary somewhat according to the nature of a specific program, key performance measures include: avoided emissions of greenhouse gases and criteria pollutants, reduced energy use, and financial savings to program partners. In 1997 EPA's program targets and performance measures were revised from the original Climate Change Action Plan (CCAP), to reflect reduced funding levels in 1996 and 1997 and were reported in the *U.S. Climate Change Action Report, 1997 Submission of the United States of America Under the United Nations Framework Convention on Climate Change.*

Through 1998, EPA programs have:

- Reduced 270 million metric tons of carbon dioxide equivalent (73 million metric tons of carbon equivalent or MMTCE) since 1995.
  - ➢ EPA's programs offset greenhouse gas emissions growth by one half in 1997 (the latest year for which data is available)*.
- Reduced emissions of nitrogen oxides (NO_X) by more than 150,000 tons since 1995.

FIGURE 1: U.S. GREENHOUSE GAS EMISSIONS: ANNUAL REDUCTIONS

1998 reductions were equivalent to eliminating the greenhouse gas emissions from more than 22 million cars for the year.



EPA's Climate Programs have prevented 270 million tons of greenhouse gas emissions since 1995.

- Reduced energy consumption by more than 71 billion kilowatt hours (kWh) since 1995.
- Saved businesses, consumers, and organizations more than $6.5 billion since 1995.
- Partnered with more than 7,000 businesses, state and local governments and other organizations.

Program Effectiveness

EPA also measures success in terms of overall program effectiveness. In addition to meeting the revised annual goal for 1998, reducing annual greenhouse gas emissions by more than 107 million metric tons of carbon dioxide equivalent (30 MMTCE), EPA's technology deployment programs have demonstrated great cost-effectiveness. For every dollar spent by EPA on climate change, the climate change voluntary programs have:

- reduced greenhouse gas emissions by 2.5 tons of carbon dioxide equivalent **and**

* Source: http://www.epa.gov/globalwarming/inventory/1999-inv.html

- delivered $70 in energy bill savings to consumers and organizations.

These results demonstrate that climate protection and economic growth can go hand in hand. Overall program effectiveness is expected to improve over the next several years because much of EPA's work to date has been devoted to program design and start up.

Program Goals and Objectives

Over the next several years, EPA will build upon its government/industry partnership efforts to achieve even greater greenhouse gas reductions by taking advantage of additional opportunities to simultaneously reduce pollution and energy bills. EPA will continue to break down market barriers and foster energy efficiency programs, products and technologies, and cost effective renewable energy. In 2000, EPA expects to:

- reduce greenhouse gas emissions by more than 213 million metric tons of carbon dioxide equivalent (58 MMTCE) annually across key sectors of the economy, as shown in Table ES-1. This reduction is equivalent to eliminating the greenhouse gas emissions from 15% of the cars, sports utility vehicles, and light trucks on the road;
- reduce U.S. energy consumption by more than 59 billion kilowatt hours annually;
- reduce other forms of pollution, including air pollutants such as NO_X, particulate matter and mercury from energy efficiency and reduce water pollution (from better fertilizer management). NO_X emissions will be reduced by more than 152,000 tons in 2000;
- provide $8 billion in energy bill savings to consumers and businesses for the year;
- develop a new generation of efficient and low polluting cars and trucks;
- build partnerships to vastly increase the penetration of energy efficient technologies throughout all sectors of the economy.

Carbon vs. Carbon Dioxide

The same way units of measurement can be expressed in either standard or metric, emissions of greenhouse gases can be reported either in terms of metric tons of carbon equivalent (MTCE) or in metric tons of carbon dioxide equivalent ($MTCO_2E$). The "equivalent " term allows the conversion of non-CO_2 greenhouse gases such as methane and PFCs to a common carbon metric. This document presents both units. To compare the two units, carbon equivalent emissions are multiplied by the molecular to atomic weight ratio of carbon dioxide equivalent. The simple conversion is:

1 MTCE = 3.67 $MTCO_2E$

Justification of Funding Increase

Over the next decade there are important opportunities to further reduce U.S. greenhouse gas emissions and local air pollution, and improve the U.S. economy. EPA is requesting a $107 million increase in 2000 funding for its climate technology programs in order to target these additional

opportunities throughout all sectors of the economy. The request is part of the President's 5-year Climate Change Technology Initiative. Over the next decade, the increase in funding for EPA will deliver at least:

- 1.3 billion tons of greenhouse gas emissions reductions (carbon dioxide equivalent)
- $35 billion in energy savings to families and businesses
- 850,000 tons of NO_x emissions reductions.

These benefits are based on the current effectiveness of EPA's programs. Because EPA expects overall program effectiveness to increase over the next several years, these benefits could be greater.

Table ES-1
Overview of Greenhouse Gas Reductions in 2000 from EPA CCTI Programs

Sector	**Emission Reductions** (million metric tons of CO2 equiv.)
Buildings	**47**
Industry	**139**
Transportation	**21**
State and Local	**6**
Total	**213 (58 MMT Carbon Equivalent)**

Increasing funding for technology deployment is critical to cost-effectively reducing greenhouse gas emissions. Both technology deployment and technology R&D are essential elements of a balanced strategy to address climate change in both the near-term and the long-term. Technology deployment efforts help the marketplace more rapidly adopt existing yet underutilized technologies as well as to more rapidly adopt new technologies from the R&D pipeline. Technology deployment efforts are particularly important in the buildings and industrial sectors. In these sectors, two-thirds of greenhouse gas pollution in 2010 will be caused by equipment that is purchased between now and then.

EPA's strategy to help achieve these additional environmental and economic benefits is to expand its existing programs where additional benefits can be achieved at a profit to businesses and consumers and to launch new initiatives targeted at areas of opportunity that EPA has not

What are these admin.-wide goals?

addressed. With additional funding, EPA will pursue the following goals through 2010:

- In the buildings sector, EPA will expand upon the successful Energy Star partnerships (including ENERGY STAR Labeling and the ENERGY STAR Buildings and Green Lights Program) working toward the goal of improving the efficiency of one-half of all commercial buildings and homes by the year 2010. An administration-wide effort to achieve this goal will increase reductions to about 256 million metric tons of carbon dioxide (70 MMTCE) annually in 2010. It would also reduce the nation's energy bill by over $30 billion per year. EPA will contribute a large portion of the reductions in 2010 building on the 45 million metric tons of carbon dioxide (12.7 MMTCE) that the programs will deliver in 2000.

- In the industrial sector, EPA will work with DOE and expand its existing partnerships with the goal of: (1) doubling the rate of energy and resource efficiency improvements in industry between now and 2010, and; (2) cost-effectively limiting emissions of the more potent greenhouse gases (HFCs, PFCs, SF_6). EPA, whose industry programs will deliver annual greenhouse gas reductions of 140 million metric tons of carbon dioxide (37.9 MMTCE) annually in 2000, will play a large role in delivering the administration-wide goal of 513 million metric tons of carbon dioxide (140 MMTCE) annually by 2010.

- In the transportation sector EPA will accelerate its part in the Partnership for a New Generation of Vehicles and work with manufacturers to bring to market cars that achieve three times the gas mileage of today's vehicles and to expand the partnership to include light and heavy duty trucks. In addition, EPA's Transportation Partners will continue to build on the existing network of over 340 companies, community organizations and local governments to implement strategies to reduce vehicle miles traveled (VMT).

- In the State & Local Climate Change Program, EPA will continue to work towards integrating energy efficiency, clean air, and climate change goals into state and local government energy planning policies.

- In the International Capacity Building area, EPA will continue to work with developing countries to develop plans for mitigating greenhouse gas emissions, with a goal of reducing greenhouse gas emissions by 5 percent in targeted countries, or about 135 MMTCE annually by 2010. EPA will also help enhance forest management by aiding assessment of associated local pollution. Finally, EPA will also work with international partners and U.S. businesses and NGOs to establish market mechanisms that dramatically lower the cost of mitigating greenhouse gas and help finance expansion of international markets for U.S. clean technologies.

The programs are designed to capitalize on opportunities to deploy technology more rapidly through the marketplace, technologies that will save consumers and organizations money on their energy bills while reducing air and other pollution. The primary source of authority for most of these programs is the Clean Air Act. Other statutes provide additional authority for individual programs and specific activities. EPA's current and future programs help fulfill U.S. commitments under the Framework Convention on Climate Change ratified by the United States in 1992 and are in no way intended to implement the Kyoto Protocol prior to Senate ratification.

1.0 Introduction

1.1 Background

According to the world's leading climate scientists, the build up of greenhouse gases in the atmosphere – resulting primarily from the burning of fossil fuels – is leading to global warming. These scientists predict that unless action is taken to reduce emissions, concentrations of carbon dioxide in the atmosphere in the next century will increase to their highest levels in 160,000 years. The Intergovernmental Panel on Climate Change concluded in its consensus 1995 report, that global warming resulting from this increase in greenhouse gas emissions "is likely to have wide-ranging and mostly adverse impacts on human health with significant loss of life."

Burning fossil fuels, coal, oil and natural gas, to produce energy is the source of the vast majority of greenhouse gas emissions. Roughly a third of these emissions come from transportation, a third from industry, and a third from residential and commercial buildings. It has long been recognized that existing, available technologies can provide the same services while using much less energy, and thus causing much less pollution. If a variety of recent technologies and practices were more widely adopted in specific applications, energy use could be cut by more than 30 percent. Many efficient technologies not only reduce greenhouse gas emissions, but do so while saving money and reducing other forms of pollution.

Several major studies support the economic value of improved energy efficiency. A 1996 study by the Energy Information Agency suggests that a reduction in U.S. energy consumption of 12 percent (by the year 2015) would increase GDP by 0.5 percent. Additional studies by the National Academy of Sciences, Office of Technology Assessment, and American Council for an Energy-Efficient Economy have all demonstrated that the technological potential exists to cut energy consumption by 20% or more at a net economic benefit.

EPA's climate change programs are designed to overcome market barriers that have directed the country along a less-than-optimal energy efficiency path to date. These barriers slow the rate of investment in available, smart, efficient technologies that can reduce operating costs and prevent the emissions of greenhouse gases. The existence or availability of a financially attractive technology does not by itself mean the technology will be purchased and used in sizable quantities. Before these efficient technologies can become widely adopted, a number of other key factors have to be in place:

- Potential buyers of products need to know of the technology;
- Potential buyers of products need clear, reliable information on the performance and economic benefits of the technology;
- Potential buyers must be the ones to see the benefits of lower energy bills; and
- Service providers and users of the technologies must have expertise to appropriately design for, install, and operate the technology.

EPA's programs are designed to overcome these barriers in a range of sectors in the economy. Programs like ENERGY STAR Buildings and Green Lights offer the technical assistance, information, and motivation needed for commercial buildings to achieve 30 to 40% energy savings cost-effectively and at low risk. In residential buildings, the ENERGY STAR Homes Program provides a label so builders are able to distinguish their high efficiency homes which deliver utility bill savings with no sacrifice in performance. EPA supports this label with broad consumer awareness efforts. EPA is also working with the financial community to help them understand the added value of energy

efficiency. As a result there are several preferred loan packages for consumers purchasing energy efficient homes or equipment.

Policies that can unleash more of the potential of energy-efficient technologies are important because they offer a cost-effective pathway to reducing greenhouse gas emissions. In addition, greater energy efficiency will enhance the economy by generating productivity investments. Market transformation policies are a cornerstone of a balanced strategy to limit greenhouse gas emissions. They complement R&D investments, as well as other policies.

Responding to the threat of global warming and capitalizing on the opportunities technology offers, President Clinton launched the interagency Climate Change Action Plan (CCAP) in October 1993. Over the last 6 years, it has been one of the Clinton Administration's top environmental priorities. By spurring investment in cost-effective, energy-efficient technologies, these partnership programs transform markets for these technologies, save businesses and consumers billions of dollars in wasted energy expenditures, and reduce emissions of greenhouse gases and other air pollutants.

Building on the success of the original CCAP, in 1997 President Clinton announced expanded efforts to further reduce greenhouse gases and increase efficiency throughout the U.S. economy. The Climate Change Technology Initiative (CCTI) is a broad portfolio of activities designed to further reduce greenhouse gas emissions in the U.S. including: expanded technology deployment programs; increased research and development of low carbon and energy efficient technologies; tax credits for the purchase of efficient technologies; and consultations with industry to develop greenhouse gas reduction plans; and reduced Federal government energy use.

By advancing cost-effective, smart technologies and practices, these initiatives are reducing domestic greenhouse gas emissions, while simultaneously growing the economy. EPA's technology partnership programs do not provide financial subsidies, no money goes to EPA's partners. The programs work by overcoming widely acknowledged barriers to energy efficiency – lack of clear, reliable information on technology opportunities; lack of awareness of energy efficient products and services; and lack of financing options to turn life cycle energy savings into cost savings for consumers. As EPA Administrator, Carol Browner, pointed out on September 1997:

> *Addressing the challenge of global warming is not about ratcheting down our economy. It is about investing in new technologies and using America's technological leadership to develop new ways to make things, new ways to get where we want to go, to work and to play. And it's about economic growth. Those who are first in bringing pollution-reducing technologies to market are going to be very well-positioned in the global economy of the 21st Century. And American industries are leaders in developing these technologies.*

1.2 Congressional Request

This past year, Congress has requested information on EPA's Climate Change Technology Initiative (CCTI) programs. On Thursday, June 11, 1998, the Senate Full Committee on VA, HUD and Independent Agencies met and marked up EPA's FY 1999 Appropriations Bill. Senator Craig (R-ID) offered, and the Committee accepted, the following amendment:

> *On October 22, 1997, the President announced a three-stage proposal on Climate change in anticipation of an international agreement to be negotiated 2 months later in Kyoto, Japan. With regard to programs pursued under the President's proposal, the Committee expects the Environmental Protection Agency to comply with the letter and spirit of the Government*

Performance and Results Act. The Committee directs the Agency to provide the Committee with a detailed plan for implementing the President's proposal, which would include an annual performance goal for the reduction of greenhouse gases that has objective quantifiable, and measurable target levels. The plan should provide substantial evidence on the effectiveness of implementing the President's proposal in facilitating compliance with binding greenhouse gas emissions reduction commitments contained in international agreements negotiated on behalf of the United States. The Agency shall submit this plan to the Committee by December 31, 1998. The General Accounting Office is directed to prepare a report that evaluates the Agency's completed plan and submit its report to the Committee within 90 days after receipt of the Agency's plan.

This language was modified by a colloquy between Senators Byrd and Bond. Senator Bond agreed that EPA could submit the report with the submission of its FY2000 budget and that the provision is only meant to ask for "a more comprehensive explanation by the EPA of its energy and environment programs, justifications for funding increases, and a clear definition of how these programs are justified by the EPA's goals and objectives independent of the implementation of the Kyoto Protocol."

In addition, the Congressional Conference Report accompanying EPA's FY 1999 Appropriations (i.e., Report 105-769, FY 1999 VA, HUD, and Independent Agencies Appropriations Act) included the following language (page 274 of Report 105-769):

To the extent future funding requests may be submitted which would increase funding for climate change activities prior to Senate consideration of the Kyoto Protocol (whether under the auspices of the Climate Change Technology Initiative or any other initiative), the Administration must do a better job of explaining the components of the programs, their anticipated goals and objectives, the justification for any funding increases, a discussion of how success will be measured, and a clear definition of how these programs are justified by goals and objectives independent of implementation of the Kyoto Protocol. The conferees expect these items to be included as part of the fiscal year 2000 budget submission for all affected agencies.

This report responds to the amendment submitted by Senator Craig, as modified by the colloquy between Senators Byrd and Bond and to the language in the Appropriations Committee Conference Report.

1.3 Organization of Report

In this report, EPA has addressed the aspects of the Climate Change Programs as requested by Congress. The report is organized as follows:

- Chapter 2 – Overview of the performance measures for the programs, and the accomplishments of the programs to date.
- Chapter 3 -- Summary of the goals of EPA's programs for 2000.
- Chapter 4 – Explanation of the request for increased funding , the additional benefits of the spending increase, how the incremental benefit is measured, and EPA's authorities for performing the work.
- Chapter 5 – Program by program profiles of activities and accomplishments.

2.0 Accomplishments and Performance Measures for EPA's Climate Programs

EPA's voluntary partnership programs are an essential component of the U.S. strategy to reduce greenhouse gas emissions while improving economic growth. These programs work to protect the environment by removing market barriers to investments in energy efficiency and other climate-friendly technologies. By breaking down these barriers, the programs help partners achieve early reductions in greenhouse gas emissions by promoting the use of cost-effective technology, reducing energy consumption and the build-up of long-lived greenhouse gases in the atmosphere.

EPA's programs continue to be ahead of the targets as revised and reported on in the *U.S. Climate Change Action Report, 1997 Submission of the United States of America Under the United Nations Framework Convention on Climate Change*. Development of this report included an interagency review of program goals and accomplishments. It was the first interagency effort to re-estimate the goals for CCAP programs based on the reduced funding the programs received in FY96, FY97, and FY98.

EPA measures program accomplishments and success using five key performance measures. They are:

- greenhouse gas emissions reductions,
- NO_X emissions reductions (not included in CCAP),
- SO_2 emissions reductions (not included in CCAP),
- reduction in energy consumption,
- money saved on utility bills, and
- number of partners participating in climate change programs.

The methodology used to collect data and estimate program impacts vary from program to program. For the most part, EPA relies on direct program participant reporting. For instance, The ENERGY STAR Buildings and Green Lights Partnership collects detailed, technology specific reports from program participants that includes energy savings from completed energy-efficiency projects as well as detailed information on investments in the energy efficient technologies. Other programs such as EPA's The ENERGY STAR Labeling program, relies on industry reports of shipments of equipment and the penetration rate of the ENERGY STAR label for that particular equipment. Based on this information and other known factors, EPA is able to calculate the energy savings and energy cost savings resulting from the use of the ENERGY STAR products. Carbon savings, as well as NO_X and SO_2 reductions, attributed to EPA's programs are calculated using regional carbon (or NO_X or SO_2) factors (carbon emitted/kWh) and applying them to the reported or calculated energy savings.

These performance measures were included in the original CCAP and were the basis for the U.S. progress report, *U.S. Climate Change Action Report, 1997 Submission of the United States of America Under the United Nations Framework Convention on Climate Change*. This section provides a summary of EPA's accomplishments for each of these performance measures, after a discussion of overall program effectiveness.

2.1 Program Effectiveness

EPA's programs address all major greenhouse gases in all major sectors of the economy. EPA has identified a wide range of cost-effective, smart technology pathways. By working with businesses, organizations, and consumers, EPA is achieving greenhouse gas reductions while reducing energy bills. These market based programs are demonstrating that reductions in greenhouse gas emissions and criteria air pollutants are achievable. Programs including ENERGY STAR Labeling, Climate Wise and ENERGY STAR Buildings and Green Lights have saved businesses, consumers and organizations across the country billions of dollars while reducing the emissions of harmful greenhouse gases by millions of tons.

EPA's technology deployment programs have demonstrated great cost-effectiveness. For every dollar spent by EPA, the deployment programs have

- reduced greenhouse gas emissions by 2.5 tons of carbon dioxide equivalent **and**
- delivered $70 in energy bill savings to consumers and organizations.

These results demonstrate that climate protection and economic growth can go hand in hand. Overall program effectiveness is expected to improve over the next several years as well, because much of EPA's work to date has been devoted to program design and start up.

2.2 1998 Accomplishments

Through 1998, EPA's Climate Change programs have reduced U.S. greenhouse gas emissions 270 million tons of carbon dioxide equivalent (73 MMTCE). EPA's partners, now over 7,000 in number, are reducing emissions of carbon dioxide and other long-lived greenhouse gases such as methane and perfluorocarbons by implementing energy-efficiency upgrades as well as industrial best management practices. These improvements have reduced energy consumption by more than 71 billion kilowatt hours (kWh), saving families and businesses more than $6.5 billion and keeping more than 150,000 tons of smog-forming nitrogen oxide (NO_X) pollution from entering the air.

In 1998 alone, these programs:

- Conserved enough energy to light 35 million homes for the year.
- Prevented NO_X emissions equivalent to the annual pollution from 46 power plants.

Carbon vs. Carbon Dioxide

The same way units of measurement can be expressed in either standard or metric, emissions of greenhouse gases can be reported either in terms of metric tons of carbon equivalent (MTCE) or in metric tons of carbon dioxide equivalent ($MTCO_2E$). The "equivalent " term allows the conversion of non-CO_2 greenhouse gases such as methane and PFCs to a common carbon metric. This document presents both units. To compare the two units, carbon equivalent emissions are multiplied by the molecular to atomic weight ratio of carbon dioxide equivalent. The simple conversion is:

1 MTCE = 3.67 $MTCO_2E$

- Avoided greenhouse gas emissions equivalent to eliminating the pollution from more than 22 million cars for the year. The reductions attributed to EPA's climate change programs reflect changes from the business as usual pathway as a result of partners' participation in the programs.

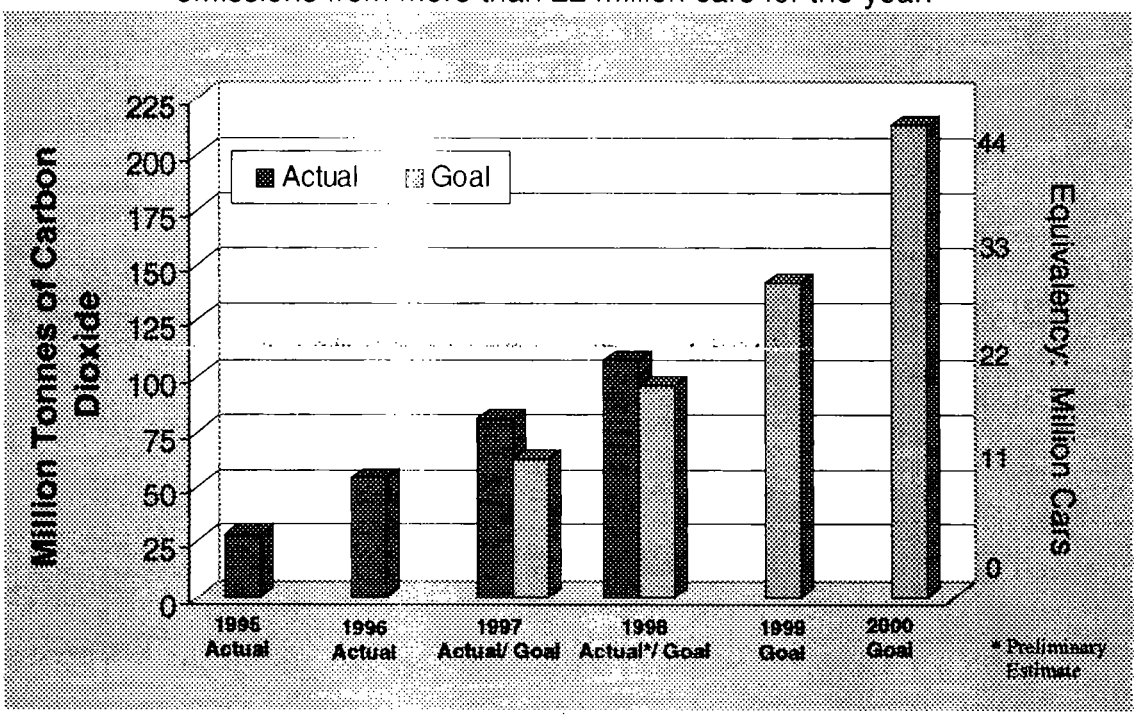
2.3 Program Performance Measures and Accomplishments

This section summarizes through a series of graphs the success that EPA's technology deployment programs have had through 1998, as well as demonstrates that the programs are on track to meet the revised year 2000 goals. There is a graph for each key performance measure:

- greenhouse gas emissions reductions, Figure 1;
- NO_x and SO_2 emissions reductions. Figure 2 and Figure 3;
- reduction in energy consumption, Figure 4;
- money saved on utility bills, Figure 5 and;
- number of partners participating in climate change programs, Figure 6.

FIGURE 1: U.S. GREENHOUSE GAS EMISSIONS: ANNUAL REDUCTIONS

1998 reductions were equivalent to eliminating the greenhouse gas emissions from more than 22 million cars for the year.



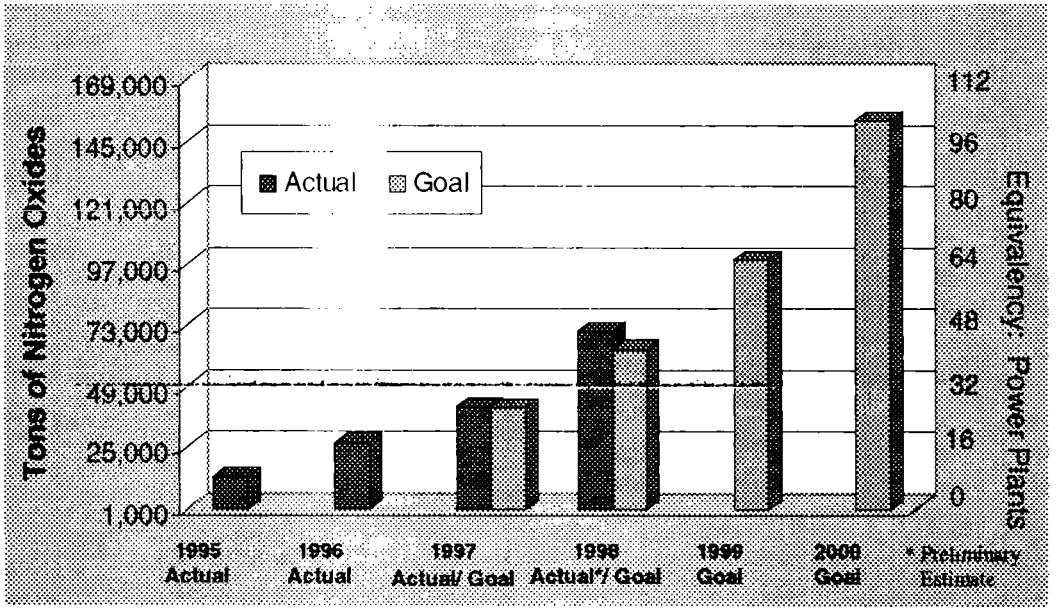
EPA's Climate Programs have prevented 270 million tons of greenhouse gas emissions since 1995.

As shown in Figure 1, EPA is achieving its goal to reduce greenhouse gas emissions, eliminating more than 107 million metric tons of carbon dioxide equivalent in 1998 (30 MMTCE) alone. The programs are on track to continue to meet their goals as revised in 1997. Emissions reductions in 1998 are equivalent to taking more than 22 million cars off the nation's roads.

These programs offer multiple environmental benefits. Not only do they reduce the amount of greenhouse gases that are released into the environment, but by reducing nitrogen oxides and sulfur dioxide, these programs help improve air quality. As shown in Figures 2 and 3, EPA's programs are ahead of target for reducing emissions of nitrogen oxides and sulfur dioxide.

FIGURE 2: U.S. NITROGEN OXIDE (NO_x) EMISSIONS: ANNUAL REDUCTIONS

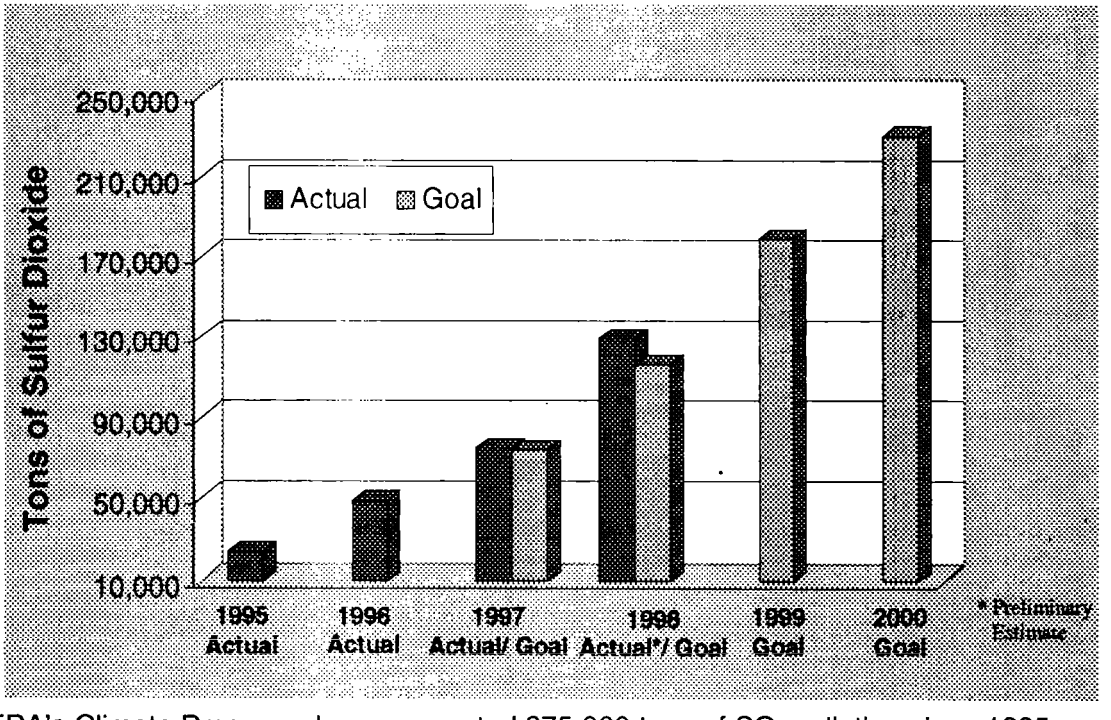
1998 reductions were equivalent to eliminating the emissions from 46 mid-size power plants.



EPA's Climate Programs have prevented 150,000 tons of NO_x pollution since 1995.

FIGURE 3: U.S. SULFUR DIOXIDE (SO_2) EMISSIONS: ANNUAL REDUCTIONS

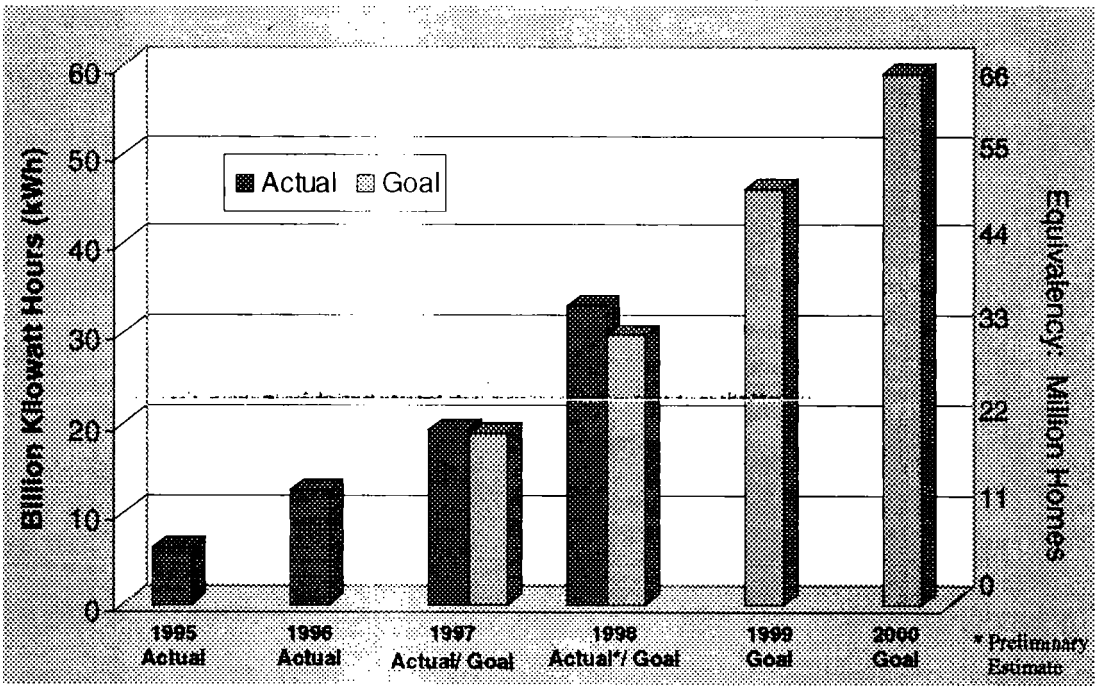
1998 SO_2 reductions were greater than the total emissions from all power plants in the states of California, Nevada, Utah, and Oregon.



EPA's Climate Programs have prevented 275,000 tons of SO_2 pollution since 1995.

FIGURE 4: ANNUAL ENERGY SAVINGS

In 1998, EPA's climate technology programs saved enough energy to light 35 million homes for the entire year.



EPA's Climate Programs have saved 70 billion kilowatt hours of electricity since 1995.

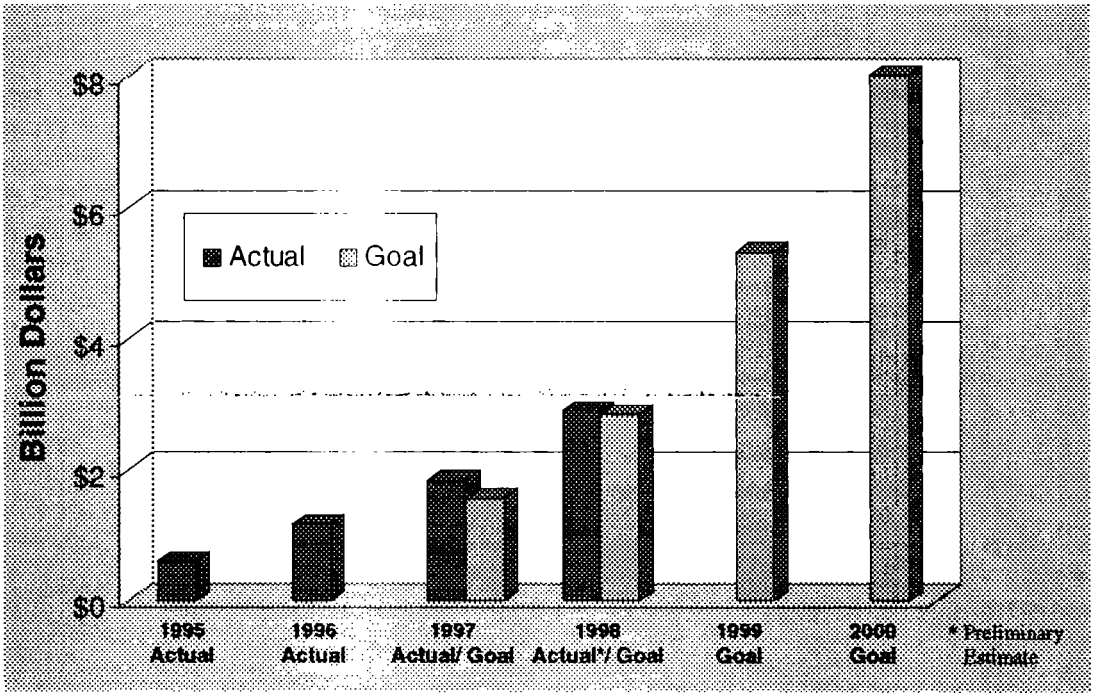
As shown in Figure 4, EPA's programs are sizably reducing our nation's demand for energy. In 1998 alone, EPA's programs were responsible for reducing energy consumption by more than 32 billion kWhs, enough energy to light 35 million homes for the entire year. Programs that reduce electricity generation, thereby decreasing greenhouse gas emissions and emissions of other harmful pollutants, are exceeding their goals. In 1998, the goal was exceeded by 3 billion kilowatt hours (kWhs).

EPA is also on target for reducing the energy bills of families, schools, businesses, and other organizations, as shown in Figure 5. In 1998, consumers, businesses and organizations saved $2.9 billion dollars on utility bills. Energy bill savings do not show EPA's programs to be ahead of target to the same degree as are other performance measures. This is because some of EPA's programs are reducing emissions of greenhouses gases other than carbon dioxide (i.e. methane, PFCs, etc.). Reductions in emissions of these gases do not have associated energy bill savings, for the most part.

The final performance measure is number of partners, as shown in Figure 6. Already, EPA has formed partnerships with more than 7,000 schools, state and local governments, companies (large and small), hospitals and other organizations. Through these partnerships EPA is meeting its goals to reduce greenhouse gas emissions. While in 1997 and in 1998 EPA fell just short of meeting its partnership goals, EPA has demonstrated that through effective implementation it has been possible to meet and exceed the other goals.

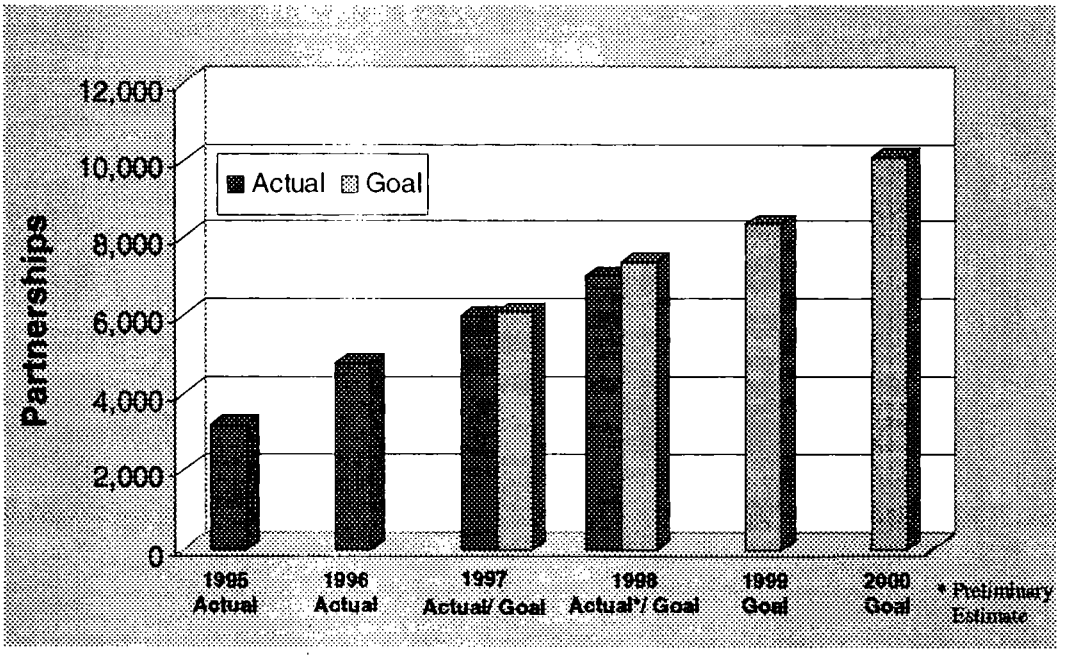
FIGURE 5: ANNUAL ENERGY BILL SAVINGS TO FAMILIES, SCHOOLS AND BUSINESSES

Since 1995, EPA's programs have helped schools and universities save over $200 million. Savings in 1998 alone could buy 1 million text books or hire 1,000 teachers.



EPA's climate programs have saved U.S. families and organizations $6.5 billion since 1995.

FIGURE 6: NUMBER OF EPA PARTNERSHIPS WITH SMALL AND LARGE BUSINESSES, SCHOOLS, HOSPITALS, AND STATE & LOCAL GOVERNMENTS



Since 1995, EPA has formed 7,000 partnerships with small and large businesses, schools, hospitals, and state and local government agencies.

EPA's partnerships with companies, organizations, manufacturers and industries have resulted in a strong record of success across the country. For example:

- Manufacturers of office equipment and electronics are making more energy-efficient products available that reduce energy consumption without sacrificing product performance. For example, since 1991, when the ENERGY STAR label first appeared on office equipment, the penetration rates of the ENERGY STAR label has soared from 0 to 95% on computer monitors, 99% on printers, and 85% on computers. In 1998, EPA formed a new partnership with TV and VCR manufacturers to produce TVs and VCRs that waste less energy, reduce pollution by more than 3.5 million tons of carbon dioxide per year and save consumers up to $500 million per year on their energy bills.

- Schools partnering with EPA in the ENERGY STAR Buildings and Green Lights Partnership are increasing the quality of their lighting and comfort in classrooms while seeing large reductions in energy bills. Since 1995, EPA's programs have helped schools and universities save more than $200 million -- enough money to buy 4 million text books or hire 4,000 teachers.

- Home builders have built more than 5,000 new ENERGY STAR Homes that use 30 percent less energy, saving homeowners $400 per year and increasing the performance and comfort of the homes.

- Hundreds of small businesses are lowering their overhead through implementing energy efficiency. In 1998, 1,600 small businesses were working with the Energy Star Small Business program to realize savings on their energy bills. Nearly half of *Climate Wise* Industrial Partners have fewer than 100 employees. All are receiving technical assistance, and many have documented improvements in both energy efficiency and increases in productivity.

- Large businesses and organizations are protecting the environment and improving worker productivity through their investments in advanced technologies. For example, in the Wisconsin headquarters building of West Bend Mutual Insurance, efficient building design has been documented to save about $125,000 per year on utility bills and has been credited with improved employee productivity on the order of $260,000 per year. Climate Wise Partner, Anheuser-Busch has developed a "bio-energy" recovery system that turns solid waste into a renewable source of energy that provides 15% of the brewery's fuel supply. By the year 2000, eight facilities are expected to employ the technology and save more than $40 million annually.

- Financiers are making mortgages and loans with special terms for energy-efficient products widely available to consumers. The big names on Wall Street as well as smaller financial institutions are seeing the value of promoting energy efficiency. In 1998 five national lenders, including GE Capital, Household Finance, and Chase Manhattan, and more than seven regional lenders offered ENERGY STAR loans and mortgages to purchasers of ENERGY STAR heating and cooling equipment and homes.

- Hundreds of organizations that are part of the Transportation Partners network have contributed to a host of actions that have produced quantifiable reductions in transportation greenhouse gas emissions through measures that reduce VMT. These measures include building more livable communities and involving the public in important transportation and community design issues.

- State and local governments are identifying measures that save energy, reduce pollution, and

facilitate sharing of information and technologies. Local governments, participating in the Cities for Climate Protection (54 in 1998), have implemented building, transportation, waste efficiency, and renewable projects resulting in the elimination of more than 3 million metric tons of carbon dioxide. State governments such as New Jersey have broken new ground through their innovative work. New Jersey established a state carbon bank program to help meet the Department of Environmental Protection's goal of reducing New Jersey's emissions 3.5 percent below 1990 levels by 2005.

- Land owners and farmers are increasing carbon storage on US lands while improving soil quality, reducing soil erosion, and enhancing other environmental and conservation goals.

- The international community is working with EPA to adopt commitments and carry out actions that reduce greenhouse gases, expand markets for clean U.S. technologies, and establish markets for avoided emissions and sequestration.

3.0 Goals and Objectives

This section provides a summary of EPA's year 2000 goals for its CCTI programs. The section provides year 2000 goals for the key performance measures as well as goals for greenhouse gas reductions across the key economic sectors.

There are large opportunities for further pollution reductions and energy bill savings from energy efficiency programs and greater use of cost-effective renewable energy. U.S. energy consumption causes more than 85 percent of the emissions of major air pollutants such as NO_X, SO_2 and CO_2. At the same time, American families and businesses spend more than $500 billion each year on energy bills – more than we spend on education. Technologies are available today that can cut this energy use significantly with attractive rates of return on investments. Other technologies are being developed that may provide even more dramatic opportunities -- such as a car that can reduce fuel use and greenhouse gas emissions by 2/3 without sacrificing safety and performance.

In 2000, EPA efforts will:

- reduce GHG emissions by 213 million metric tons of carbon dioxide equivalent (58 MMTCE) (equivalent to eliminating the GHG emissions from 15% of the cars, sports utility vehicles, and light trucks on the road) across key sectors of the economy as shown in Table 1;
- reduce other forms of pollution, including air pollutants such as NOx, particulate matter and mercury from energy efficiency and reduce water pollution (from better fertilizer management). NOx emissions will be reduced by more than 152,000 tons in 2000;
- reduce U.S. energy consumption by more than 59 billion kilowatt hours in 2000;
- provide $8 billion in energy bill savings to consumers and businesses;
- develop a new generation of efficient and low polluting cars and trucks;
- build partnerships to vastly increase the penetration of energy efficient technologies throughout all sectors of the economy.

Table 1. Overview of Greenhouse Gas Reductions in 2000 from EPA CCTI Programs	
Sector	**Emission Reductions** (million metric tons of CO2 equiv.)
Buildings	**47**
Industry	**139**
Transportation	**21**
State and Local	**6**
Total	**213** **(58 MMTCE)**

4.0 Benefits of Funding Increase

This section provides a summary of EPA's funding history as well as the year 2000 request. The section then provides a justification for the FY 2000 funding increase, and an explanation of the authorities under which the Agency operates.

4.1 EPA Historical Climate Budget Breakdown - Requested and Enacted Levels

Table 2. Resource Summary
(Dollars in thousands)

	FY 1999 Request	FY 1999 Enacted	FY 2000 Request	FY 2000 Req. v. FY 1999 Ena.
Climate Change	**$205,400**	**$109,400**	**$216,400**	**$107,000**
Environmental Program & Management	$158,500	$72,500	$166,500	$94,000
Science & Technology	$46,900	$36,900	$49,900	$13,000

Table 3. Key Programs
(Dollars in thousands)

	FY 1999 Request	FY 1999 Enacted	FY 2000 Request
Climate Change Technology Initiative: Buildings	$78,100.0	$38,800.0	$80,100.0
Climate Change Technology Initiative: Transportation	$58,900.0	$31,750.0	$61,900.0
Climate Change Technology Initiative: Industry	$51,600.0	$18,600.0	$55,600.0
Climate Change Technology Initiative: Carbon Removal	$3,400.0	$0.0	$3,400.0
Climate Change Technology Initiative: State and Local Climate Change Program	$5,000.0	$2,900.0	$5,000.0
International Capacity Building	$8,400.0	$7,400.0	$10,400.0
CCTI: RESEARCH	$0.0	$10,000.0	$0.0

4.2 Overall Benefit of Additional Funding

EPA is requesting a $107 million increase in 2000 funding for its climate technology programs in order to target additional cost-effective opportunities to reduce greenhouse gas emissions, emissions of criteria air pollutants, and energy consumption throughout all sectors of the economy. The request is part of the President's five-year Climate Change Technology Initiative. Over the next decade, the increase in funding for EPA will deliver at least:

- 1.3 billion tons of greenhouse gas emissions reductions (carbon dioxide equivalent)

- $35 billion in energy savings to families and businesses
- 850,000 tons of NO_x emissions reductions.

These benefits are based on the current effectiveness of EPA's programs. Because EPA expects overall program effectiveness to increase over the next several years, these benefits could be greater. Overall program effectiveness is expected to improve because much of EPA's work and resources to date have been devoted to program design and start up.

Both technology deployment and technology research and development are essential elements of a balanced strategy to address climate change in both the near-term and the long-term. Technology deployment is particularly important in both the buildings and industrial sectors where by 2010, two-thirds of greenhouse gas pollution will be caused by equipment that is purchased over the next decade. EPA's strategy to achieve these benefits is to expand its existing programs where additional benefits can be achieved at a profit to businesses and consumers and to launch new initiatives targeted at areas of opportunity that EPA has not addressed.

The potential in commercial buildings is sizeable. The energy used to support the activities of just one office worker for one day produces over twice the pollution caused by driving to work. These emissions could be 30 percent lower if systematic investments in building systems were made. The ENERGY STAR Buildings and Green Lights Partnership provides a proven, organized approach. If all building owners took advantage of ENERGY STAR Buildings and Green Lights, by 2010, they would shrink their cumulative energy bill by $130 billion and reduce greenhouse gas pollution equivalent to eliminating the emissions from 20 million cars for the next decade.

There is tremendous potential for homeowners as well. The energy used in the average house contributes more greenhouse gas emissions than the average car. These emissions could be 30 percent lower while saving precious household dollars if houses were equipped with energy-efficient ENERGY STAR-qualified products or if initially built to ENERGY STAR levels. If all U.S. residents bought only energy-efficient products marked with the ENERGY STAR label over the next 15 years, we would shrink our cumulative energy bill by $100 billion.

4.3 Sector by Sector Targeted Opportunities

The Buildings Sector

The buildings sector, which includes both homes and commercial buildings, offers a large potential for carbon reductions using technologies that are on the shelf today. Consumers and businesses continue to invest substantial resources in equipment that is relatively inefficient, resulting in higher energy bills and higher pollution levels. The buildings sector represents one of EPA's largest areas of investments and one of its most successful.

EPA's work in the buildings sector will deliver emissions reductions of 46 million tons of greenhouse gas emissions (carbon dioxide equivalent) annually (12.7 MMTCE) in 2000. EPA and DOE are working toward the goal of improving the energy efficiency of one-half of all commercial buildings and homes by the year 2010. An administration-wide effort to meet this goal, including the expansion of EPA's efforts in the building sector, DOE's initiatives, PATH and others could deliver reductions of 256 million metric tons of carbon dioxide equivalent (70 MMTCE) annually in 2010. It would also reduce the nation's energy bill by over $30 billion per year. EPA will work in the following areas:

- *New ENERGY STAR Products.* EPA will play a key role in advancing the efficiency of all buildings, including federal facilities, by expanding beyond its existing partnerships and support the launch of 25 new ENERGY STAR product lines by 2000.

- *PATH.* As part of the Partnership for the Advancement of Technology in Housing (PATH) initiative, EPA will implement a nationwide ENERGY STAR Home Improvement program. This would deliver consumer-based technical tools for identifying what consumers/homeowners can do to reduce the energy used in their homes, improving the comfort level and lowering utility bills with less impact on the environment. Home owners can potentially reduce their energy bills by $400 annually.

- *ENERGY STAR Buildings Label.* In commercial buildings, EPA will be able to expand beyond its existing partnerships and sign up 2,000 additional small business and school partners in 2000. The ENERGY STAR Buildings label, a critical benchmarking tool, will be rolled out for several commercial building types. This tool will continue to be developed to meet the needs of other buildings types and by the end of 2000 EPA expects to see more than 300 commercial buildings with the ENERGY STAR Label.

- *Federal Energy Efficiency.* EPA will play a key role in advancing the efficiency of the federal government. EPA will enhance the ability of the federal government to procure energy efficient products as well as assist agencies in benchmarking and labeling their high performing buildings.

- *Million Solar Roofs.* EPA will also support DOE and the Million Solar Roofs Initiative by working with partners to use renewable energy applications where cost-effective. Emissions reductions from this initiative will exceed 29 million tons of carbon dioxide equivalent annually by 2010.

The Industrial Sector

There are substantial opportunities for greenhouse gas emissions reductions in the Industrial Sector. By 2000, EPA's programs in the industrial sector will reduce greenhouse gas emissions by 140 million tons of carbon dioxide equivalent (37.9 MMTCE) annually. With additional funding, EPA working with DOE and other agencies, will expand existing programs as well as introduce new initiatives working with American business to achieve the goal of doubling the rate of energy efficiency investments in industry between now and 2010. Combined with partnerships to reduce the emissions of potent greenhouse gases such as methane and HFCs, administration efforts and partnerships with the industrial sector have the potential to reduce U.S. emissions by 513 million tons of carbon dioxide equivalent (140 MMTCE) by 2010. EPA will work to advance the following initiatives:

- *Industry Consultations.* The President has invited industries to work with the Federal government to take actions to meet voluntary reduction targets. EPA will take a lead in support of the industry consultative process for a number of important US industry sectors. EPA is working with key energy intensive industries, such as cement, chemicals, steel, petroleum, iron and steel, pulp and paper, airlines, and food processing. The work required to support successful consultations includes: identifying "stretch goals" for reducing emissions over the next decade including detailed technical work on greenhouse gas inventories, analysis of future emissions baselines, analysis of options for reducing emissions, and goal negotiation and review.

- *Early Action.* In addition to supporting the industry consultation process, EPA will continue to work with key energy intensive industries as they take actions to meet voluntary reduction targets. In 2000, EPA will expand its work with these industries.

- *Combined Heat and Power Initiative.* A combined heat and power initiative will play a key role in achieving substantial carbon reductions in 2010. This initiative could reduce greenhouse gas emissions by 146 million tons (carbon dioxide equivalent) by 2010 (40 MMTCE) —the equivalent of eliminating 40 million cars from U.S. roadways -- by doubling the capacity of U.S. combined heat and power systems employed by commercial, industrial, and institutional buildings, and in communities throughout the U.S. EPA, working with DOE, will identify and eliminate the regulatory and institutional barriers that are currently preventing more rapid dissemination of this technology.

- *Climate Wise.* EPA's Climate Wise Program will use increased funding to expand work with individual partner companies to achieve reductions of nearly 50 million tons of carbon dioxide equivalent and savings of $1.6 billion per year by the year 2010. Climate Wise Sector Compacts have already been successful in the Cement Industry; involving more than 60% of the cement industry in a comprehensive effort to reduce greenhouse gas emissions. Climate Wise will expand this effort with a goal of comprising half of the pharmaceuticals, food processing and steel industries in the year 2000. Climate Wise will work with the private sector to develop and create a market for products whose emissions have been offset or neutralized through use of energy efficiency, use of renewable power, carbon sequestration, or energy efficient projects conducted at local schools or other municipal centers. Climate Wise is also working with key partners to make the purchase or generation of renewable power a key element of their Action Plans over the next five years.

- *Stewardship Programs for the Reduction of Potent Greenhouse Gases.* EPA will expand its programs to reduce the more potent greenhouse gases, including methane, HFCs, PFCs, and SF_6, to deliver larger cost-effective greenhouse gas emissions. For example, EPA will further expand the partnership with the magnesium industry to reduce the emissions of SF_6. In 2000 EPA will bring the total number of partnerships with the magnesium industry up to 13 partners, representing all of U.S. primary production and about half of the U.S. diecasting industry. EPA will also secure SF_6 emissions reductions in the electric power sector by adding 15 new partnerships in 2000 to the SF_6 Electric Power System Voluntary Partnership launched in 1998. The Voluntary Aluminum Industrial Partnership (VAIP) will continue to deliver reductions and by the year 2000, VAIP participants will reduce the industry's emissions of PFCs by an estimated 45 percent.

The Transportation Sector

With increased funding, EPA will accelerate its efforts to reduce greenhouse gas emissions from the transportation sector particularly in the Partnership For a New Generation of Vehicles (PNGV) and in applying modified versions of PNGV engine technology to trucks. This increase will enable EPA to greatly accelerate the PNGV and expand the process to trucks. EPA will accelerate its program to develop an optimized renewable alcohol-fueled engine that can simultaneously achieve high efficiency and low carbon, particulate, and NO_x levels. EPA also will help initiate and participate in the development of a new generation of heavy truck production vehicles, to transfer PNGV engine technology from methanol to petroleum fuels, and to initiate work to design and build a low emission diesel combustion.

Increased funding will allow EPA to expand its work with state and local decision-makers to develop and implement transportation improvements that reduce the growth in vehicle travel, emissions, and congestion. EPA's Transportation Partners Program will expand its existing network of more than 340 companies, community organizations, and local governments to implement VMT reduction strategies which will account for reducing 13 million tons of carbon dioxide equivalent annually in the year 2000.

The Transportation Partners network, including both local and national partners, will expand upon its existing efforts in reducing greenhouse emissions and congestion through promoting the restoration of communities, collaboration among neighboring communities, and expanded public involvement. Transportation Partners will work strategically to take advantage of new provisions in the Transportation Equity Act for the 21st Century (TEA-21), including the Transportation and Community and System Preservation Pilot Program, to further reduce emissions by encouraging better transportation decisions that help create more livable communities.

EPA's Transportation Partners Program will also work with the EPA's Climate Wise Program to implement Commuter Choice and fleet efficiency programs with corporations nationwide. Commuter Choice allows corporations to provide employees with new environmentally friendly options for commuting to work, thus reducing emissions in addition to saving energy.

Carbon Removal

Providing funding for carbon removal will allow EPA to develop incentives to increase carbon storage on agricultural and forest lands while improving soil quality, reducing soil erosion, and enhancing other environmental and conservation goals. EPA will continue efforts to fully account for carbon sequestration in the U.S. greenhouse gas inventory to enable these activities to be recognized internationally, and will accelerate efforts to promote the use of livestock-based fertilizer products and more efficient use of nutrients from all sources.

International Capacity Building

In 2000 and beyond, work on International Capacity Building will play a critical role in a successful climate protection strategy. EPA will expand cooperation to an additional six key developing countries, which had total CO_2 emissions of approximately 6 billion metric tonnes in 1996. These countries' CO_2 emissions are estimated to be 10 billion metric tonnes in 2010. EPA's goal is to promote actions that reduce projected greenhouse gas levels in these targeted countries by at least 5 percent by 2010 -- or 135 MMTCE avoided annually. General emphasis will be on: local environmental benefits of greenhouse gas mitigation and sequestration; financial benefits of participating in global greenhouse gas markets; economic opportunities in restructuring; improved access to clean technologies; and vulnerabilities to climate change. In addition, EPA will seek to improve international compliance systems and enforcement.

State and Local Governments

In 2000, EPA will provide additional support to states and localities to help conduct analyses of the co-benefits of greenhouse gas mitigation, state carbon sequestration opportunities, and climate change policy impacts on state economies. In addition EPA will support state and local efforts to implement and expand promising policy options identified by states in their greenhouse gas mitigation plans; conduct regional assessments and state-level case studies of climate change

impacts and adaptation options, and work with stakeholders to develop and implement adaptation measures to increase resilience to climate variability.

4.4 Program Authorities

EPA's climate change programs are designed to capitalize on opportunities to deploy technology more rapidly through the marketplace, technologies that will save consumers and organizations money on their energy bills. The primary statutory authorities for these programs are the following: Clean Air Act, 42 U.S.C. 7401 et seq; Clean Water Act, 33 U.S.C. 1251 et seq; Solid Waste Disposal Act, 42 U.S.C. 6901 et seq; Pollution Prevention Act of 1990, 42 U.S.C. 13101 et seq; National Environmental Policy Act, 42 U.S.C. 4321 et seq; Global Climate Protection Act of 1987, 15 U.S.C. 2901, and; Federal Technology Transfer Act, 15 U.S.C. 3710a.

These programs support and are consistent with on-going international commitments made by the United States under the Framework Convention on Climate Change (signed by President Bush and ratified by the United States Senate in 1992). The programs are entirely voluntary and involve no binding regulations. They are designed to speed up the deployment of energy efficient technologies in the marketplace, mainly by providing consumers and businesses with reliable information on how these technologies can save money while reducing greenhouse gas emissions and other forms of pollution.

The United States signed the Kyoto Protocol in November of 1998. For the U.S. to be subject to the commitments in the Protocol, the Constitution requires the United States Senate to give its advice and consent. The Kyoto Protocol has not entered into force, and has not been ratified by the Senate.

Most of the programs described in this report began prior to the Kyoto Protocol which was agreed to on December 10, 1997, some began as early as 1990, and have been consistently funded and supported by Congress since then. Other programs simply extend the successful models established by earlier programs to take advantage of additional energy saving, pollution prevention opportunities elsewhere in the economy. With the exception of certain refinements and improvements reflecting experience and the specific challenges of new economic sectors, all of the programs are consistent with the original Climate Change Action Plan (CCAP).

EPA will continue to implement these extremely successful programs, saving consumers and businesses billions of dollars while reducing greenhouse gas emissions and other forms of pollution. EPA will not implement the Kyoto Protocol until and unless it has been ratified by the Senate.

Reduction of Global and Cross-border Environmental Risk

Objective # 2: Climate Change

By 2000 and beyond, U.S. greenhouse gas emissions will be reduced to levels consistent with international commitments agreed upon under the Framework Convention on Climate Change and ratified by the United States, building on initial accomplishments under the Climate Change Action Plan.

Resource Summary
(Dollars in thousands)

	FY 1999 Request	FY 1999 Enacted	FY 2000 Request	FY 2000 Req. v. FY 1999 Ena.
Climate Change	**$232,960.4**	**$127,968.9**	**$242,765.0**	**$114,796.1**
Environmental Program & Management	$163,237.5	$74,347.9	$170,025.9	$95,678.0
Science & Technology	$69,722.9	$53,621.0	$72,739.1	$19,118.1
Total Workyears:	333.9	324.3	325.7	1.4

Key Programs
(Dollars in thousands)

	FY 1999 Request	FY 1999 Enacted	FY 2000 Request
Climate Change Technology Initiative: Buildings	$78,100.0	$38,800.0	$80,100.0
Climate Change Technology Initiative: Transportation	$58,900.0	$31,750.0	$61,900.0
Climate Change Technology Initiative: Industry	$51,600.0	$18,600.0	$55,600.0
Climate Change Technology Initiative: Carbon Removal	$3,400.0	$0.0	$3,400.0
Climate Change Technology Initiative: State and Local Climate Change Program	$5,000.0	$2,900.0	$5,000.0
International Capacity Building	$8,400.0	$7,400.0	$10,400.0

Climate Change Research	$22,817.4	$16,670.5	$22,833.6
Partnership with Industrial and Other Countries	$160.0	$409.1	$428.2
CCTI: RESEARCH	$0.0	$10,000.0	$0.0

FY 2000 Request

EPA is meeting the United States' climate change objectives by working in partnership with business and other sectors to deliver multiple benefits – from cleaner air to lower energy bills – while improving overall scientific understanding of climate change and its potential consequences. In 2000, EPA expects to continue expanding on the significant accomplishments of its Climate Change programs to date.

Through 1998, EPA's Climate Change programs have reduced U.S. greenhouse gas emissions by 260 million tons of carbon dioxide equivalent (70 million metric tons of carbon equivalent). EPA's programs are reducing emissions of carbon dioxide as well as a number of other long-lived, high global warming potential (GWP) greenhouse gases such as methane and perfluorocarbons. EPA's climate technology programs have saved families and businesses over $6 billion on their energy bills and kept over 150,000 tons of smog-forming nitrogen oxide (NO_X) pollution from entering the air. In 1998, these programs:

- Conserved enough energy to light 35 million homes for the year.
- Prevented NO_X emissions equivalent to the annual pollution from 46 powerplants.
- Avoided greenhouse gas emissions equivalent to taking 23 million cars off the road for the year.

Technology partnership programs do **not** provide subsidies: they work by overcoming widely acknowledged barriers to energy efficiency – lack of clear, reliable information on technology opportunities; lack of awareness of energy efficient products and services; and lack of financing options to turn life cycle energy savings into initial cost savings for consumers. EPA is working with:

- Manufacturers to make more energy-efficient products available that reduce energy consumption without sacrificing product performance. For example, in 1998, EPA formed a new partnership with TV and VCR manufacturers to produce TVS and VCRs that waste less energy, reduce pollution by more than 3.5 million tons of carbon dioxide per year and save consumers up to $500 million per year on their energy bills.
- Schools to bring superior quality lighting and comfort into classrooms with large reductions in energy bills. Since 1995, EPA's programs have helped schools and universities save over $200 million -- enough money to buy 4 million text books or hire 4,000 teachers.

- Families to reduce their energy bills by up to $400 per year with currently available home products that improve home comfort while protecting the environment.

- Home Builders to get over 5,000 new homes built 30 percent above model energy code, saving consumers $400 per year and increasing the performance and comfort of the homes.

- Small Businesses to help lower their overhead through lower energy bills. In 1998, 1,600 small businesses were working with the Energy Star Small Business program to realize savings on their energy bills. Nearly half of *Climate Wise* Industrial Partners have fewer than 100 employees. All are receiving technical assistance, and many have documented improvements in both energy efficiency and increases in productivity.

- Large Businesses and Organizations to protect the environment and improve productivity through their investments in advanced technologies. For example, in the Wisconsin headquarters building of West Bend Mutual Insurance, efficient building design has been documented to save about $125,000 per year on utility bills and has also been credited with improved employee productivity on the order of $260,000 per year.

- Building Owners to offer a benchmarking tool that will allow them to recognize and identify, with the ENERGY STAR label, the most efficient 25 percent of commercial building stock. Through the ENERGY STAR Buildings label, all buildings, new and old, will have the opportunity to save energy, save money, increase asset value and prevent pollution. In 1998, owners of the Empire State Building, the Sears Tower, the World Trade Center, and other landmark buildings from around the country joined with EPA to be charter applicants for the ENERGY STAR label.

- Large Industries to improve energy efficiency and enhance productivity through comprehensive Action Plans developed under EPA's *Climate Wise* program. In 1998, Climate Wise Partners identified more than 2,500 actions to improve efficiency and prevent pollution. These actions are expected to reduce emissions by nearly 10 million metric tons of carbon dioxide equivalent and save $400 million. EPA has also been working with industry to reduce emissions of high global warming potential (GWP) gases such as PFCs and hydrofluorocarbons (HFCs), to achieve reductions in excess of 18 million metric tons of carbon dioxide equivalent annually in 1998.

- WasteWi$e Partners (over 800 in 1998) with an emphasis on sector-specific, targeted technical assistance on waste reduction efforts leading to energy savings, reduced methane emissions, and increased carbon sequestration. Stakeholder meetings are being held with commodity trade associations (e.g., American Forest & Paper Association, American Plastics Council, Paper Recycling Coalition, etc.) in order to form new waste reduction and recycling initiatives.

- Financiers to make mortgages and loans with special terms for energy-efficient products widely available to consumers. The big names on Wall Street as well as smaller financial institutions are seeing the value of promoting energy efficiency. In 1998 five national lenders,

including GE Capital, Household Finance, and Chase Manhattan, and over seven regional lenders offered ENERGY STAR loans and mortgages to purchasers of ENERGY STAR heating and cooling equipment and homes.

- State and Local Governments to identify measures that save energy and reduce pollution and facilitate sharing of information and technologies. Local governments participating in the Cities for Climate Protection (54 in 1998) have implemented building, transportation, waste efficiency, and renewable projects resulting in the elimination of over 3 million metric tons of carbon dioxide. State governments such as New Jersey have broken new ground through their innovative work. New Jersey established a state carbon bank program to help meet its Department of Environmental Protection's goal of reducing New Jersey's greenhouse gas emissions 3.5 percent below 1990 levels by 2005.

- The International Community to adopt commitments and carry out actions that reduce greenhouse gases, expand markets for clean U.S. technologies, and establish markets for avoided emissions and sequestration. Activities will build technical consensus on issues vital to U.S. interests, such as cost reduction through flexibility mechanisms and credits for carbon sequestration, and motivate developing countries to commit to GHG mitigation, for example by assessing the local health and economic benefits of actions.

- Land owners and farmers, in close conjunction with the Department of Agriculture (USDA), to provide the incentives to increase carbon storage on U.S. lands while improving soil quality, reducing soil erosion, and enhancing other environmental and conservation goals.

Despite the significant accomplishments of EPA's programs to date, there remain large opportunities to achieve further pollution reductions and energy bill savings from energy efficiency programs and greater use of cost-effective renewable energy. In the U.S., energy consumption causes more than 85 percent of the emissions of major air pollutants such as NO_X, sulfur dioxide (SO_2), and carbon dioxide. At the same time, American families and businesses spend over $500 billion each year on energy bills – more than we spend on education. Technologies are available that can cut this energy use significantly today. Other technologies are being developed that may provide even more dramatic opportunities -- such as a car that can reduce fuel use and greenhouse gas emissions by 2/3 without sacrificing safety and performance. In 2000, EPA's programs will continue to capitalize on these opportunities and will deliver 213 million metric tons in annual carbon dioxide equivalent reductions (58 MMTCE) and over $8 billion in energy savings.

Technology deployment programs have demonstrated their effectiveness. For every dollar spent by EPA, these programs have reduced greenhouse gas emissions by 2.5 tons of carbon dioxide equivalent and delivered $70 in energy bill savings. Because much of EPA's work to date has been devoted to program design and start up, the effectiveness of EPA's climate programs can be expected to improve substantially over the next several years. Over the next decade there are important opportunities to reduce local air pollution and make progress on controlling U.S. greenhouse gas emissions. By 2010, two-thirds of greenhouse gas pollution will be caused by equipment that is purchased over the next decade, equipment that can be made to pollute less and be more energy

efficient. EPA's programs are designed to help businesses and consumers make better investments when they purchase technology, capitalizing on economic opportunities to reduce air pollution.

- Buildings Sector -- The Buildings Sector, which includes both homes and commercial buildings, offers a large potential for carbon reductions using technologies that are on the shelf today. Consumers and businesses continue to invest substantial resources in equipment that is relatively inefficient, resulting in higher energy bills and higher pollution levels. The Buildings Sector represents one of EPA's largest areas of investments, and one of its most successful.

  EPA's ENERGY STAR Program is a critical component of transforming the market for energy efficiency. EPA will continue to provide clear, technically accurate, and reliable information to consumers and businesses on how to purchase products. EPA's success with the ENERGY STAR label will continue to grow as EPA adds products to the list of products that qualify for the label. Products identified with the ENERGY STAR label are substantially reducing greenhouse gas emissions.

  EPA's ENERGY STAR Buildings & Green Lights Partnership is successfully laying the foundation for market transformation in the commercial buildings sector. EPA will expand its partnerships with equipment manufacturers and building owners in order to provide reliable, easily understood information to a greater segment of the residential and commercial markets. EPA will continue work to support other Federal agencies in improving the energy performance of their facilities, and to support state and local governments in their efforts to reduce greenhouse gas emissions.

  EPA supports the Department of Energy (DOE) and the *Million Solar Roofs Initiative* by working with partners to use renewable energy applications where cost-effective. Emissions reductions from this initiative will exceed 29 million tons of carbon dioxide equivalent annually by 2010.

- Industry Initiatives -- The President has invited entire industries to work with the Federal government to take actions to meet voluntary reduction targets. EPA is working with key energy intensive industries, such as cement, chemicals, steel, petroleum, airlines, and food processing. The focus of this effort is to: 1) inventory current greenhouse gas emission sources and reduction options; 2) establish a specific reduction goal or target; 3) develop an action plan for meeting the identified target; and 4) identify and remove barriers to reducing greenhouse gas emissions in that sector. EPA provides assistance in establishing baselines and assessing progress toward the attainment of the sector emission targets. EPA also provides technical assistance tools such as project tracking software and emission projections models.

  EPA's Climate Wise Program is a partnership initiative designed to stimulate the voluntary reduction of greenhouse gas emissions among participating manufacturing companies by providing technical assistance and allowing organizations to identify the most cost-effective ways to reduce greenhouse gas emissions. As part of the *Climate Wise* program, companies

submit an Action Plan within six months of joining. Action Plans detail ways to reduce greenhouse gas emissions by implementing energy efficiency and environmental management practices. Companies quantify energy savings and emission reduction numbers. The *Climate Wise Program* works with individual partner companies that now represent nearly 12 percent of U.S. energy use and more than 15 percent of U.S. manufacturing energy use.

EPA's WasteWi$e Program will continue to work with its partner base (over 800 in 1998) with an emphasis on sector-specific, targeted technical assistance on waste reduction efforts leading to energy savings, reduced methane emissions, and increased carbon sequestration. WasteWi$e will build upon FY99 efforts, where selected partners will be engaged in a stakeholder dialogue in an effort to help partners understand and communicate the climate benefits of their waste reduction activities. Activity tracking and emission reduction calculation tools will be used to support voluntary reporting of greenhouse gas emission reductions. The climate benefits of increased technical assistance to WasteWi$e partners and support of State and local waste reduction initiatives will exceed 5.0 million metric tons of carbon in the year 2000. In addition, an expansion of outreach and training activities on waste management to the international arena will support efforts to demonstrate meaningful participation from developing countries on climate change.

EPA's programs to reduce high GWP gases, including methane, HFCs, PFCs, and (SF_6), are delivering significant cost-effective reductions. In 1998 alone these programs eliminated the emissions of over 56 million tons of carbon dioxide equivalent (15.5 MMTCE). Continued expansion of these partnerships will increase greenhouse gas reductions in the coming years.

- Transportation Initiatives -- The Partnership for a New Generation of Vehicles (PNGV) is a public/private partnership between the U.S. government (seven agencies and 20 Federal laboratories) and Chrysler, Ford, and General Motors that aims to strengthen America's competitiveness by developing technologies for a new generation of vehicles. Announced at the White House on September 29, 1993 by President Clinton, Vice President Gore, and the Chief Executive Officers of the domestic auto makers, this government/industry program includes support for over 350 automotive suppliers, universities, and small businesses. PNGV's long term goal, the "Clean Car" goal, is to develop an environmentally friendly car with up to triple the fuel efficiency of today's mid-size cars without sacrificing affordability, performance, or safety. The National Academy of Sciences (NAS) has determined that EPA's renewable fuels application for 4-Stroke Direct Injection (4-SDI) engines is the lead candidate technology. When complete, EPA's design will provide the basis for a viable and proven concept vehicle for commercialization and for innovation to conventional vehicles. It will also provide a strong technical base from which to initiate additional EPA research into similar technologies for light- and heavy-duty truck applications.

Transportation (cars, trucks, aircraft, marine) accounts for almost one third of U.S. carbon dioxide emissions and represents one of the fastest-growing sectors for greenhouse emissions. The Agency will increase support for implementing a National Voluntary Commuter Choice/Parking Cashout Initiative that highlights changes in Federal tax laws which provide new incentives for commuters to consider transit, ridesharing, and other transportation

alternatives to driving through 'parking cashout' and the ability to use pre-tax earnings to pay for commuting expenses, such as transit passes. EPA will continue its work to support innovative state and local efforts that encourage "livable communities and smart growth"-- compact, walkable, transit-friendly, and mixed-use development-- while reducing the growth in vehicle travel, emissions, and congestion and will expand its public information campaign to describe how transportation choices and consumers impact air quality, traffic congestion, and climate change.

Transportation Partners includes a network of over 340 companies, community organizations and local governments to implement vehicle miles traveled (VMT) reduction strategies. By 2000, we anticipate that this network will have grown to include over 500 partners throughout the country and will be reducing 13 million tons of carbon dioxide equivalent annually.

- International Capacity Building – Greenhouse gas emissions from developing countries already constitute more than half of the global total and are growing rapidly. EPA is working with other agencies to secure meaningful participation from key developing country parties building on the success of the U.S. Country Studies Program. Eight of the 10 national reports so far submitted to the Climate Change Convention Secretariat by developing countries have come from Country Studies Program partners.

- State and Local Climate Change Program – State and local governments have a significant role and home-court advantage in the reduction of greenhouse gases, provided they are equipped with the tools they need to integrate climate change into their daily decisions. With assistance from EPA's State and Local Climate Change Program, 35 states have initiated and 32 states have completed state greenhouse gas emission inventories while 26 states have initiated and 12 have completed greenhouse gas emission reduction strategies. Five of the state plans alone have identified strategies that could collectively reduce greenhouse gas emissions by 34 MMTCE, or 2% of U.S. 2010 emissions, while saving over $600 million per year. In addition, 30 demonstration and education projects have been launched, and 54 cities and counties, representing 25 million people and 8% of US GHGs, have begun developing inventories and implementing plans, some already reducing over one million tons of carbon-equivalent each year.

Research

EPA's research and assessment activities in this area will evaluate the potential regional consequences of climate change and climate variability for the United States. EPA will pay particular attention to the potential beneficial and detrimental consequences of climate variability and change for human health, ecosystems, and economic systems at the regional, state and local levels. EPA will also assess possible adaptation opportunities in order to reduce the risks, or take advantage of the opportunities, presented by climate variability and change.

The work planned for FY 2000 will directly support the objective through research and assessment activities that examine the potential effects of climate variability and change on: (1) human health (including the mortality and morbidity effects of heat stress; effects of climate change

on air and water quality and the consequent health effects; the spread of infectious diseases; the health consequences of extreme events such as floods, droughts and hurricanes; and changes in nutrition due to effects on agriculture and food distribution); (2) air quality (including changes in concentrations of ozone and particulate matter), and the ability of urban areas to attain air quality standards; (3) water quantity and quality; (4) ecosystem health (particularly wildlife and biodiversity in both terrestrial and aquatic ecosystems; unique ecosystems; National Parks; and effects on ecosystem services of high societal value); (5) the frequency, intensity, and socioeconomic impacts of extreme weather events; (6) agricultural productivity and food availability (including changes in the distribution of production across different regions of the country); and (7) forest health (including consequences for commercial timber and recreational activities).

The Agency will assess all of these climate-induced changes in the context of multiple stressors; that is, climate change will be viewed as one of many stressors. For example, we will assess the synergistic effects of climate change and UV-B exposure on human health and ecosystems. We will also develop indicators of change. The development of sensitive and accurate indicators of ecological and human health impacts in response to climate change, climate variability, and other stressors will support ongoing monitoring of change and the development of appropriate adaptive responses to change.

These research and assessment activities will also evaluate the potential co-control benefits of greenhouse gas mitigation policies and the potential co-control benefits of policies to reduce criteria air pollutants. For example, do efforts to reduce greenhouse gas emissions lead to changes in criteria air and water pollutants, and, do efforts to reduce air pollutants lead to changes in greenhouse gas emissions? In addition, we will assess the consequences for human health and welfare of the changes in criteria air pollutants, water pollutants, and greenhouse gases.

EPA's Global Change Research Program is integral to the U.S. National Assessment Process of the U.S. Global Change Research Program (USGCRP), which is evaluating the potential consequences of climate change and variability to the United States. The USGCRP coordinates the global change research efforts of multiple government agencies. Research under this objective will continue to support specific regional assessments (*e.g.*, Mid-Atlantic, Great Lakes, and Gulf Coast regions) and sectoral assessments (*e.g.*, human health sector) of the potential impacts of climate change and variability. These assessments will be conducted through a public-private partnership that actively engages researchers from the academic community, decision makers and resource managers, and other affected stakeholders in the assessment process.

The regional assessment activities will continue to focus on four key questions in order to provide useful insights to decision makers, resource managers, and other affected stakeholders: (1) What are the current conditions of resources in a particular region or sector, and what are the stressors on those resources other than climate variability and change? (2) How might climate variability and change exacerbate or ameliorate future conditions? (3) What adaptive opportunities exist to reduce the risks, or to take advantage of the opportunities, presented by climate variability and change (particularly with respect to air quality, water quality, and ecosystem health)? (4) What are the key, policy-relevant knowledge gaps upon which future global change research should focus?

Annual Performance Goals and Performance Measures

Reduce Greenhouse Emissions

In 2000 Greenhouse gas emissions will be reduced from projected levels by more than 50 million metric ton carbon equivalent per year through EPA partnerships with businesses, schools, State and local governments, and other organizations. Reduction level will increase 10 million metric tons over 1999.

In 1999 Reduce U.S. greenhouse gas emissions by 35 million metric ton carbon equivalent (MMTCE) per year through partnerships with businesses, schools, state and local governments, and other organizations.

Performance Measures	**FY 1999**	**FY 2000**
Methane Programs - Annual Greenhouse Gas Reductions	8.5 MMTCE	
HFC/PFC Programs - Annual Greenhouse Gas Reductions	11.5 MMTCE	
Annual Greenhouse Gas Reductions - All EPA Programs	35 MMTCE	50 MMTCE
ENERGY STAR Buildings and Green Lights - Annual Greenhouse Gas Reductions	3.9 MMTCE	
ENERGY STAR Labeled Products - Annual Greenhouse Gas Reductions	4.8 MMTCE	

Baseline: Performance Baseline: The baseline for evaluating program performance is a forecast of U.S. greenhouse gas emissions in the absence of the Climate Change Action Plan programs. The baseline was developed as part of an interagency evaluation of the Climate Change Action Plan in 1997, which built on a similar baseline forecast that was developed in 1993 for the Climate Change Action Plan. The updated baseline includes updated energy forecasts and economic growth projections. The baseline is discussed at length in the Climate Action Report 1997, which includes a discussion of differences in baselines between the original Climate Change Action Plan and the 1997 baseline update.

Reduce Energy Consumption

In 2000 Reduce energy consumption from projected levels by more than 60 billion kilowatt hours, resulting in over $8 billion in energy savings to consumers and businesses that participate in EPA's climate change programs.Increase of 15 billion kilowatt hours & $5 million in annual energy savings over 1999.

In 1999 Reduce U.S. energy consumption by over 45 billion kilowatt hours per year, including annual energy bill savings to consumers and businesses of over $3 billion. Encourage more widespread adoption of low greenhouse gas emitting technologies.

Performance Measures	**FY 1999**	**FY 2000**
Green Programs - Annual Energy Savings	47 Billion kWh	60 Billion kWh

Baseline: Baseline under development.

Technology for 70 mpg sedan

In 2000 Demonstrate technology for a 70 mpg mid-size family sedan that has low emissions and is safe, practical, and affordable.

In 1999 Demonstrate that an American family car can attain over 60 miles per gallon on the Federal Test Procedure without loss in utility, safety, and emissions control performance.

Performance Measures	**FY 1999**	**FY 2000**
Fuel Efficiency of EPA-Developed PNGV Concept Vehicle over EPA Driving Cycles Tested		70 mpg
PNGV MPG Demonstration	60 MPG	

Baseline: Performance Baseline: Fuel economy average miles per gallon.

Analysis, Assessment and Reporting Support

In 2000 Provide analysis, assessment, and reporting support to Administration officials, the Intergovernmental Panel on Climate Change, and the Framework Convention on Climate Change.

Performance Measures	**FY 1999**	**FY 2000**
GHG Inventory (FCCC)		1999 Inventory

Baseline: EPA will continue to fulfill analytical, assessment, and reporting commitments under the FCCC

Research

Global Change Research - Global Scale

In 2000 Assess the consequences of global change and climate variability at a regional scale.

In 1999 Conduct preliminary assessment of consequences of climate change at three geographical locations: (Mid-Atlantic, Gulf Coast, and upper Great Lakes).

Performance Measures	**FY 1999**	**FY 2000**
Determine impacts of global change on coastal ecosystems in the Gulf Coast and Mid-Atlantic		09/30/2000
Complete 3 regional assessments of potential consequences of global change & climate variability for the USGCRP National Assessment. The 3 regions are the Mid-Atlantic, Great Lakes, & Gulf Coast		3 reg. assessment
Conduct preliminary assessment of regional scale consequence climate change at three geographic locations (Mid-Atlantic, Gulf Coast, and upper Great Lakes).	09/30/1999	

Baseline: The regional scale focus is an advance beyond the existing national-level assessments of the

aggregate impacts of climate change on the United States by accounting for the potential regional impacts. Climate variability itself is accounted for, whereas previous assessments only focused on changes in average climate.

Global Change Research - Human Health

In 2000 Assess the consequences of global change and climate variability on human health.

In 2000 Provide the capability to assess ecological and associated human health vulnerability to climate-induced stressors at the regional scale and assess mitigation and adaptation strategies.

Performance Measures	**FY 1999**	**FY 2000**
Complete a Health Sector Assessment of the potential consequences of climate change and variability for public health, for the USGCRP National Assessment process.		1 assessment
Provide preliminary results from a case study which will determine how climate change & variability affect the formation of trop. ozone in a city & consider the viability of certain adaptation options		09/30/2000 results
Develop prototype ecological and health data and information system to integrate with the Global Climate Data and Information System (GCDIS).		1 info. system

Baseline: Performance Baseline: Uncertainties remain concerning the positive or negative consequences of climate change and variability on human health. Development of "formal" baseline information for EPA research is currently underway.

Global Change Research - Ecosystem Services

In 2000 Assess the impact of global change on ecosystem services.

Performance Measures	**FY 1999**	**FY 2000**
Assess potential effects of global change on ecosystem services.		09/30/2000

Baseline: Performance Baseline: Uncertainties remain concerning the impact of climate change on ecosystem services such as water and air purification, carbon and nitrogen fixing, and erosion prevention. Development of "formal" baseline information for EPA research is currently underway.

Global Change Research - Human Dimensions

In 2000 Assess the human dimensions of Global Change.

Performance Measures	**FY 1999**	**FY 2000**
New research based on an FY99 solicitation will focus on the human dimensions of global change. The focus will be to identify, understand, & analyze how human activities contribute to changes in natural systems.		1 grant

Baseline: Performance Baseline: Research needs to be done to link scientific studies of climate change with socio-economic causes and effects, and possible mitigation and adaptation activities.

Development of "formal" baseline information for EPA research is currently underway.

FY 2000 Change from FY 1999 Enacted

EPA is requesting a $107 million increase in funding for its climate technology programs in order to target additional opportunities throughout all sectors of the economy. The request is part of the President's five-year Climate Change Technology Initiative announced in the FY 1999 Budget. Over the next decade, the increase in funding for EPA will deliver at least:

- 1.3 billion tons of greenhouse gas emissions (carbon dioxide equivalent)
- $35 billion in energy savings to families and businesses
- 850,000 tons of NO_X emissions.

Both technology deployment and technology research and development are essential elements of a balanced strategy to address climate change in both the near-term and the long-term. Technology deployment is particularly key in both the buildings and industrial sectors where by 2010, two-thirds of greenhouse gas pollution will be caused by equipment that is purchased over the next decade. EPA's strategy to achieve these benefits is to expand its existing programs where additional benefits can be achieved at a profit to businesses and consumers and to launch new initiatives targeted at areas of opportunity that EPA has not addressed:

- (+$37,000,000 EPM) Industry Initiatives -- By 2000, EPA's programs in the industrial sector will reduce greenhouse gas emissions by 140 million tons of carbon dioxide equivalent (37.9 MMTCE) annually. Fully funded, EPA will expand existing programs as well as introduce new initiatives working with American business to achieve the goal of doubling the rate of energy efficiency investments in industry between now and 2010. Combined with partnerships to reduce the emissions of potent gases such as methane and HFCs, these industrial partnerships have the potential to reduce U.S. emissions by 513 million tons of carbon dioxide (140 MMTCE) by 2010.

  EPA will continue to work with key energy intensive industries to take actions to meet voluntary reduction targets. In 2000, EPA will expand its work with these industries to build a program that provides appropriate credit for early action.

  EPA's Climate Wise Program will use increased funding to expand work with individual partner companies to achieve reductions of nearly 17 million tons of greenhouse gas emissions (carbon dioxide equivalent) per year by the year 2000. By expanding work *Climate Wise* partners will comprise half of the cement, pharmaceuticals, food processing and steel industries in the year 2000. *Climate Wise* will work with the private sector to develop and create a market for products whose emissions have been offset or neutralized through energy efficiency, use of renewable power, carbon sequestration, or energy efficient projects conducted at local schools or other municipal centers. *Climate Wise* is also working with key

partners to make the purchase or generation of renewable power a key element of their Action Plans over the next five years.

A combined heat and power initiative will reduce carbon emissions by 146 million tons of greenhouse gas emissions (carbon dioxide equivalent) by 2010—the equivalent of eliminating 40 million cars from U.S. roadways -- by doubling the capacity of U.S. combined heat and power systems employed by commercial, industrial, and institutional buildings, and in communities throughout the U.S. EPA, working with DOE, will identify and eliminate the regulatory and institutional barriers that are currently preventing more rapid dissemination of this technology.

EPA will expand its programs to reduce high GWP gases, including methane, HFCs, PFCs, and SF_6, to deliver cost-effective greenhouse gas emissions. For example, EPA will further expand the partnership with the magnesium industry to reduce the emissions of SF_6. In 2000, EPA will bring the total number of partnerships with the magnesium industry up to 13 partners, representing all of primary U.S. production and about half of U.S. diecasting industry. EPA will also secure SF_6 emissions reductions in the Electric Power sector by adding 15 new partnerships in 2000 to the SF_6 Electric Power System Voluntary Partnership launched in 1998. The Voluntary Aluminum Industrial Partnership (VAIP) will continue to deliver reductions and by the year 2000, VAIP participants will reduce the industry's emissions of PFCs by an estimated 45 percent.

(+$7,200,000 EPM, +$23,000,000 S&T) Transportation Initiatives -- With increased funding, EPA will accelerate its efforts to reduce greenhouse gas emissions from the transportation sector. Transportation Efficiency Systems expects reductions of 2.1 MMTCE of emissions for 2000. This increase will enable EPA to greatly accelerate the PNGV and expand the process to trucks. EPA will accelerate its program to develop an optimized renewable alcohol-fueled engine that can simultaneously achieve high efficiency and low carbon, particulate, and No_x levels. EPA also will help initiate and participate in the development of a new generation of heavy truck production vehicles, to transfer PNGV technology to petroleum fuels, and to initiate work to design and build a combined-cycle demonstration engine.

Increased funding will allow EPA to expand its work with state and local decision-makers to develop and implement transportation improvements that reduce the growth in vehicle travel, emissions, and congestion. EPA's *Transportation Partners Program* will continue to expand its existing network of over 340 companies, community organizations, and local governments to implement VMT reduction strategies. By 2000, we anticipate that this network will have grown to include over 500 partners throughout the country and will be reducing 13 million tons of carbon dioxide equivalent (3.6 MMTCE) annually in the year 2000. EPA will also work with the *Climate Wise* Program to implement Commuter Choice programs with corporations nationwide. Using strategies such as transit incentives, bicyclist support facilities, and parking cash-out, *Transportation Partners* will assist companies in reducing in reducing their employees' commute burden. *Transportation Partners* and *Climate Wise* will also assist corporations in examining opportunities for emissions reductions through

corporate fleet management. The *Transportation Partners* network will be working with both national and local Partners to maximize the effectiveness of new transit programs and other Department of Transportation pilot programs, such as the Transportation and Community and System Preservation pilots. By engaging local decision-makers in planning and design projects, communities will foster a more transit-supportive environment, and contribute to increasing ridership.

- (+$41,300,000 EPM) Buildings Initiatives. Building on the success of EPA's programs in the buildings sector (residential and commercial) will deliver emissions reductions of 46 million tons of greenhouse gas emissions (carbon dioxide equivalent) annually (12.7 MMTCE) in 2000. EPA is working toward the goal of improving the energy efficiency of one-half of all commercial buildings and homes by the year 2010. Expanding EPA's activities and achieving this goal would deliver reductions of about 256 million metric tons of carbon dioxide equivalent annually in 2010. It would also reduce the nation's energy bill by over $30 billion per year.

- Fully funded, EPA will expand beyond its existing partnerships and support the launch of 25 new ENERGY STAR product lines. In commercial buildings, EPA will be able to expand beyond its existing partnerships and sign up 2,000 additional small business and school partners in 2000. The ENERGY STAR Buildings label, a critical benchmarking tool, will be rolled out for several commercial building types. This tool will continue to be developed to meet the needs of other buildings types and by the end of 2000, there will be several hundred ENERGY STAR labels on commercial buildings. EPA will also focus efforts to improve efficiency of Federal facilities.

  As part of the Partnership for the Advancement of Technology in Housing (PATH) initiative, EPA will implement a nationwide ENERGY STAR Home Improvement program that will offer homeowners the tools that they need to upgrade their homes to a better comfort level with lower utility bills and less impact on the environment. Home owners can potentially reduce their energy bills by $400 annually.

  EPA will also support DOE and the Million Solar Roofs Initiative by working with partners to use renewable energy applications where cost-effective. The EPA will lead by example in installing and purchasing renewable energy where allowed under procurement rules. EPA will provide improved access to information on renewable energy, including peer-reviewed tools to households and businesses so that they may assess for themselves the environmental implications of energy products offered to them. Emissions reductions from this initiative will exceed 29 million tons of carbon dioxide equivalent annually by 2010.

- (+$3,400,000 EPM) Carbon Removal. Providing funds for this activity will allow EPA to develop incentives to increase carbon storage on agricultural and forest lands while improving soil quality, reducing soil erosion, and enhancing other environmental and conservation goals.

EPA will continue efforts to fully account for carbon sequestration in the U.S. greenhouse gas inventory to enable these activities to receive credit internationally, and will accelerate efforts to promote the use of livestock-based fertilizer products and more efficient use of nutrients from all sources.

- (+$3,000,000 EPM) International Capacity Building. In 2000, EPA will expand cooperation to an additional six key developing countries, with total greenhouse gas emissions of more than 1.6 billion metric tons in 1996. EPA's goal is to gain actions that reduce projected greenhouse gas levels in key countries by at least 5 percent by 2010 (or roughly 135 MMTCE avoided annually). General emphasis will be on: local environmental benefits of greenhouse gas mitigation and sequestration; financial benefits of participating in global greenhouse gas markets; economic opportunities in restructuring; improved access to clean technologies; and vulnerabilities to climate change. In addition, EPA will seek to improve international compliance systems and enforcement.

- (+$2,100,000) State and Local Climate Change Program. In 2000, EPA will provide additional support to states and localities to help conduct analyses of the co-benefits of greenhouse gas mitigation, state carbon sequestration opportunities, and climate change policy impacts on state economies; implement and expand promising policy options identified by states in their greenhouse gas mitigation plans; and conduct regional assessments and state-level case studies of climate change impacts and adaptation options, and work with stakeholders to develop and implement adaptation measures to increase resilience to climate variability. Reductions of 1.7 MMTCE of emissions are expected for 2000.

- (-$10,000,000) Funding is discontinued for Climate Change Technology Initiative activities funded through the FY 1999 Omnibus appropriation.

Research

S&T

- (+$1,180,000) This increase in funding will be used to assess the potential effects of climate change on human health (e.g., changes in the presence of vector-borne and water-borne diseases), air quality (e.g., impacts of tropospheric ozone and PM), water quality (e.g., impact on water quality criteria), and ecosystem health (e.g., changes in the composition of landscapes; changes in ecosystem services).

- (+$400,000) This increase in funding will be used to assess data collected through the UV-B monitoring network to ascertain potential effects on ecosystems.

- (+$4,887,900) This increase in our Global Change Research Grants program will increase the number of global change assessment grants awarded. Solicitations will be issued for integrated assessments at the state and local level of the potential consequences of climate change on human health, ecosystems, and economic systems. Other grants will support work to assess data gathered through the UV-B monitoring network to examine the possible impacts

of UV-B exposure on ecosystems. Grants will also support research into the human dimensions of climate change. Human dimensions research entails understanding how humans contribute to and respond to global change.

- (+$216,000 and +4 workyears) This request continues the second year of the Agency's Postdoctoral Initiative to enhance our intramural research program, building upon the overwhelmingly positive response by the academic community to EPA's announcement of 50 postdoctoral positions for 1999. These positions will provide a constant stream of highly-trained postdoctoral candidates who can apply state-of-the-science training to EPA research issues.

NOTE: The FY 1999 Request, submitted to Congress in February 1998, included Operating Expenses and Working Capital Fund for the Office of Research and Development (ORD) in Goal 8 and Objective 5. In the FY 1999 Pending Enacted Operating Plan and the FY 2000 Request, these resources are allocated across Goals and Objectives. The FY 1999 Request columns in this document have been modified from the original FY 1999 Request so that they reflect the allocation of these ORD funds across Goals and Objectives.

Coordination with Other Agencies

Agencies throughout the Administration will make significant contributions to the CCTI; EPA worked extensively with these other agencies in the development of the CCTI. For example, the DOE will pursue actions such as promoting the research, development, and deployment of advanced technologies (for example, renewable energy sources). The Treasury Department will administer proposed tax incentives for specific investments that will reduce emissions. EPA is expanding its public information transportation choices campaign as a joint effort with the Department of Transportation.

EPA has also worked extensively with the DOE and other Federal agencies and offices in evaluating the performance of voluntary climate programs, and coordinating performance measures for the year 2000. An interagency process, headed by the Council on Environmental Quality, evaluated the performance of each program and their targets for the year 2000. The results were published by the Department of State in the *Climate Action Report 1997*. EPA and DOE, which together manage a majority of the voluntary climate programs, continue to coordinate on performance measures for the year 2000.

Research

EPA is an active participant in the interagency U.S. Global Change Research Program (USGCRP) and the ongoing National Assessment of "The Potential Consequences of Climate Change and Variability on the United States." As part of these efforts, EPA coordinates research and assessment activities with other USGCRP agencies to ensure that an integrated federal research and assessment program is implemented, and that agencies' activities are complementary rather than duplicative.

Verification and Validation of Performance Measures

EPA has several strategies to validate and verify performance measures. At the national level, the primary mechanism for monitoring overall changes in greenhouse gas emissions is the annual greenhouse gas inventory that is developed by EPA in coordination with other government agencies and departments. The EPA greenhouse gas inventory serves as the official U.S. government submission to the United Nations.

Within the voluntary programs, EPA monitors and evaluates accomplishments based on extensive information provided by partners. For example, the Green Lights partners provide detailed information on investments and energy savings from over 14,000 completed energy-efficiency projects (e.g., the annual kilowatt-hour savings from completed lighting upgrades). These standardized reports on energy efficiency projects can be easily translated into annual emission reductions by applying the appropriate emission factor (lbs/kWh) for each pollutant of concern. The voluntary programs continually use the information collected to improve the program's performance and more accurately assess its future potential.

Another measure of progress for the voluntary programs is obtained by using the Voluntary Reporting of Greenhouse Gases Program developed by the Energy Information Agency under the 1992 Energy Policy which reports the results and achievements of individual companies. Through this program, companies submit reports directly to the Energy Information Agency, which reviews them for accuracy and to ensure plausibility.

Research

EPA has several strategies to validate and verify performance measures in the area of environmental science and technology research. Because the major output of research is technical information, primarily in the form of reports, software, protocols, etc., key to these strategies is the performance of both peer reviews and quality reviews to ensure that requirements are met.

Peer reviews provide assurance during the pre-planning, planning, and reporting of environmental science and research activities that the work meets peer expectations. Only those science activities and resulting information products that pass Agency peer review are addressed and published. This applies to program-level, project-level, and research outputs. The quality of the peer review activity is monitored by EPA to ensure that peer reviews are performed consistently, according to Agency policy, and that any identified areas of concern are resolved through discussion or the implementation of corrective action.

The Agency's expanded focus on peer review helps ensure that the performance measures listed here are verified and validated by an external organization. This is accomplished through the use of the Science Advisory Board (SAB) and the Board of Scientific Counselors (BOSC). The BOSC, established under the Federal Advisory Committee Act, provides an added measure of assurance by

examining the way the Agency uses peer review, as well as the management of its research and development laboratories.

In 1998, the Agency presented a new Agency-wide quality system in Agency Order 5360.1/chg 1. This system provided policy to ensure that all environmental programs performed by or for the Agency be supported by individual quality systems that comply fully with the American National Standard, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E4-1994).

The order expanded the applicability of quality assurance and quality control to the design, construction, and operation by EPA organizations of environmental technology such as pollution control and abatement systems; treatment, storage, and disposal systems; and remediation systems. This rededication to quality provides the needed management and technical practices to assure that environmental data developed in research and used to support Agency decisions are of adequate quality and usability for their intended purpose.

A quality assurance system is implemented at all levels in the EPA research organization. The Agency-wide quality assurance system is a management system that provides the necessary elements to plan, implement, document, and assess the effectiveness of quality assurance and quality control activities applied to environmental programs conducted by or for EPA. This quality management system provides for identification of environmental programs for which Quality Assurance/Quality Control (QA/QC) is needed, specification of the quality of the data required from environmental programs, and provision of sufficient resources to assure that an adequate level of QA/QC is performed.

Agency measurements are based on the application of standard EPA and ASTM methodology as well as performance-based measurement systems. Non-standard methods are validated at the project level. Internal and external management system assessments report the efficacy of the management system for quality of the data and the final research results. The quality assurance annual report and work plan submitted by each organizational unit provides an accountable mechanism for quality activities. Continuous improvement in the quality system is accomplished through discussion and review of assessment results.

Statutory Authorities

Clean Air Act, 42 U.S.C. 7401 et seq. - Sections 102, 103, 104, 108

Clean Water Act, 33 U.S.C. 1251 et seq. - Section 104

Solid Waste Disposal Act, 42 U.S.C. 6901 et seq. - Section 8001

Pollution Prevention Act of 1990, 42 U.S.C. 13101 et seq. - Sections 6602, 6603, 6604, 6605

National Environmental Policy Act of 1969, 42 U.S.C. 4321 et seq. - Section 102

Global Climate Protection Act of 1987, 15 U.S.C. 2901 - Section 1103

Federal Technology Transfer Act, 15 U.S.C. - Section 3710a

Research

U.S. Global Change Research Program Act of 1990

United Nations Framework Convention on Climate Change

National Climate Program Act (1997)

- additionality (any way tons)

- $'s spent

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

MEMBER

cc: JY TA SP QF Cong

November 20, 1998

MEMORANDUM FOR TODD STERN

FROM: JEFF FRANKEL JF

SUBJECT: A NEW IDEA HOW TO DO SOMETHING IN THE AUTO SECTOR

I know that you have run into some roadblocks on the proposal for tax credits for fuel-efficient cars. You might be in the market for "outside the box" suggestions for how to do something in the auto sector. So I thought I would offer one.

The Administration could announce a regular series of cash awards for anyone making an outstanding contribution to reducing GHG emissions in the auto sector. It could be annual, like the Baldridge Awards, or more frequent. Recipients could include large corporations, private research labs, national labs, individuals (e.g., authors or inventors), think-tanks, NGOs, and local governments.

Hypothetical examples:

- Innovations in the vehicle:
  - redesigned engines that increase efficiency such as direct injection
  - light-weight materials
  - improved power source such as fuel cells
- Innovations in fuels:
  - improved refining methods that lower costs of reducing sulfur
  - improved natural gas or other alternative fuels
- Innovation in systems:
  - switch of corporate/government fleets
  - systems of delivering alternative fuels
- Innovations in infrastructure:
  - improved traffic monitoring and information to reduce congestion
  - automated tolls systems

I have discussed this with other members of the economists team (though not at the senior level), and they are enthusiastic about the idea.

cc: David Wilcox, Bob Cumby, Mark Mazur, Victoria Greenfield

Climate Change Technology Initiative Funding

	FY98 App	FY99 Req	House	Senate	Conf	Enacted ~~Omnibus~~
Energy & Water Appropriation	***272***	***409***	***286***	***352***	***290***	***350***
Outlays	272	331	274	305	276	303
Energy Supply Account *	**272**	**382**	**272**	**325**	**276**	**336**
Solar & Renewable Energy	272	372	272	315	276	336
Nuclear Energy	0	10	0	10	0	0
Outlays	272	316	266	290	268	295
Science Account	**0**	**27**	**14**	**27**	**14**	**14**
Energy Research	0	27	14	27	14	14
Outlays	0	16	8	16	8	8
Interior Appropriation	***457***	***651***	***489***	***509***	***501***	***552***
Energy Conservation Accoun	**457**	**618**	**471**	**487**	**481**	**526**
(Including Grants)	612	809	632	647	642	892
Fossil Energy R&D Account	**0**	**30**	**18**	**22**	**20**	**24**
(Non-CCTI add)						4
Energy Information Administr	**0**	**3**	**0**	**0**	**0**	**3**
DOE TOTAL	**729**	**1,060**	**774**	**860**	**790**	**902**
EPA	**90**	**205**	**99**	**114**	**99**	**109**
HUD	**0**	**10**	**10**	**0**	**10**	**10**
USDA	**0**	**10**	**0**	**0**	**0**	**0**
DOC	**0**	**7**	**0**	**0**	**0**	**0**
CCTI TOTAL	**819**	**1,292**	**883**	**974**	**899**	**1,021**
Increase		473	64	155	80	202
Relative to FY 1998 Approp		58%	8%	19%	10%	25%
Relative to FY 1999 Request			-32%	-25%	-30%	-21%

Message Copied To:

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CBO MEMORANDUM

CLIMATE CHANGE AND THE
FEDERAL BUDGET

August 1998

CONGRESSIONAL BUDGET OFFICE
SECOND AND D STREETS, S.W.
WASHINGTON, D.C. 20515

CONTENTS

TABLES

CHAPTER I
CLIMATE CHANGE: THE POLICY CHALLENGE AND CURRENT PROGRAMS

For over a decade, scientists and policymakers worldwide have debated how human activity affects the global climate and whether anything can or should be done about it. Some people believe that climate change poses a great risk to future generations and call for immediate action that could impose high costs on the economy and society at large. Other people believe that it is not a serious problem and can be dealt with if and when it occurs. Still others believe that the warmer temperatures that coincide with climate change might benefit the economy. Opinions about climate change reflect the uncertainties that surround it: about the science of the phenomenon itself; about the implications for people, economies, and ecosystems; and about the best policy for dealing with it. Further research can help inform policymakers but, as with other highly charged issues, decisions will have to be made before all the facts are in.

Since the mid-1980s, the United States has funded scientific research and monitoring efforts and participated in international negotiations and agreements, all centered around the global climate issue. In 1993, the government developed a set of voluntary programs to cut emissions of carbon dioxide and other greenhouse gases that scientists believe to be at the core of the problem.

But stronger measures would be needed to cut emissions significantly. In December 1997, representatives from the United States and other industrialized countries agreed to the Kyoto Protocol—a treaty with binding targets and timetables for reducing emissions of carbon dioxide and other greenhouse gases.[1] The reductions that the participants agreed to are a modest first step toward a goal of eventually stabilizing atmospheric concentrations of those gases, but some analysts believe that even those preliminary measures will be excessively costly to the U.S. economy.

The Kyoto Protocol requires ratification by the Senate. The Administration is postponing presentation of the Kyoto Protocol to the Senate to get "meaningful participation" from developing countries in the effort to limit emissions—something lacking in the treaty. Climate change is a global problem, and the United States and other industrialized countries will not succeed without global cooperation. Talks with developing countries are ongoing.

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1. Kyoto Protocol to the United Nations Framework Convention on Climate Change, FCCC/CP/1997/L.7/Add.1, Conference of Parties, Third Session, Kyoto, December 1-10, 1997 (available at http://www.unfccc.de/fccc/docs/cop3/07a01.pdf).

Even if some level of global cooperation is achieved and the treaty is presented to the Senate, the debate on climate change will have just begun. Policymakers face questions for which there are no certain answers: Should current sacrifices be made for uncertain future benefits? Who should pay for reductions in emissions? and What actions could lessen adjustment costs? If the treaty is ratified, future Congresses will have to consider authorizations and appropriations for particular programs to meet the treaty's targets and timetables.

This memorandum reviews current and proposed federal spending programs and tax policies that relate to climate change, their effects on the federal budget, and the Administration's proposals for funding them. Included in that inventory are activities that directly address climate change and those that are associated with climate change through their effects on emissions of carbon dioxide.

Federal regulatory activities could also affect climate change but are not included in this memorandum. The private sector bears most of the cost of regulation, so those figures do not show up in the federal budget; even the expenses of federal agencies to administer and enforce regulations are often offset by collections from the regulated industry and, hence, have little or no net budgetary impact. Although some regulations may affect energy use and emissions of carbon dioxide, none directly address climate change. That could change as policies evolve.

Sooner or later, policymakers will face major decisions on climate policy—particularly whether to limit carbon emissions and how to go about it. Those policy decisions will inevitably affect the budget. Sharply limiting emissions would have large near-term effects on the economy with ensuing consequences for federal revenues and outlays. The choice of a policy instrument could also have a large budgetary effect. Taxes to curtail use of fossil fuels, for example, could generate substantial revenues. The budgetary effects of tradable emissions allowances—a policy option in the Kyoto treaty—would depend on whether permits were distributed or auctioned. Ultimately, policy decisions that may be influenced by budgetary effects will be dominated by the larger question of the effects of policy actions, or of taking no actions, on the U.S. and world economies.

"DIRECT" AND "ASSOCIATED" SPENDING PROGRAMS AND TAX POLICIES

Programs and tax policies reported in this memorandum are divided into two categories, based on whether they are directly related to climate change or just associated with it. The first category includes spending programs and tax policies that are specifically designated by the Administration as climate change programs. The second category comprises programs that may affect climate change even though that may not be their primary purpose. Some of those programs may be intended to cut the use of fossil fuels—a goal shared with activities that are identified as climate

change programs. Others—particularly certain tax policies—may lead to an increase in the use of fossil fuels and thus contribute to carbon emissions, although, again, that is not their purpose.

The direct category comprises spending programs in the U.S. Global Change Research Program (USGCRP), the Climate Change Technology Initiative, and several international programs related to climate change. Budget authority for those programs in 1998 totals $2.9 billion (see Table 1). The USGCRP, which consists mainly of programs to discern the science and consequences of global change, was funded at about $1.9 billion in 1998—roughly 65 percent of funding for programs directly related to climate change. The President requested a substantial increase in 1999, to $3.4 billion, for all climate change programs, mostly for research and development in energy technology.

The Climate Change Technology Initiative also contains proposed changes in tax law. Those changes include several tax credits to encourage the development and adoption of new energy-efficient technologies in transportation, industry, buildings, and electricity. Estimated revenue losses associated with those tax proposals are $478 million in 1999, rising to nearly $1.3 billion by 2003. Those policy proposals and tax policies are discussed in more detail in Chapter 2.

The second category of programs are those associated with climate change primarily through their effects on the use of fossil fuels. Table 1 shows spending for a number of such programs, mostly in the areas of transportation, energy conservation, and nuclear energy research and development. Budget authority totals nearly $1.8 billion in 1998, and the request for 1999 is roughly the same. Those programs are discussed in more detail in Chapter 3.

Various taxes and tax preferences also influence the use of fossil fuels and, consequently, emissions of carbon dioxide. Tax preferences that may discourage the use of fossil fuel include credits, exclusions, and exemptions to encourage energy conservation, the development of alternative fuel supplies or energy-producing technologies, or both. Excise taxes on fossil fuels and activities related to transportation and travel exert a direct effect on energy use by applying upward pressure on prices, which, in turn, reduces demand. The estimated effects on revenues of tax preferences and excise taxes is quite large. But since the effects on climate change are largely incidental to the purposes of the programs and vary greatly by program, the total is not particularly meaningful.

TABLE 1. FEDERAL PROGRAMS DIRECTLY RELATED TO GLOBAL CLIMATE CHANGE OR ASSOCIATED WITH CLIMATE CHANGE (In millions of dollars of budget authority)

	1997	1998	Requested 1999	Change 1998-1999
Spending Programs and Tax Policies Directly Related to Climate Change				
U.S. Global Change Research Program[a]	1,818	1,867	1,864	-3
Climate Change Technology Initiative	744	820	1,292	471
International Programs	206	213	287	74
Total	2,768	2,901	3,442	542
Revenue Effects of CCTI Tax Incentives[b]	n.a.	n.a.	-478	
Spending Programs Associated with Climate Change				
Partnership for a New Generation of Vehicles (Non-CCTI)[c]	99	82	78	-4
Congestion Mitigation and Air Quality Improvement Program	807	1,257	1,260	3
Advanced Transportation Technologies Consortium (Non-CCTI)[c]	16	16	10	-7
Other Transportation Programs	14	14	5	-9
Energy Conservation Assistance Grant Programs	150	155	191	36
Civilian Nuclear Energy R&D				
Fission (Non-CCTI)[c]	41	7	34	27
Fusion	230	230	228	-1
Total	1,357	1,762	1,806	45
All Programs and Tax Policies				
Total	4,125	4,663	5,248	587

SOURCE: Congressional Budget Office based on information from the Office of Management and Budget; *Budget of the United States Government, Fiscal Year 1999*: U.S. House of Representatives, *Making Appropriations for Energy and Water Development for the Fiscal Year Ending September 30, 1998*, conference report to accompany H.R. 2203, Report 105-271 (September 26, 1997); Department of Energy, *Fiscal Year 1999 Budget Request to Congress: Control Table by Appropriation* (January 30, 1998); Department of Energy, *Fiscal Year 1999 Congressional Budget Request: Science, Technology and Energy for the Future* (February 1998); Department of Housing and Urban Development; Department of the Treasury; Global Environment Facility Secretariat's Office; Department of State; Environmental Protection Agency; and the Agency for International Development.

NOTE: CCTI = Climate Change Technology Initiative; R&D = research and development; n.a. = not available.

a. Totals are augmented in 1997 by $1 million and in 1998 by $1.6 million—funding for the Department of Energy's research on carbon sequestration. Comparable funding for CCTI is $743 million in 1997 and $819 million in 1998.

b. Estimates of revenue losses that would result from enactment of CCTI tax incentives.

c. Funding for activities in this program that are not included in CCTI in the President's 1999 budget.

CURRENT PROGRAMS AND TAX POLICIES AND THE EMISSION OF GREENHOUSE GASES

The federal government is now spending nearly $5 billion annually on programs that are either directly related to climate change or associated with climate change through their effects on the use of fossil fuels. In addition, taxes and tax policies that affect the prices, production, or use of fossil fuels can also affect carbon emissions. The directly related programs are helping U.S. researchers and policymakers learn more about climate change, conduct applied technology research and development to improve energy efficiency, promote international actions, and, to a modest extent, cut emissions of greenhouse gases.

Other programs and tax policies that affect the use of fossil fuels may also indirectly affect emissions of carbon dioxide. A Congressional Budget Office (CBO) study prepared in 1990 looked specifically at carbon dioxide emissions and concluded that whether programs and tax policies then in place had a net positive or negative effect on total emissions was unclear. The studies predicted that, whatever the direction of the effect, it would probably be small.[2] That conclusion still holds. More programs are now designated as climate change programs than in the past. Since most of the funds are spent to learn more about the phenomenon and to improve energy efficiency in the future, the short-term effect is minimal.

2. Congressional Budget Office, *Energy Use and Emissions of Carbon Dioxide: Federal Spending and Credit Programs and Tax Policies* (December 1990).

CHAPTER II
CURRENT AND PROPOSED SPENDING PROGRAMS AND TAX POLICIES DIRECTLY LINKED TO CLIMATE CHANGE

Current U.S. policy toward climate change focuses on three areas: scientific research and monitoring to better understand climate change, its implications, and what to do about it; applied technology research and development to reduce energy use or to make future limits on carbon emissions less costly to the economy; and activities to promote international agreements and actions.

Two other categories of climate change activities receive less attention now but could dominate federal action in the future. First are efforts to reduce the emissions of greenhouse gases. Several voluntary federal programs to cut emissions exist, but they fall short of meeting any significant reduction goals such as those in the Kyoto Protocol. Second are activities to adapt to the effects of climate change. Adapting to change, instead of trying to prevent it, requires little current action.

SPENDING PROGRAMS DIRECTLY LINKED TO CLIMATE CHANGE

The U.S. Global Change Research Program, the Climate Change Technology Initiative (CCTI), and a group of international activities are the major federal efforts directly linked to climate change. The USGCRP has been in place since 1989. The CCTI, a new umbrella designation, includes programs formerly in the Climate Change Action Plan and the research and development programs of the Department of Energy (DOE).

The U.S. Global Change Research Program

The U.S. Global Change Research Program is a comprehensive effort to understand the science and consequences of a full range of natural and human-induced changes in the Earth's environment. The four main areas of study are seasonal to interannual climate variability; climatic changes over time; changes in ozone, ultraviolet radiation, and atmospheric chemistry; and changes in land cover and ecosystems. Ten executive departments or agencies conduct or fund that research. Funding for 1998 is almost $1.9 billion, and the request for 1999 is nearly the same (see Table 2).[1]

1. Several Department of Defense (DoD) research activities, totaling $6.5 million in 1998 (the request for 1999 is $6.7 million), also support the programs, but funding for DoD programs is not included in the official totals of the USGCRP.

TABLE 2. FUNDING FOR THE U.S. GLOBAL CHANGE RESEARCH PROGRAM
(In millions of dollars of budget authority)

	1997	1998	Requested 1999	Change, 1998-1999
National Aeronautics and Space Administration	1,369	1,417	1,372	-45
National Science Foundation	166	167	187	20
Department of Energy	109	108	113	5
Department of Commerce	62	62	71	9
Department of Agriculture	57	58	59	1
Department of the Interior	29	29	29	0
Environmental Protection Agency	14	15	21	6
Smithsonian	7	7	7	0
Department of Health and Human Services	4	4	5	1
Tennessee Valley Authority	1	a	a	n.a.
Total	1,818	1,867	1,864	-3

SOURCE: Congressional Budget Office based on information from the Office of Management and Budget; *Budget of the United States Government, Fiscal Year 1999* (February 1998); and National Science and Technology Council, Committee on Environment and Natural Resources, Subcommittee on Global Change Research, *Our Changing Planet, The FY 1999 U.S. Global Change Research Program* (March 1998).

NOTE: n.a. = not applicable.

a. No funding in that year.

About 40 percent of USGCRP funds go to research scientists studying a broad range of questions. The USGCRP publishes an annual report on research objectives and projects, including information on budgetary resources allocated to projects within agencies or departments.[2]

The remaining 60 percent of funding supports development of a space-based observation system—a series of satellites and data systems to monitor the Earth's natural systems. The National Aeronautics and Space Administration controls that activity, which accounts for about 80 percent of NASA's funding within the USGCRP—the remainder being scientific research. Most of those hardware development funds are for the Earth Observing System (EOS) program. The first satellite in that program, the EOS AM-1, is scheduled for launch this year to gather various data on land surface, atmosphere, and oceans.

2. National Science and Technology Council, Committee on Environment and Natural Resources, Subcommittee on Global Change Research, *Our Changing Planet, The FY 1999 U.S. Global Change Research Program* (March 1998).

The Climate Change Technology Initiative

The Climate Change Technology Initiative is a group of programs that would receive increased funding for research, development, and deployment of technologies to improve energy efficiency and reduce carbon emissions. The 1999 budget request totals $1,292 million, an increase of $471 million over the 1998 level (see Table 3). About $100 million of the $471 million would be for new activities. The remainder represents increased funding for existing programs, with some of those being major expansions. The increase over five years from current levels would total $2.7 billion. The CCTI also includes tax incentives, described below.

The CCTI is led by the Department of Energy and the Environmental Protection Agency (EPA). Those two agencies would receive 98 percent of the requested funding for 1999. The remaining 2 percent would fund activities at the Department of Housing and Urban Development, the Department of Commerce's National Institute of Standards and Technology (NIST), and the Department of Agriculture.

Most CCTI programs also serve other policy goals—for example, enhancing energy security, promoting energy efficiency, and improving air quality. The CCTI consists of the following activities within the Department of Energy:

- Energy efficiency and conservation activities, including research and development programs, the Federal Energy Management Program, DOE's contribution to the Partnership for a New Generation of Vehicles (a multiagency program to promote high-efficiency vehicles), municipal energy management, and DOE's contribution to the Advanced Transportation Technologies Consortium, which promotes research on electric and hybrid vehicles. The 1999 request is $617 million, exceeding 1998 funding by $161 million.

- Solar and renewable energy R&D. The 1999 request is $372 million, an increase of $100 million over 1998 levels.

- New activities within the fossil energy research and development program. The President requested $10 million to investigate the sequestration of carbon and $20 million for a new effort to improve the efficiency of the combustion of coal.

- Other research and development. New programs include $10 million to investigate ways to increase the useful life of existing nuclear plants and $27 million in the basic science account for research, principally on carbon sequestration. The research on carbon sequestration in the basic science program and the fossil fuel R&D

TABLE 3. FUNDING FOR PROGRAMS IN THE CLIMATE CHANGE TECHNOLOGY INITIATIVE (In millions of dollars of budget authority)

	1997	1998	Requested 1999	Change, 1998-1999
Department of Energy				
Energy conservation R&D				
Energy efficiency and conservation	273	307	403	
Federal Energy Management Program	20	20	34	
Partnership for a New Generation of Vehicles	120	128	164	
Municipal energy management	2	2	7	
Advanced Transportation Technologies Consortium	a	a	10	
Subtotal	414	457	617	161
Solar and renewable energy R&D[b]	244	272	372	100
Fossil energy R&D				
Sequestration of carbon[c]	1	2	10	
Advanced combustion of coal	a	a	20	
Subtotal	1	2	30	28
Other energy R&D				
Extending life of nuclear plants	a	a	10	
Tracking CO_2 emissions	a	a	3	
Basic science/technology (Sequestration of carbon)	a	a	27	
Subtotal	a	a	40	40
Total	658	730	1,059	329
Environmental Protection Agency[d]				
Former Programs of the Climate Change Action Plan (excluding PNGV)	71	73	115	
Partnership for a New Generation of Vehicles	15	17	35	
Other	a	a	55	
Subtotal	86	90	205	115
Department of Housing and Urban Development (PATH)[e]	a	a	10	10
Department of Commerce (NIST)	a	a	7	7
Department of Agriculture[e]	a	a	10	10
Total	744	820	1,292	471

TABLE 3. CONTINUED

SOURCE: Congressional Budget Office based on information from the Office of Management and Budget; *Budget of the United States Government, Fiscal Year 1999;* U.S. House of Representatives, *Making Appropriations for Energy and Water Development for the Fiscal Year Ending September 30, 1998,* conference report to accompany H.R. 2203, Report 105-271 (September 26, 1997); Department of Energy, *Fiscal Year 1999 Budget Request to Congress: Control Table by Appropriation* (January 30, 1998); Department of Energy, *Fiscal Year 1999 Congressional Budget Request: Science, Technology and Energy for the Future* (February 1998); Department of Housing and Urban Development; Department of the Treasury; Global Environment Facility Secretariat's Office; Department of State; Environmental Protection Agency; and the Agency for International Development.

NOTE: R&D = research and development; PNGV = Partnership for a New Generation of Vehicles; PATH = Partnership for Advancing Technologies in Housing; NIST = National Institute of Standards and Technology.

a. No funding in that year.

b. Net of prior-year balances, including balance carryovers for Renewable Energy Research Program (research in photovoltaics, biomass/biofuels, wind, hydrogen, and solar photoconversion) in 1998 and 1999.

c. Climate Change Technology Initiative (CCTI) totals in the table are augmented in 1997 by $1 million and in 1998 by $1.6 million—funding for the Department of Energy's carbon sequestration research. Comparable funding for CCTI is $743 million in 1997 and $819 million in 1998.

d. Figures for the Environmental Protection Agency in 1997 and 1998 equal agency funding for Climate Change Action Plan (CCAP) programs.

e. Some funding related to climate change activities for Department of Housing and Urban Development (HUD) and Department of Agriculture (USDA) were not included in order to be consistent with the President's budget request. HUD used about $1 million in "seed" funds for the Partnership for Advancing Technologies in Housing program in 1998; those funds were taken from HUD's general R&D fund and used as start-up funds for the program. Funding for Climate Change Action Plan (CCAP) programs at USDA was $8 million in 1997 and 1998. CBO was unable to determine what happened to the USDA CCAP programs.

programs is the only example of newly proposed research that would not also serve other energy policy goals.

CCTI activities within the Environmental Protection Agency would include the bulk of programs that were formerly part of the Climate Change Action Plan (CCAP). Many of the CCAP programs administered by EPA would be expanded under the proposal, including the Energy Star Programs for buildings, appliance labeling, and homes. The 1999 request for the former CCAP activities other than the Partnership for a New Generation of Vehicles (PNGV) is about $115 million, up from $73 million in 1998. The PNGV, formerly part of CCAP, is now part of the Climate Change Technology Initiative. EPA's contribution to PNGV would roughly double, from $17 million to $35 million, in the 1999 request.

The Partnership for a New Generation of Vehicles, launched in 1993, is a cooperative effort between the federal government and industry to foster breakthrough technology in personal vehicles. In addition to DOE and EPA, the Department of Commerce, the National Science Foundation, and the Department of Transportation receive funding for PNGV activities. One goal of the program is to

develop a production prototype vehicle capable of 80 miles per gallon by 2004. Funding was about $234 million in 1997 and $227 million in 1998. The President's request for PNGV funding for all agencies, whether included in CCTI or not, is $50 million above 1998 levels.

The CCTI program in the Department of Housing and Urban Development is the Partnership for Advancing Technologies in Housing (PATH). The purpose of PATH is to develop, demonstrate, and help to commercialize safe, energy-efficient housing technologies. The PATH program received about $1 million in seed money from a HUD R&D account in 1998. The program would be funded at $10 million in 1999 under the President's proposal.

CCTI programs at the Department of Agriculture (USDA) would fund research on biomass and carbon sequestration. CCTI would allot $10 million to USDA to support research on the conversion of wood, crop wastes, and energy crops to fuels and electricity and on enhancing the carbon-sequestering capabilities of agricultural species.

The CCTI also includes funding for new research at the National Institute of Standards and Technology in the Department of Commerce. Research efforts at NIST would work to improve measurements of greenhouse gases and would support biotechnology work on plant metabolism and carbon sequestration. The proposed level of funding for NIST programs in 1999 is $7 million.

International Activities That Target Climate Change

The United States contributes to various international efforts to assess the problem of climate change and to reduce emissions of carbon dioxide and other greenhouse gases. Contributions to the Intergovernmental Panel on Climate Change, the Global Environment Facility, the Montreal Protocol, and bilateral assistance programs totaled more than $200 million in 1998 (see Table 4).

Intergovernmental Panel on Climate Change and the Climate Change Secretariat. The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme (UNEP) to assess the available scientific, technical, and socioeconomic information in the field of climate change. The IPCC released its Second Assessment Report in 1995 and periodically produces technical papers and develops methodologies (for example, inventories of greenhouse gases) for use by the parties to the Climate Change Convention. The Climate Change Secretariat was organized under the U.N. Framework Convention on Climate Change to handle coordination and administrative responsibilities under the Convention. The United States contributed $5 million to the IPCC and the Climate Change Secretariat in 1998. The 1999 request is $8 million.

TABLE 4. FUNDING FOR INTERNATIONAL PROGRAMS DIRECTLY RELATED TO GLOBAL CHANGE (In millions of dollars of budget authority)

	1997	1998	Requested 1999	Change, 1998-1999
Department of State				
Intergovernmental Panel on Climate Change and the Climate Change Secretariat[a]	3	5	8	3
Bilateral Assistance Grant Program (AID)	150	150	150	0
Department of the Treasury				
Global Environment Facility[b]	13	18	73	55
Montreal Protocol				
Department of State	28	28	34	
Environmental Protection Agency	12	12	21	
Total	40	40	55	15
All Programs				
Total	206	213	287	74

SOURCE: Congressional Budget Office based on information from the Office of Management and Budget; *Budget of the United States Government, Fiscal Year 1999*; Department of the Treasury; Global Environment Facility Secretariat's Office; Department of State; Environmental Protection Agency; and the Agency for International Development.

NOTE: AID = Agency for International Development.

a. Funding data are voluntary contributions to the Climate Stabilization Fund.

b. Funding for the "climate" share of the Global Environment Facility was calculated as 38 percent of the total budget authority (net of funding for payments in arrears).

Bilateral Assistance. Bilateral assistance is primarily conducted through the U.S. Agency for International Development (AID). AID has made the mitigation of climate change one of two global environmental priorities. The agency supports grants focusing on this issue to nine key countries—India, Indonesia, the Philippines, Mexico, Brazil, Russia, Ukraine, Kazakstan, and Poland—and supports a broader portfolio of energy efficiency, renewable energy, and forestry activities related to climate change. Obligations for grants related to climate change were $150 million in 1998, the same as the request for 1999.

Global Environment Facility. The Global Environment Facility (GEF) is an international financial institution established in 1991 to provide developing countries with grants and low-interest loans for projects in four areas: global climate change, international waters, biological diversity, and depletion of the ozone layer. The GEF is run jointly by the United Nations Development Programme (UNDP), UNEP, and the World Bank. Budget authority for climate change activities was about $18 million in 1998 (38 percent of all funds appropriated for the GEF). The total request for funds for the GEF in 1999 is $300 million—38 percent of which is $114 million. The 1999 budget identifies about $41 million (of the $114 million) as "payments in arrears," leaving $73 million that may be available for new obligation.

Montreal Protocol. The Montreal Protocol is an international environmental agreement with the objective of eliminating the use of substances that deplete the ozone layer in the stratosphere and are believed to contribute to climate change: chlorofluorocarbons, halons, and hydrochlorofluorocarbons. The agreement is implemented by the World Bank, UNDP, UNEP, and the United Nations Industrial Development Organization. The U.S. contribution, which is jointly paid by the Department of State and the Environmental Protection Agency, totaled $40 million in 1998. CBO includes spending for the Montreal Protocol in this memorandum because of the close link between ozone-depleting gases and greenhouse gases.

The request for 1999 is $55 million—$34 million for the Department of State and $21 million for the Environmental Protection Agency.

TAX PROPOSALS DIRECTLY LINKED TO CLIMATE CHANGE

As part of its Climate Change Technology Initiative, the Administration has proposed several tax preferences designed to encourage the development of new technologies that offer superior energy efficiency and to induce purchases of higher-cost, energy-efficient equipment. Improving energy efficiency would reduce emissions of carbon dioxide, the cost of complying with any future limits on emissions, or both.

The Administration sought to tailor the incentives to technologies that either are currently available or will be when the credits go into effect and to equipment that can be precisely defined for purposes of the Internal Revenue Service. According to estimates of the Joint Committee on Taxation (JCT), the tax incentives would result in revenue losses of $3.8 billion through 2003 and $9.8 billion through 2008 (see Table 5).[3]

3. Joint Committee on Taxation, "Estimated Budget Effects of the Revenue Provisions Contained in the President's Fiscal Year 1999 Budget Proposal," February 24, 1998.

TABLE 5. ESTIMATES OF REVENUE LOSSES FROM PROPOSALS FOR ENERGY AND ENVIRONMENTAL TAX INCENTIVES IN THE ADMINISTRATION'S 1999 BUDGET (In millions of dollars)

Proposal	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	1998-2003	1998-2008
Tax Credits													
Fuel-Efficient Vehicles	0	0	a	-89	-299	-544	-904	-1,011	-1,004	-994	-979	-931	-5,823
Energy-Efficient Building Equipment	0	-125	-225	-285	-340	-410	-155	-20	-5	1[b]	1[b]	-1,385	-1,563
CHP Equipment	18[c]	-326	-285	-90	-116	-115	-39	2[b]	3[b]	4[b]	4[b]	-913	-938
Wind and Biomass	0	-2	-7	-21	-43	-71	-109	-128	-131	-134	-137	-144	-784
Energy-Efficient Homes	0	-5	-25	-40	-55	-75	-35	0	0	0	0	-200	-235
Circuit Breaker Equipment	0	-5	-10	-15	-10	-5	-2	2[b]	1[b]	1[b]	1[b]	-45	-42
Rooftop Solar Equipment	0	-2	-6	-9	-12	-16	-18	-26	-12	d	d	-43	-100
PFC and HFC Recycling Equipment	0	-5	-10	-10	-5	-3	1[b]	1[b]	1[b]	1[b]	d	-33	-29
Other Tax Incentives													
Parking and Transit Benefits	0	-8	-16	-25	-31	-35	-36	-39	-43	-42	-44	-114	-318
All Tax Incentives													
Total	18	-478	-584	-584	-911	-1,274	-1,297	-1,219	-1,190	-1,163	-1,154	-3,808	-9,832

SOURCE: Congressional Budget Office based on the Joint Committee on Taxation's estimates of the revenue effects of the Climate Change Technology Initiative in the President's 1999 budget.

NOTE: CHP = combined heat and power; PFC = perfluorocompound; HFC = hydrofluorocarbon.

a. Revenue loss of less than $500,000.

b. Positive revenue estimates reflect projected lower deductions for depreciation.

c. The positive revenue estimate reflects a projected slowdown in investment pending enactment of the credit, which in turn would result in lower deductions for depreciation.

d. Revenue gain of less than $500,000.

Tax Credits

Most of the proposals for tax preferences are for new or expanded tax credits.

Tax Credits for Highly Fuel-Efficient Vehicles. Under current law, a 10 percent credit is available for the purchase of new electric vehicles for use by the taxpayer and not for resale. In addition, a deduction is available for qualified clean-fuel vehicles. The proposed tax credits are intended to reduce carbon dioxide emissions by encouraging the manufacture and purchase of fuel-efficient vehicles. The proposal is for two temporary tax credits: a $4,000 credit for each vehicle that has three times the base fuel economy for its class, and a $3,000 tax credit for each vehicle that has twice the base fuel economy for its class. The $4,000 credit would be available in calendar years 2003 through 2006 and would subsequently be reduced by $1,000 a year, phasing out completely in 2010. The $3,000 credit would be available for calendar years 2000 through 2003 and would phase out in 2006, also at the rate of $1,000 a year. The credits would be available for cars, sport utility vehicles, minivans, light trucks as well as hybrid, electric, and other light vehicles. Taxpayers who claimed the new credits would not be able to claim the credit that is currently available for electric vehicles or the deduction for clean-fuel vehicles.

The JCT estimates that enacting the proposal would reduce revenues by $931 million from 1998 through 2003 and by $5,823 million from 1998 through 2008.

Tax Credit for Energy-Efficient Building Equipment. The proposal would provide a credit for the purchase of certain types of energy-efficient building equipment: fuel cells, electric heat pumps and advanced natural gas water heaters, advanced natural gas and residential-size electric heat pumps, and advanced central air conditioners. The credit, which would be nonrefundable, would be equal to 20 percent of the purchase price, subject to a cap. For businesses, it would be subject to the limits on the general business credit, and it would reduce the basis of the equipment. The credit would be in effect from January 1, 2000, to December 31, 2004, for fuel cells, and from January 1, 1999, to December 31, 2003, for other types of equipment. To be eligible for the credit, the equipment would have to meet specified criteria.

The JCT estimates that the proposal would result in revenue losses of $1,385 million between 1998 and 2003 and $1,563 million between 1998 and 2008.

Investment Tax Credit for Combined Heat and Power Systems. Combined heat and power (CHP) systems are used to produce electricity and process heat or mechanical power from a single primary energy source. The systems use thermal energy that is otherwise wasted in the process of producing electricity conventionally—which, in turn, results in less consumption of fossil fuels, reduced carbon emissions, and lower costs. The proposal is for a 10 percent investment tax credit for CHP systems with electrical capacity of more than 50 kilowatts. Investments in the systems with cost-recovery periods of less than 15 years would be eligible for the credit only if a 15-

year recovery period and the 150 percent declining-balance method were used to calculate depreciation deductions.

The systems would be required to produce at least 20 percent of their useful energy in the form of both thermal energy and electric or mechanical power. To qualify for the credit, CHP systems would have to meet specified energy-efficiency and percentage-of-energy tests, as certified by qualified engineers, pursuant to regulations issued by the Secretary of the Treasury. The credit would be subject to the limits on general business credits and would be available for equipment placed in service during calendar years 1999 through 2003.

The JCT estimates that the proposal would result in revenue losses of $913 million through 2003.

Wind and Biomass Tax Credit. A tax credit of 1.5 cents per kilowatt hour (indexed for inflation after 1992) is currently available for electricity produced from wind or biomass. It now applies only to facilities placed in service before June 1, 1999, for wind and before July 1, 1999, for biomass. The proposal would extend the credit for both types of facilities placed in service by July 1, 2004. Unlike the other proposed tax credits, the wind and biomass credit is based on production rather than investment. The electricity must be sold to an unrelated third party, and the credit is limited to the first 10 years of production.

The JCT estimates the potential revenue losses of the proposal at $144 million through 2003 and $784 million through 2008.

Tax Credit for Purchase of New Energy-Efficient Homes. The proposal would provide a tax credit of 1 percent of the purchase price up to $2,000 to buyers of new homes that use at least 50 percent less energy for heating, cooling, and hot water than the Model Energy Code standard for single-family homes. The credit would be available for calendar years 1999 through 2003. Homes purchased in 2004 and 2005 would be eligible for a maximum credit of $1,000.

The JCT estimates that the proposal would result in revenue losses of $200 million between 1998 and 2003 and an additional $35 million in 2004.

Tax Credit for Replacement of Circuit Breaker Equipment. The proposal would provide a 10 percent tax credit to replace circuit breakers installed before 1986 that use sulfur hexafluoride (SF_6), a potent greenhouse gas. The replaced circuit breakers must be destroyed to prevent further use. The credit applies to property placed in service in calendar years 1999 through 2003 and is subject to the limits of the general business credit. Also, the amount of credit claimed reduces the depreciable basis of qualified property for which the credit is taken.

The JCT estimates that the proposal would result in revenue losses of $45 million between 1998 and 2003.

Tax Credit for Rooftop Solar Equipment. The proposed tax credit would be available for two types of solar equipment—photovoltaic heating systems and water heating systems located on or adjacent to buildings. The credit would be equal to 15 percent of the total investment in either system up to a maximum credit of $2,000 for rooftop photovoltaic heating systems and $1,000 for solar water heating systems. It would be nonrefundable and would not be available for systems to heat swimming pools. For businesses, the credit would reduce the depreciable basis of the property by the amount claimed and would be subject to the limits of the general business credit. It would apply to equipment placed in service during calendar years 1999 through 2003 for solar water heating systems and through 2005 for rooftop photovoltaic systems.

Under current law, a 10 percent energy investment tax credit for businesses is available for equipment that uses solar energy to generate electricity, to heat or cool or provide hot water for use in a structure, or to provide solar-process heat. The equivalent credit for residential solar systems expired in 1985. Under the proposals, businesses would have to choose between the present and the proposed tax credits.

The JCT estimates that enacting the proposal would reduce revenues by $43 million through 2003 and $100 million through 2008.

Tax Credit for Perfluorocompound and Hydrofluorocarbon Recycling Equipment. Perfluorocompounds (PFCs) and certain hydrofluorocarbons (HFCs) are extremely potent greenhouse gases because of their stability in the atmosphere and their capacity to absorb radiation. Under current law, manufacturers who install equipment to recover or recycle PFC and HFC gases used in producing semiconductors may depreciate the cost of that equipment over six years. The proposal would make available a 10 percent tax credit for installing PFC and HFC recovery or recycling equipment. The credit would be subject to the limits of the general business tax credit and would reduce the depreciable basis of the equipment by the amount claimed. To qualify, the equipment must recover at least 99 percent of the PFCs and HFCs used and must be placed in service between January 1, 1999, and December 31, 2003.

The JCT estimates that enacting the proposal would reduce revenues by about $33 million between 1998 and 2003.

Parking and Transit Benefits

The Administration has also proposed an increase in benefits to encourage the use of mass transit and van pools. Current law provides for the exclusion of parking benefits from gross income, regardless of whether the benefits are in addition to or

in lieu of other employee compensation. However, for transit and van-pool benefits, the exclusion applies only if those benefits are in addition to other compensation. The current limits on the income exclusion (in 1993 dollars) are $155 per month for parking and $60 for transit passes and van-pool benefits. The proposal calls for eliminating the relative tax advantage of parking benefits. It would treat parking, transit passes, and van-pool benefits in the same way, subject to the same limits that currently apply to parking.

The JCT estimates that the proposal would reduce revenues by $114 million through 2003 and $318 million through 2008.

CHAPTER III
OTHER FEDERAL SPENDING PROGRAMS AND TAX POLICIES ASSOCIATED WITH CLIMATE CHANGE

Other federal programs and tax policies affect energy use and emissions of carbon dioxide—some positively, some negatively. Energy use is so important to the economy, and the government affects economic activity in so many ways, that a very broad range of government programs could be included. Deciding where to draw the line is difficult. The programs and tax policies included in this chapter represent one way to inventory a set of programs and tax policies associated with energy use and climate change.

Programs closely associated with climate change include activities in transportation, energy conservation, and nuclear energy research and development that could affect emissions of carbon dioxide (or lower the costs of using less carbon). Those programs have multiple objectives—as do many that are directly related to climate change. Isolating the portions of the programs that should be charged to climate change is impossible. Nevertheless, since those programs are linked to activities related to climate change, they may be part of future changes to the policy mix.

FEDERAL SPENDING PROGRAMS THAT AFFECT ENERGY USE

The federal government currently funds several programs that have the purpose or effect of conserving energy or reducing emissions of greenhouse gases but that are not identified as being directly linked to climate change (see Table 6). The 1999 budget requests for most of those programs are near 1998 levels, with the exception of the Department of Energy's Weatherization Assistance Program, which would increase from $125 million to $154 million, and civilian nuclear R&D, which would rise from $7 million to $34 million. Programs and activities included are:

- The non-CCTI activities of the Partnership for a New Generation of Vehicles administered by the Department of Commerce's NIST, the National Science Foundation, and the Department of Transportation (DOT). The 1999 request totals $78 million, which is a slight decrease from 1998 levels.

- The Congestion Mitigation and Air Quality Improvement Program, which would remain at about the same level as in 1998—$1.3 billion.

TABLE 6. FUNDING FOR FEDERAL PROGRAMS ASSOCIATED WITH CLIMATE CHANGE
(In millions of dollars of budget authority)

	1997	1998	Requested 1999	Change, 1998-1999
Partnership for a New Generation of Vehicles (Non-CCTI)				
Department of Commerce	41	25	22	
National Science Foundation	54	53	52	
Department of Transportation	4	4	4	
Subtotal	99	82	78	-4
Congestion Mitigation and Air Quality Improvement Program (CMAQ)[a]				
Department of Transportation, Federal Highway Administration				
Transit	362	563	565	
Traffic flow	265	412	413	
Surface transportation program devoted to CMAQ	57	88	88	
Shared ride	36	55	55	
Demand management	31	48	48	
Bicycle/pedestrian	22	34	34	
Other	36	57	57	
Subtotal	807	1,257	1,260	3
Advanced Transportation Technologies Consortium (Non-CCTI)[b]				
Department of Defense	15	15	c	
Department of Transportation				
Federal Transit Administration	2	2	c	
Research and Special Programs Administration	c	c	10	
Subtotal	16	17	10	-7
Other Transportation Programs				
Department of Transportation, Federal Transit Administration				
Advanced Technology Transit Bus	7	10	1	
Fuel Cell Bus	8	4	4	
Subtotal	14	14	5	-9

TABLE 6. CONTINUED

	1997	1998	Requested 1999	Change, 1998-1999
Energy Conservation Assistance Grant Programs				
DOE, Office of State and Community Programs				
Weatherization Assistance	121	125	154	
State Energy Conservation	29	30	37	
Subtotal	150	155	191	36
Civilian Nuclear Energy Research and Development				
Fission (Non-CCTI)	41	7	34	
Fusion	230	230	230	
Subtotal	271	237	262	26
All Programs				
Total	1,357	1,762	1,806	45

SOURCE: Congressional Budget Office based on information from the Office of Management and Budget; *Budget of the United States Government, Fiscal Year 1999*; House Committee on Appropriations, *Department of Defense Appropriations Bill, 1998*, report to accompany H.R. 2266, Report 105-206, (July 25, 1997); Department of Energy, *Fiscal Year 1999 Congressional Budget Request: Science, Technology and Energy for the Future* (February 1998); Department of Energy, *Fiscal Year 1999 Budget Request to Congress: Control Table by Appropriation* (January 30, 1998); Department of Transportation, Federal Highway Administration and Federal Transit Administration; U.S. House of Representatives, *Making Appropriations for Department of Transportation and Related Agencies for Fiscal Year Ending September 30, 1997*, conference report to accompany H.R. 3675, Report 104-785 (September 16, 1996); U.S. House of Representatives, *Making Appropriations for Department of Transportation and Related Agencies for Fiscal Year Ending September 30, 1998*, conference report to accompany H.R. 2169, Report 105-313 (October 7, 1997); and the Northeast Alternative Vehicle Consortium.

NOTE: CCTI = Climate Change Technology Initiative; CMAQ = Congestion Mitigation and Air Quality Improvement Program; DOE = Department of Energy.

a. Figures for CMAQ categories were calculated using the percentage share held by each category from 1992 to 1996 as follows: transit, 44.8 percent; traffic flow, 32.8 percent; surface transportation program devoted to CMAQ, 7.0 percent; shared ride, 4.4 percent; demand management, 3.8 percent; bicycle/pedestrian, 2.7 percent; and other, 4.5 percent. On May 22, 1998, the House and Senate passed the Transportation Equity Act for the 21st Century. The act would authorize funds to be appropriated out of the Highway Trust Fund for the CMAQ program at a funding level of $1.35 billion in 1999.

b. Requested funding for the Advanced Transportation Technologies Consortium for 1999 is $20 million—$10 million for the Department of Energy and $10 million for the Department of Transportation—which is about $3.5 million greater than funding in 1998.

c. No funding in that year.

- The Advanced Transportation Technologies Consortium, which would receive $10 million in funding from the Department of Transportation in addition to the $10 million in funding from DOE under CCTI.

- The Advanced Technology Transit Bus and Fuel Cell Bus Programs at the Federal Transit Administration, which support the development and market penetration of low-emission, light-weight, low-cost buses. Funding for those programs totaled $14 million in 1998; the total funding request for 1999 is only $5 million because the transit bus program ends next year.

- Conservation grants administered by the Department of Energy. Those grants would be funded at $191 million in 1999—an increase of $36 million compared with 1998. The additional funding would expand programs that administer block grants to states to fund energy-efficiency programs and weatherization of low-income housing.

- Civilian nuclear energy R&D (that was not included in the CCTI). Those activities are University Nuclear Science and Reactor Support (at $10 million, an increase of $3 million from 1998), a new $24 million Nuclear Energy Research Initiative, and research on magnetic fusion, funding for which has been stable for several years and comes in at $228 million.

TAX PROVISIONS THAT AFFECT ENERGY USE

Several tax preferences in current law directly or indirectly discourage reliance on fossil fuels. In addition, several excise taxes raise the price of fossil fuels and thereby reduce demand for them.

Tax Preferences to Promote Less Use of Fossil Fuels

Of the tax preferences designed to encourage less reliance on fossil fuels, two account for the largest revenue losses: the excise tax exemption for alcohol fuels, and the exclusion from income of interest on state and local bonds for hydroelectricity-generating facilities and solid waste disposal facilities that produce electricity (see Table 7). These and other preferences are described below.

Income Tax Credits and Excise Tax Exemptions for Alcohol Fuels. The tax code provides three income tax credits for alcohol-based motor fuels: the alcohol mixture

TABLE 7. ESTIMATES OF TAX EXPENDITURES FROM PREFERENCES THAT DISCOURAGE RELIANCE ON FOSSIL FUELS (In millions of dollars)

Tax Preference	1996	1997	1998	1999	2000	2001	2002
Tax Credits for Alcohol Fuels	11	11	11	11	11	11	3
Excise Tax Exemption for Alcohol Fuels	511	520	530	539	547	556	564
Exclusion of Energy Conservation Subsidies Provided by Public Utilities	55	40	35	35	35	40	40
Tax Credits for Investments in Solar and Geothermal Energy Facilities	80	80	75	70	70	70	70
Tax Credit for Electricity Production from Wind and Biomass	5	10	20	35	37	38	40
Deductions for Clean-Fuel Vehicles and Refueling Property	16	10	10	12	13	15	4
Tax Credit for Electric Vehicles	1	11	25	34	54	71	77
Exclusion of Interest on State and Local IDBs for Energy Production Facilities	225	225	215	205	215	215	210

SOURCE: Congressional Budget Office based on the Joint Committee on Taxation's estimates of the revenue effects of the Climate Change Technology Initiative in the President's 1999 budget.

NOTES: Tax expenditures are revenues that the federal government forgoes as a result of provisions in the income tax code that give selective relief to particular groups of taxpayers or special incentives for particular types of economic activity.

IDBs = industrial development bonds.

or blender's credit, the pure alcohol credit, and the credit for small ethanol producers. The first two credits are 53 cents per gallon of ethanol and 60 cents per gallon of methanol of at least 190 proof; for mixtures of between 150 proof and 190 proof, the credits are 40 cents per gallon of alcohol and 45 cents per gallon of methanol. The credit for small ethanol producers is 10 cents per gallon of ethanol produced, used, or sold for use as a transportation fuel. That credit is limited to 15 million gallons of annual alcohol production from firms with a production capacity of less than 30 million gallons. The credits, which were extended under the Transportation Equity Act of 1998, are in effect through December 31, 2007.

Blenders have a choice of using the income tax credit or claiming an excise tax exemption of 5.4 cents for mixtures of ethanol and liquid motor fuels. Because the credits are included in income and apply only to a portion of income tax liability, most blenders opt for the excise tax exemption. Consumption of ethanol motor fuel has increased sharply in the past 20 years. That increase is probably a result not so much of the income tax credits but of the exemption of alcohol fuels from excise taxes. The Transportation Equity Act extended the excise tax reduction through 2007.

The extent to which the use of ethanol motor fuels reduces emissions of greenhouse gases has been the subject of recent reports by the General Accounting Office (GAO) and Argonne National Laboratory (ANL), among others. The GAO reports concluded that the effect on emissions is difficult to determine but is likely to be minimal. By contrast, the ANL study concluded that the use of corn-based ethanol significantly reduces both the use of fossil energy and emissions of greenhouse gases.[1]

Exclusion of Energy Conservation Subsidies Provided by Public Utilities. The tax code permits residential customers to exclude from income the subsidies provided by public utilities for the purchase or installation of an energy conservation item. The exclusion, which is permanent, reduces the costs of programs financed by utilities to conserve energy.

Tax Credit for Investments in Solar and Geothermal Energy Facilities. The tax code provides a 10 percent credit for business investment in solar and geothermal energy equipment (electric utilities do not qualify). The credits are permanent.

Tax Credit for Electricity Production from Wind and Biomass. The tax code permits a 1.5-cent credit (in 1992 dollars, adjusted for inflation) per kilowatt hour for electricity produced from wind energy or "closed-loop" biomass. (Closed-loop

1. See General Accounting Office, *Tax Policy: Effects of the Alcohol Fuel Incentives*, Letter Report, GAO/GGD-97-41 (1997), and *Motor Fuels: Issues Related to Reformulated Gasoline, Oxygenated Fuels, and Biofuels*, Letter Report, GAO/RCED-96-121 (1996); Argonne National Laboratory, *Fuel-Cycle Fossil Energy Use and Greenhouse Gas Emissions of Fuel Ethanol Produced from U.S. Midwest Corn* (Oak Ridge, Tenn.: 1997).

biomass generates electricity using matter from plants grown solely for fuel.) The credit was instituted to encourage development of technologies that use renewable energy resources rather than conventional fossil fuels. The electricity must be produced from a qualified facility and must be sold to an unrelated third party. (A qualified facility is one that is placed in service after 1992 and before July 1, 1999, for biomass and after 1993 and before June 1, 1999, for wind. The facility must be owned by the taxpayer who claims the credit.) The credit is available for 10 years after a facility is placed in service. It is phased out as the price of electricity from the renewable resource rises over a 3-cent range, from 8 cents to 11 cents (in 1992 dollars, adjusted for inflation). It is also reduced by other government subsidies, including tax-exempt financing. The Administration is proposing to extend the credit.

Deductions for Clean-Fuel Vehicles and Refueling Property and the Tax Credit for Electric Vehicles. Deductions are available for the portion of the cost attributed to the engine, the fuel delivery system, and the exhaust system of vehicles that burn clean fuel. The vehicle must be new, but deductions can also be taken for retrofitting vehicles propelled by gasoline or diesel fuel. Costs are limited by a vehicle's type and weight. The deductions phase out between 2002 and 2005.

Electric vehicles qualify for a tax credit but not the deduction. The credit is 10 percent of the cost of the vehicle up to $4,000. It, too, phases out between 2002 and 2005. The tax preferences are intended to make clean-fuel and electric vehicles more economically attractive, but costs are still high relative to conventional vehicles.

Exclusion of Interest on State and Local Industrial Development Bonds for Energy Production Facilities. Tax-exempt financing is limited to solid waste disposal facilities that produce electric energy and to the construction of hydroelectric generating facilities at dam sites built before 1979 or at sites without dams that require no impoundment of water. The bonds generally are subject to a state-by-state annual volume cap on private activity bonds; however, bonds issued for governmentally owned solid waste disposal facilities are not subject to the cap. The exclusion is permanent.

Excise Taxes and Fees

Excises and fees that may result in decreased emissions of carbon dioxide chiefly include taxes on coal, motor fuels, equipment, and transactions related to travel and shipping (see Table 8). Those tax receipts primarily finance spending on roads, airports, harbors, and other transportation needs. Financing those transportation programs could increase emissions of carbon dioxide. Building more and better roads, airports, and harbors may provide an incentive for more travel. Taxes on motor fuels are dedicated to several trust funds. The largest share of revenue goes

TABLE 8. ESTIMATES OF RECEIPTS FROM EXCISE TAXES AND FEES THAT MAY REDUCE THE USE OF FOSSIL FUELS (In millions of dollars)

Tax or Fee	1996	1997	1998	1999	2000	2001	2002
Highway Trust Fund[a]							
Trust Fund Taxes	23,456	24,354	25,569	37,873	32,499	33,010	33,548
General Fund Taxes	6,513	6,772	321	489	414	420	426
Total	29,968	31,126	25,890	38,362	32,913	33,430	33,974
Airport and Airway Trust Fund[a]							
Trust Fund Fuel Taxes	688	753	798	836	867	893	918
Other Trust Fund Taxes	1,153	3,822	7,566	9,254	8,446	8,923	9,643
General Fund Taxes	584	612	0	0	0	0	0
Total	2,425	5,187	8,364	10,090	9,313	9,816	10,561
Aquatic Resources Trust Fund							
Taxes on Motorboat Fuels, Motors, and Sportfishing Equipment	315	321	281	376	336	339	345
Inland Waterways Trust Fund							
Fuel Taxes	103	107	110	113	115	117	119
Land and Water Conservation Trust Fund							
Taxes	1	1	1	1	1	1	1
Leaking Underground Storage Tank Trust Fund							
Fuel Taxes	40	0	139	206	176	179	181
Harbor Maintenance Trust Fund							
Cargo Taxes	746	784	826	873	922	972	1,025
Hazardous Substance Superfund							
Petroleum, Chemicals, and Feedstock	211	0	0	0	0	0	0
Black Lung Disability Trust Fund							
Coal Tax	615	632	641	651	661	671	681

(Continued)

TABLE 8. CONTINUED

Tax or Fee	1996	1997	1998	1999	2000	2001	2002
Abandoned Mine Reclamation Fund							
Coal Fee	256	266	262	260	262	267	274
Taxes Not Dedicated to Trust or Special Funds							
Gas Guzzler Taxes	33	47	37	34	34	34	34
Ozone-Depleting Chemicals Taxes	429	100	65	14	0	0	0

SOURCE: Congressional Budget Office.

a. Projections reflect modifications in the rules governing deposits. Taxes imposed on gasoline, diesel fuel, special motor fuels, and kerosene that would otherwise be deposited with the Treasury after July 31, 1998, and before September 20, 1998, are not required to be deposited until October 5, 1998. The same rule modifications apply to air cargo taxes. In addition, deposits of air passenger taxes normally due after August 14, 1998, and before October 1, 1998, are now due on October 5, 1998.

to transportation, with smaller amounts going to nature conservation and environmental cleanup. The Land and Water Conservation Trust Fund accumulates roughly $1 million per year from oil and gas leases. The only excise taxes not dedicated to trust or special funds and designed solely to discourage consumption of products that are detrimental to the environment (as opposed to paying for cleanup after damage has occurred) are taxes on cars that do not achieve specified fuel economy ratings and on ozone-depleting chemicals. Those taxes raise nominal amounts of revenue compared with the trust fund taxes.

Highway Trust Fund. Several excise taxes finance the Highway Trust Fund, which was established under the Federal-Aid Highway Act of 1956. The primary sources of revenue are a tax of 18.3 cents per gallon levied on gasoline, a tax of 24.3 cents per gallon on diesel fuel, and taxes on gasohol and other special fuels. Other trust fund taxes are levied on sales of tires, inner tubes, trucks, tractors, and trailers. In addition, annual use taxes are levied on trucks weighing more than 55,000 pounds. Of the total taxes on gasoline, 1.5 cents per gallon is dedicated to a special mass transit account, which may be used for capital and related expenditures. The taxes dedicated to the Highway Trust Fund were scheduled to expire on September 30, 1999, with the exception of a motor fuels excise tax of 4.3 cents per gallon. The Transportation Equity Act of 1998 extended them through 2005.

Airport and Airway Trust Fund. Taxes on air passenger tickets, air cargo, noncommercial jet fuel and aviation gasoline, domestic flight segments, and

international departures and arrivals are dedicated to the Airport and Airway Trust Fund. Those taxes were scheduled to expire on September 30, 1997. The Taxpayer Relief Act of 1997 extended them with significant modifications, including new taxes on domestic flight segments and international arrivals. The trust fund, which was established in the Airport and Airway Development and Revenue Acts of 1970, finances a substantial portion of the Federal Aviation Administration's budget. When fully phased in, the domestic air passenger tax will be 7.5 percent of the transportation cost plus $3 per flight segment (indexed for inflation). Air cargo is subject to a 6.25 percent excise tax. Aviation gasoline is subject to a permanent excise tax of 4.3 cents per gallon. (Noncommercial aviation fuels are subject to an excise tax of 15 cents per gallon on aviation gasoline and 17.5 cents per gallon on jet fuel.) Commercial air passengers coming from another country or leaving the United States are subject to a $12 tax per arrival or departure.

Aquatic Resources Trust Fund. Taxes on gasoline, electric outboard motors, sportfishing equipment, and sonar devices for finding fish are dedicated to the Aquatic Resources Trust Fund, which was established under the Deficit Reduction Act of 1984. The trust fund is composed of two accounts: one for fish management and restoration and the other for boating safety. Taxes on diesel fuel for recreational motorboats were repealed by the Taxpayer Relief Act of 1997.

Inland Waterways Trust Fund. Taxes dedicated to the Inland Waterways Trust Fund are levied at the rate of 20 cents a gallon on fuels used by commercial vessels plying specified inland and intracoastal waterways. The expenditures from the trust fund, which was established in 1978 under the Inland Waterways Revenue Act, finance up to half of the construction and rehabilitation expenditures for navigation projects on a designated system of 27 inland and intracoastal waterways.

Leaking Underground Storage Tank Trust Fund. An additional 0.1-cent tax on gasoline, diesel, and other motor fuels; aviation fuels; and fuels used by vessels in inland waterways is dedicated to the Leaking Underground Storage Tank Trust Fund. Expenditures from the trust fund finance the cleanup of underground petroleum tanks that are leaking. The tax, which was initially established under the Superfund Amendments and Reauthorization Act of 1986 and had expired at the end of 1995, was reinstated by the Taxpayer Relief Act of 1997.

Harbor Maintenance Trust Fund. Under the Water Resources Development Act of 1986, a tax on both ship passengers and the value of cargo loaded or unloaded at U.S. harbors, channels, and ports was dedicated to the operation and maintenance costs of the Saint Lawrence Seaway and harbors within the United States. The tax is 0.125 percent and, in the case of passengers, had been levied on transportation charges. The Supreme Court recently held that the harbor maintenance tax was unconstitutional as applied to exports. Subsequently—in June 1998—the U.S. Court of International Trade ruled that the tax on embarking passengers was also unconstitutional.

Black Lung Disability Trust Fund. Taxes of $0.55 a ton on surface-mined coal and $1.10 a ton on underground-mined coal other than lignite are dedicated to the Black Lung Disability Trust Fund, established in 1977 under the Black Lung Benefits Revenue Act. The trust fund finances medical care and rehabilitation for miners with black lung disease and makes disability payments to them and to their surviving spouses and dependents.

Abandoned Mine Reclamation Fund. Fees that are structurally similar to excise taxes are levied on the tonnage of domestically mined coal and dedicated to the Abandoned Mine Land Fund, established in 1977 under the Surface Mining Control and Reclamation Act. The current fee is 35 cents per ton on surface-mined coal and 15 cents per ton on underground-mined coal or, alternatively, 10 percent of the value of the coal at the mine, whichever is less. For surface-mined lignite, the fee is 10 cents a ton, or 2 percent of the value of the coal at the mine. The Energy Policy Act of 1992 extended the authorization of the fees through September 30, 2004.

Gas Guzzler Taxes. Gas guzzler taxes are levied on domestic and imported cars with fuel-economy ratings of less than 22.5 miles per gallon. The tax ranges from $1,000 for cars that get at least 21.5 but less than 22.5 miles per gallon to $7,700 for cars that get less than 12.5 miles per gallon. Revenue from the tax is deposited in the general fund.

Taxes on Ozone-Depleting Chemicals. Taxes imposed on a variety of CFCs and halons as well as carbon tetrachloride and methyl chloroform are calculated as the product of a base tax amount and the specific chemical's "ozone-depleting factor." The base rate was set at $5.35 per pound in 1995 and has increased by $0.45 per pound per year. The amount of revenue collected, however, is small because production and import of most ozone-depleting chemicals are prohibited.

Proposed Increases in Excise Taxes That May Cut the Use of Fossil Fuels and Emissions of Carbon Dioxide

The Administration has proposed reinstating several taxes dedicated to the Oil Spill Liability Trust Fund and the Hazardous Substance Superfund (see Table 9). The taxes dedicated to these two funds expired a few years ago. Reinstatement would lead to price increases for oil and petroleum products and thus could indirectly result in reduced emissions of greenhouse gases. The Administration also proposed reinstating the motor fuel excise taxes dedicated to the Highway Trust Fund; those taxes were recently extended and are currently in effect through 2005.

Oil Spill Excise Tax. The President's budget proposes to reinstate the oil spill excise tax of 5 cents per barrel on domestic crude oil and imported petroleum products. The tax, which expired at the end of calendar year 1994, was dedicated to the Oil Spill

TABLE 9. ESTIMATES OF REVENUES FROM PROPOSALS FOR INCREASES IN EXCISE TAXES RELATED TO ENERGY AND THE ENVIRONMENT IN THE ADMINISTRATION'S 1999 BUDGET (In millions of dollars)

Proposal	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	1998-2003	1998-2008
Oil Spill Excise Tax	64	186	231	235	239	243	248	253	258	264	269	1,197	2,489
Hazardous Substance Excise Taxes	84	667	693	706	718	731	745	760	775	792	809	3,598	7,479
Total	148	853	924	941	957	974	993	1,013	1,033	1,056	1,078	4,795	9,968

SOURCE: Congressional Budget Office based on the Joint Committee on Taxation's estimates of the revenue effects of the Climate Change Technology Initiative in the President's 1999 budget.

Liability Trust Fund to finance the cleanup of oil spills and other costs associated with oil pollution. The tax was not imposed for the calendar quarter if the unobligated balance in the trust fund exceeded $1 billion at the close of the previous quarter. The proposal would reinstate the tax from the date of enactment through September 30, 2008, and would increase the funding limit from $1 billion to $5 billion.

The JCT estimates that the proposal would increase revenues by $1,197 million through 2003 and by $2,489 million through 2008 (see Table 9).

Hazardous Substance Excise Taxes. The President's budget also calls for reinstating three taxes that were dedicated to the Hazardous Substance Superfund and expired at the end of 1995: an excise tax of 9.7 cents per barrel on domestic crude oil and imported petroleum products; an excise tax on listed hazardous chemicals at rates that varied from $0.22 to $4.87 per ton; and an excise tax on imported substances that use any materials in their manufacture or production that are subject to the hazardous chemicals excise tax. The taxes were dedicated to the Superfund for expenditures connected to releases of hazardous substances into the environment, under provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended. The proposal would reinstate the taxes for calendar years 1998 through 2008.

The JCT estimates that the proposal would increase revenues by $3,598 million through 2003 and by $7,479 million through 2008.

Tax Preferences to Increase the Domestic Supply of Fossil Fuels

Several tax preferences in current law were designed to increase domestic production of oil and other fuels and reduce reliance on imports, particularly from the Persian Gulf region or politically unstable areas (see Table 10). To the extent that tax preferences lead to lower fuel prices, their effect may go beyond substituting domestic oil for imported oil to fostering increased consumption of fossil fuels. Tax preferences to encourage energy self-sufficiency may also result in more rapid depletion of national resources. In recent years, however, oil drilling activity has been low because of a drop in oil prices and cutbacks in certain tax benefits; as a result, preferences to encourage domestic production of fossil fuels would currently have little effect on emissions of carbon dioxide.

Expensing of Exploration and Development Costs for Oil, Gas, and Other Fuels. Firms engaged in production of oil, gas, or geothermal energy are permitted to expense (rather than capitalize) certain intangible drilling and development costs (IDCs), which include amounts paid for labor, fuel, repairs to drilling equipment,

TABLE 10. ESTIMATES OF TAX EXPENDITURES FROM PREFERENCES TO INCREASE DOMESTIC PRODUCTION OF FOSSIL FUELS AND REDUCE RELIANCE ON IMPORTS (In millions of dollars)

Tax Preference	1996	1997	1998	1999	2000	2001	2002
Expensing of Exploration and Development Costs							
Oil and gas	304	324	356	405	454	498	541
Other fuels	a	a	a	a	a	a	a
Excess of Percentage over Cost Depletion							
Oil and gas	418	471	489	508	529	550	572
Other fuels	85	143	145	148	151	154	157
Tax Credit for Enhanced Oil Recovery Costs	a	a	a	a	a	a	a
Expensing of Tertiary Injectants	a	a	a	a	a	a	a
Tax Credit for Production of Nonconventional Fuels	1,200	1,250	1,300	1,325	1,350	1,350	1,350

SOURCE: Congressional Budget Office based on estimates of the Joint Committee on Taxation.

NOTE: Tax expenditures are revenues that the federal government forgoes as a result of provisions in the income tax code that give selective relief to particular groups of taxpayers or special incentives for particular types of economic activity.

a. Positive tax expenditure of less than $50 million.

hauling, supplies, and site preparation. For vertically integrated producers, expensing is limited to 70 percent of IDCs. That limit was set in the Tax Reform Act of 1986, which also repealed expensing on foreign properties. Additionally, IDCs are subject to the alternative minimum tax (AMT). The amount subject to the AMT is limited to 70 percent.

Excess of Percentage over Cost Depletion for Oil, Gas, and Other Fuels. Firms that extract oil, gas, or other minerals are permitted a deduction to recover their capital investment in the mineral reserve, which depreciates as the minerals are depleted. Cost depletion allows for the recovery of the actual capital investment over the period that the reserve produces income. Percentage depletion allows for the deduction of a fixed percentage of revenue from sales of the mineral. The percentage depletion method of deduction may and typically does exceed the amount of capital invested. Percentage depletion is allowed only for independent producers and

owners entitled to royalties and only for up to 1,000 barrels of oil or its equivalent in gas per day. At present, about one-fourth of oil and gas production benefits from the subsidy. Percentage depletion for the major integrated oil companies was repealed in 1975.

The percentage depletion rate for oil and gas is 15 percent; a higher rate is permitted for marginal wells. The percentage depletion rate for other fuels ranges from 10 percent to 22 percent.

Tax Credit for Enhanced Oil Recovery Costs. The tax code provides a 15 percent credit for the costs of recovering domestic oil by a qualified "enhanced oil recovery" method. Qualifying methods are those that make possible the extraction of oil that is too viscous to be extracted by conventional methods. The costs of labor, repair of equipment, and injectants as well as the intangible costs of drilling and development, qualify for the credit, which is subject to the limits of the general business credit. The credit phases out over a $6 range for oil prices above $28 per barrel (adjusted for inflation after 1991). Current oil prices are well below the phaseout threshold.

Expensing of Tertiary Injectants. Tertiary recovery projects inject fluids, gases, and other chemicals into oil or gas reservoirs to enhance the recovery process. The tax code permits a deduction for the costs of the chemical injectants used in oil and gas production in the year in which the costs are incurred. Without incentives, tertiary recovery methods are generally uneconomic.

Tax Credit for Production of Nonconventional Fuels. The tax code provides a production tax credit of $3 per barrel (in 1979 dollars) for certain types of liquid and gaseous fuels that are equivalent to oil and are produced from alternative energy sources. The credit is phased out as oil prices rise from $23.50 to $29.50 (in 1979 dollars). Both the credit and the phaseout range are adjusted for inflation. Qualifying fuels include oil produced from shale or tar sands and synthetic fuels produced from coal. The credit is available through 2002 for facilities placed in service before 1993. For gas produced from biomass and synthetic fuels produced from coal or lignite, it is available through 2007 for facilities placed in service by July 1, 1998, pursuant to a binding contract entered into before 1997. The credit is offset by benefits from government grants, tax-exempt financing, and credits for energy, investment, and enhanced oil recovery. Apart from coal-bed methane, production of nonconventional fuels has hardly increased since 1980.[2]

2. The use of coal-bed methane as a source of energy results in emissions of carbon dioxide instead of methane. Carbon dioxide is a less potent greenhouse gas than methane.

OTHER FEDERAL ACTIVITIES

Many other federal activities that appear in the budget may indirectly affect emissions of carbon dioxide and other greenhouse gases by altering the supply of energy or the demand for energy.

The federal government contributes to the supply of energy by:

- Producing power (Tennessee Valley Authority, Bonneville Power Administration, and four other power marketing administrations);
- Providing loans to rural electric cooperatives;
- Contributing to efforts to develop a nuclear waste disposal facility;
- Enriching uranium for use in nuclear power;
- Operating the naval petroleum reserves and protecting the oil shale reserves; and
- Leasing oil, gas, and other minerals onshore and offshore.

Although the government spends money on those supply activities, it also benefits from the substantial receipts they generate in the form of user fees, payments, and royalties.

The Low Income Home Energy Assistance Program (LIHEAP) provides assistance to low-income households in meeting the costs of heating and cooling their homes by making payments to eligible households and energy suppliers. States may target assistance to households with high energy needs and may assist households in reducing their need for energy. Budget authority for LIHEAP was about $1 billion in 1997 and 1998.

Transportation programs, in addition to those specifically cited above, may alter fuel use and carbon emissions. Over time, such programs may affect the total amount of travel (and, therefore, fuel used and emissions produced) as well as the type of travel chosen (substituting the amount of one type of travel for another can affect total emissions). For example, the Federal Transit Administration provides grants to transit operators and conducts transit planning and research activities. Emissions could either increase if spending raises the total demand for travel by boosting ridership or decrease (or stay constant) if rising ridership displaces automobile travel.

Finally, the federal government is itself a major user of energy. Gross energy consumption by the government is about 2 percent of all energy consumed in the

United States, with the government's energy bill totaling roughly $8 billion annually. The Federal Energy Management Program, described previously, aims to cut energy usage. Even if goals are met, however, the government would remain a major energy consumer and would be affected significantly by future policies to reduce carbon emissions.

United States General Accounting Office

GAO

Report to Congressional Committees

June 1997

GLOBAL WARMING

Information on the Results of Four of EPA's Voluntary Climate Change Programs

GAO/RCED-97-163

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-276994

June 30, 1997

The Honorable Christopher S. Bond
Chairman, Subcommittee on VA, HUD,
and Independent Agencies
Committee on Appropriations
United States Senate

The Honorable Jerry Lewis
Chairman, Subcommittee on VA, HUD,
and Independent Agencies
Committee on Appropriations
House of Representatives

Increasing emissions of carbon dioxide, methane, and other heat-trapping greenhouse gases generated by human activity are believed to contribute to global warming. In an effort to reduce greenhouse gas emissions, the United States issued its Climate Change Action Plan (CCAP) in October 1993. The plan was designed to reduce greenhouse gas emissions primarily through voluntary efforts by companies, state and local governments, and other organizations. The Environmental Protection Agency (EPA) is responsible for 20 CCAP programs. The Department of Energy and other federal agencies are responsible for other CCAP programs.

Because of your concerns about the effectiveness of the climate change programs, you asked us to determine (1) what EPA has done to ensure that the greenhouse gas reductions it reports reflect only the results of its efforts, as opposed to other factors, and (2) whether EPA's projected reductions are consistent with experience to date. As agreed with your offices, we focused our review on four CCAP programs, which are designed to reduce emissions of various greenhouse gases through work with different kinds of organizations. These four programs account for about one-third of EPA's funding for CCAP.

Specifically, the Green Lights Program primarily encourages businesses and other organizations to install energy-efficient lighting in their buildings in order to reduce the use of electricity and the emission of carbon dioxide produced by generating electricity. The Coalbed Methane Outreach Program encourages coal mining companies to capture and use, as an energy source, methane that would otherwise be vented to the atmosphere. To reduce greenhouse gas emissions from manufacturing,

transporting, and disposing of materials, the Source Reduction and Recycling Program encourages businesses to reduce the amount of solid waste they generate and to increase the amount of waste they recycle. The State and Local Outreach Program helps state and local governments understand the sources of and possible solutions to global warming and also supports selected demonstration projects.

Results in Brief

For two of the four CCAP programs we reviewed, EPA adjusted the reductions in greenhouse gas emissions it had reported to account only for the effects of its efforts; for the other two programs, it did not adjust the reported reductions. Specifically, for the Coalbed Methane Outreach and Source Reduction and Recycling programs, EPA determined that nonprogram factors accounted for some of the reported reductions and, therefore, adjusted those reductions. For the Green Lights Program, EPA officials said that some reported reductions were probably the result of nonprogram factors, but they did not attempt to quantify the extent of the nonprogram factors because they believe it is not possible to do so. They said that any reductions resulting from nonprogram factors would likely be counterbalanced by reductions that they believe are attributable to the program but were not reported to EPA because the organizations did not participate in the program. Finally, for the State and Local Outreach Program, EPA did not attempt to determine whether some of the reported reductions resulted from nonprogram factors, although program officials said they tried to eliminate double-counting where reductions might be the result of other CCAP programs. EPA officials said they limited their efforts to quantify how much of the reported reductions resulted only from the effects of EPA's programs because it is difficult to make such an assessment, especially in the early stages of the programs' development.

EPA's projections of future reductions in greenhouse gases are not consistent with experience to date for three of the four programs but are consistent for the fourth program. For the Green Lights and Source Reduction and Recycling programs, the projected reductions are based on an assumption that the participants will, respectively, upgrade a larger proportion of their space and reduce waste at the source more in the future than they have thus far. For the State and Local Outreach Program, the projections assume that one key project will increase its impact, even though there are questions about the basis for the reductions reported thus far. Finally, for the Coalbed Methane Outreach Program, the projected reductions are consistent with experience to date.

Background

According to the Intergovernmental Panel on Climate Change, climate models project an increase in the earth's average surface temperature of between about two and six degrees Fahrenheit in the next century as a result of increasing emissions of greenhouse gases.[1] Furthermore, the panel reported in 1995, such increases could lead to floods, droughts, and other harmful changes in ecosystems. To address concerns about the possibility of global climate change, in May 1992 the United States and other countries signed the United Nations Framework Convention on Climate Change. As part of the Convention, the United States and other developed countries agreed to establish policies and measures with the aim of returning their greenhouse gas emissions to 1990 levels by 2000. In fulfilling its obligations under the Convention, the United States developed CCAP, whose goal is to reduce emissions by 109 million metric tons of carbon equivalent (MMTCE), from the projected 2000 level of 1,568 MMTCE to 1,459 MMTCE, slightly below the 1990 emissions level.[2]

EPA's 20 CCAP programs are generally designed to provide the information and tools to encourage the participants to voluntarily undertake changes that will reduce emissions of greenhouse gases whenever the changes make economic sense. Also, some programs are designed to overcome the institutional barriers that have traditionally prevented organizations from taking action.[3] The Congress appropriated about $86 million for EPA's CCAP programs for fiscal year 1997; EPA requested $149 million for these programs in fiscal year 1998.

For this review, we selected four programs because (1) they are involved with different greenhouse gases and different kinds of organizations, (2) each accounts for a substantial proportion of EPA's CCAP funding, and

[1]The panel was established in 1988 by the United Nations Environment Programme and the World Meteorological Organization to assess scientific and technical information about climatic change. See Working Group II Second Assessment Report: Summary for Policymakers: Impacts, Adaptation and Mitigation Options, Intergovernmental Panel on Climate Change, Working Group II, Technical Support Unit, Oct. 20, 1995. For additional information on the issue of global warming, see Global Warming: Difficulties Assessing Countries' Progress Stabilizing Emissions of Greenhouse Gases (GAO/RCED-96-188, Sept. 4, 1996.)

[2]Greenhouse gases have varied effects on the atmosphere as measured by their global warming potentials. These global warming potentials are applied to emissions to arrive at a common measure for the greenhouse gases; the measure is expressed in million metric tons of carbon equivalent.

[3]According to a 1992 report by the Office of Technology Assessment, there are several reasons why energy-efficient technologies are not used more often in buildings. These reasons include the following: (1) There is often a separation between those who purchase energy-using equipment (for example, building owners) and those who pay to operate the equipment (building tenants). (2) Because energy costs are relatively low in comparison to total operating costs, those concerned with cost reduction often focus elsewhere. (3) Energy efficiency is often misperceived as requiring discomfort or sacrifice, limiting its appeal. See Building Energy Efficiency, ch. 3, Office of Technology Assessment (OTA-E-518, May 1992).

(3) each is credited by EPA as substantially reducing greenhouse gas emissions. Appendix I provides funding levels, the number of participants, and other information about each program.

The Green Lights Program is designed to encourage organizations to voluntarily adopt energy-efficient lighting technologies, such as compact fluorescent light bulbs and electronic ballasts. EPA provides information intended to encourage the adoption of these technologies. The Source Reduction and Recycling Program is designed to reduce the volume of solid waste produced and sent to landfills. Under the program's WasteWise element,[4] EPA signs up businesses that agree to voluntarily decrease the amount of waste they generate and to increase the amount of waste they recycle. Under the program's Unit-Based Pricing element, local communities agree to charge residents for waste disposal on the basis of the amount of waste they generate.

The Coalbed Methane Outreach Program is designed to encourage coal mines and related industries to recover and use methane that would otherwise be emitted. The State and Local Outreach Program is a foundation program, designed primarily to raise awareness about climate change and provide technical support to state and local agencies and nonprofit organizations in analyzing and developing cost-effective response strategies, not to achieve short-term reductions in greenhouse gas emissions. The program also funds demonstration projects designed to test innovative strategies for reducing emissions and examine the impact of climate change on the states.

EPA establishes annual program targets for the programs, such as the volume of reductions in greenhouse gases (except for foundation programs, as noted above) and the number of participants. It tracks progress against these targets, relying primarily on reports from the programs' participants. However, EPA does not independently verify these reported reductions.

[4]EPA refers to it as WasteWi$e.

Greenhouse Gas Reductions Reported by EPA Are Not Limited to Program Effects in Two of the Four CCAP Programs We Examined

Efforts to improve energy efficiency, increase recycling, and achieve related goals have been under way for years. These long-standing efforts make it difficult to measure the programs' "net" reductions—those that result only from CCAP programs—as compared with total, or "gross," reductions—those that result from CCAP programs as well as from other, nonprogram factors. EPA officials told us that measuring the net reductions that are strictly due to the results of CCAP efforts is difficult.[5]

Green Lights Program

According to EPA, 2,308 organizations were participating in the Green Lights Program as of February 1997. These organizations committed to upgrade the lighting in 6 billion square feet of floorspace, about 9 percent of the national total, according to EPA. Through fiscal year 1996, Green Lights participants reported upgrading the lighting in 1.3 billion square feet of floorspace, resulting in greenhouse gas reductions of 0.6 MMTCE. Although some of the reported reductions may be the result of influences from outside of the Green Lights Program, EPA did not attempt to measure the program's "net" benefits. Officials said that they believed that any reductions that resulted from other factors were likely offset by the reductions achieved by the nonparticipating organizations that were influenced by the program but not reported to EPA.

According to the representatives of seven former participants we spoke with, the program had a positive impact on these organizations' efforts to achieve energy savings from lighting technology. When we interviewed officials at these organizations that had completed their participation in the Green Lights Program, representatives of all seven said that they were pleased with the program. For example, some representatives said that they viewed the data provided by EPA on the benefits of specific lighting technologies as being valuable and objective.

The reductions reported by EPA could be overstated if some Green Lights participants undertook at least some of their lighting upgrades because of nonprogram factors. Four factors suggest that some upgrades were made because of nonprogram factors.

First, according to a 1992 survey of commercial buildings, a substantial amount of floorspace was upgraded before the Green Lights Program was

[5]According to EPA officials, in a forthcoming report the administration will provide information on its estimates of the net greenhouse gas reductions resulting from the climate change programs. The report is scheduled to be issued in July 1997.

well established. The national survey of commercial buildings was conducted by the Department of Energy's Energy Information Administration (EIA).[6] The survey found that 43 percent of commercial floorspace had lighting conservation features (such as occupancy sensors and time clocks) and that 22 percent of the floorspace had undergone an energy audit (which can identify opportunities for saving energy) in the previous 5 years.

Second, financial incentives that were available during the early to mid-1990s may have induced some organizations to install energy-efficient lighting. Officials of the Edison Electric Institute, an electric utility trade group, estimated that 80 to 90 percent of its members offered financial incentives during that time period to encourage their customers to install more energy-efficient lighting. By offsetting some of the costs of lighting upgrades, such assistance provides an incentive to adopt energy-efficient lighting. In fact, Green Lights participants reported to EPA that they had received $143 million in such rebates through fiscal year 1996.

Third, some of the reductions attributed to the Green Lights Program were achieved by companies involved with lighting products, which could be expected to install energy-efficient lighting without the program. Of the 2,308 Green Lights participants, 593, or about one-quarter, were classified as "allies," that is, companies that manufacture, sell, and install lighting products. The reductions reported by these companies account for about 6 percent of the program's total. However, such companies could be expected to install energy-efficient lighting even without the Green Lights Program, given their knowledge of the benefits of this technology.

Finally, most of the representatives of organizations we spoke with about lighting upgrades, some of whom had participated and others who had not, told us that they would likely have made some of the upgrades without the program. When we spoke with the representatives of seven organizations that had completed their affiliation with the program, five of the seven stated that they would have done some or all of the upgrades without the program; the other two stated that they would not have done the upgrades without the program. In addition, we spoke with representatives of two major national corporations that did not participate in the program. Both companies told us that they had undertaken major lighting upgrades in the past few years without EPA's assistance.

[6]This survey was conducted shortly after the Green Lights Program was implemented. See Commercial Building Characteristics 1992, pp. 9-16, Energy Information Administration (DOE/EIA-0246(92), Apr. 1994).

Green Lights Program officials noted that they did not attempt to offset the reported reductions that may have been attributable to these other factors because they believe the program has offsetting impacts above and beyond the reductions reported by the participating organizations. For example, they noted several instances of nonparticipating companies that they believe undertook lighting actions as a result of information furnished by the Green Lights Program. However, they said they had not attempted to quantify the extent of the uncounted reductions by nonparticipants.

State and Local Outreach Program

According to EPA, 29 states and Puerto Rico have conducted inventories of their greenhouse gas emissions, 42 cities are developing action plans, and 7 demonstration projects have been selected for evaluation. Program officials said that although the program does not have a greenhouse gas reduction goal, it resulted in a reduction of 0.8 MMTCE in 1996.

Most of the reduction, about 0.7 MMTCE, was attributed to one demonstration project, called the Planet Protection Center. The main goal of this joint project between EPA and the approximately 46,000-member National Retail Hardware Association was to reduce residential energy use by promoting energy-efficient heating, lighting, and plumbing products. The participating retailers received materials to use in their stores to inform shoppers and salespeople, at the point of sale, about the benefits of buying energy-saving products. EPA officials said they initially estimated that 8 million households could reduce their energy consumption by an average of 10 percent because of the program. They said that to account for the possibility that market penetration might be less than 10 percent, as well as purchases that might have been made anyway, they halved the initial estimate.[7] The result of these adjustments was an estimate that 8 million households did reduce their energy consumption by an average of 5 percent each.

Studies by an EPA contractor and the hardware association raised questions about the link between the program's activities and the reported reductions, as did our analysis of data in the hardware association's study. First, the EPA contractor that analyzed the data on the project's effects said that there was no concrete estimate of the project's impact because, among other reasons, of the difficulty of collecting sales data and a seeming lack of methods for reporting progress in greenhouse gas

[7]Although program officials said they adjusted the estimated reductions, in part, because some purchases might have been made without the program, we found no analytical basis for either the initial estimate or the adjustment to it.

emissions (which would result from reduced energy consumption).[8] Second, the hardware association's 1995 study of the project's results found no overall difference in sales between the participating retailers and a control group of nonparticipants it surveyed, although it cautioned that the number of retailers responding was too small to be statistically significant.[9] The study found that about one-third of the participating retailers who responded said they featured energy- and water-conserving products from time to time without the project. For this report, we analyzed certain data presented in the association's study, including sales data for 31 energy- and water-saving product lines. According to data from the responding retailers, sales at the nonparticipating retailers increased more than sales at the participating retailers for 17 of the product lines and less for the other 14 product lines.

Source Reduction and Recycling Program

Although the Source Reduction and Recycling Program has two elements—WasteWise and Unit-Based Pricing—EPA attributed virtually all of the program's results to WasteWise. According to EPA, 513 companies were participating in WasteWise as of March 1997. EPA reported reductions from WasteWise of 0.8 to 2.3 MMTCE in fiscal year 1995—the most recent year for which it calculated greenhouse gas reductions. As with energy efficiency measures, the trends over the past few years indicate a general movement toward increased recycling. Recognizing that recycling exists outside of the program, EPA asks the WasteWise participants to report separately on recycling associated with the program and general recycling efforts. EPA officials explained that they compile the participants' reports and check them for general reasonableness. However, they do not make any further adjustments.

When we spoke with seven WasteWise participants about their experience, six of them said they were pleased with the program, generally because they appreciated the free information provided on recycling and reducing wastes. While all six also said they were likely or somewhat likely to have made some of the improvements without the program, two said that they accelerated their actions because of the program. The seventh participant said his company was already taking all the steps recommended by the program.

[8]"Planet Protection Center Program: Presentation and Discussion of Emissions Reductions Results," ICF, Inc. (1996).

[9]Environmental Merchandising and Advertising/Promotion in the Retail Hardware/Home Improvement Industry, National Retail Hardware Association (Indianapolis, IN: Aug. 1995).

The range in estimated reductions attributable to the WasteWise element is largely the result of incomplete reporting by the participants. For fiscal year 1995, less than half of the WasteWise participants reported their program accomplishments to EPA. The low-end estimate (0.8 MMTCE) was based on the amounts reduced and recycled by the reporting participants. The high-end estimate (2.3 MMTCE) was based on program officials' judgments that (1) some of the nonreporting participants also reduced their wastes and recycled and (2) the nonreporting participants who reduced and recycled did as much, on average, as did the reporting participants.

Coalbed Methane Outreach Program

According to EPA, as of February 1997, 13 projects had been started under the Coalbed Methane Outreach Program. On the basis of the data on methane reported by the coal companies, EPA reported gross reductions of 2.7 MMTCE in 1996.

EPA officials estimated that 60 percent of the gross reductions were the result of nonprogram factors and that the program achieved net reductions of 1.1 MMTCE in 1996. The primary nonprogram factor is the Energy Policy Act of 1992, which helped remove a barrier to the capture of coalbed methane. EPA officials said they calculated the 60-percent factor by estimating the increase in the amount of methane captured as a result of their program over the amount that would have been captured as a result of the 1992 act without their program.

Specifically, certain provisions of the 1992 act were intended to deal with the possibility that adjacent landowners could contest the ownership of coalbed methane, which could discourage coal companies from capturing that methane. To help overcome this barrier, the act provided that the Department of the Interior would implement a program, in certain states, relating to those entities claiming an ownership interest in a particular unit of coalbed methane. Under the program, these entities would be required to arrange for an escrow account to be established and the proceeds from the sales of such coalbed methane would be placed into that account. Ultimately, the proceeds would be distributed after a final legal determination of ownership interest.[10]

In addition, program officials said that they claimed credit for the reductions in coalbed methane only if the coalbeds were being mined.

[10]Such programs were to be established in states that, among other things, have disputes about the ownership of coalbed methane and that do not have programs promoting the permitting, drilling, and production of coalbed methane.

Thus, the methane captured from wells drilled into coalbeds was not counted if the coal was not yet being mined. That methane could be counted later, when the coalbed was being actively mined.

Projected Greenhouse Gas Reductions Exceed Historical Results for Three of the Four CCAP Programs We Examined

EPA's projections of future greenhouse gas reductions depend on a number of assumptions, such as the number of participants, the extent to which these participants will act to decrease emissions, and the extent to which the reductions are linked to the program's efforts. As discussed in detail below, for the Green Lights and Source Reduction and Recycling Programs, the reductions projected for 2000 are based on a level of performance by the participating organizations that exceeds the programs' results to date. EPA officials said they believe that the performance of many programs will improve over time, in part because of their experience and because of better targeting of the programs.

For the State and Local Outreach Program, about one-half of the projected reductions of 1.7 MMTCE for 2000 are attributed to the Planet Protection Center project. In the previous section, we noted that there are questions about whether some of the project's reported greenhouse gas reductions were the result of nonprogram factors; such questions would also apply to its projected reductions. For the Coalbed Methane Outreach Program, the projected reductions are consistent with experience to date, and EPA continues to attribute about 60 percent of the gross reductions to the 1992 Energy Policy Act. Thus, the estimated gross reductions of 6.1 MMTCE in 2000 are reduced to net reductions of 2.6 MMTCE as a result of the program.

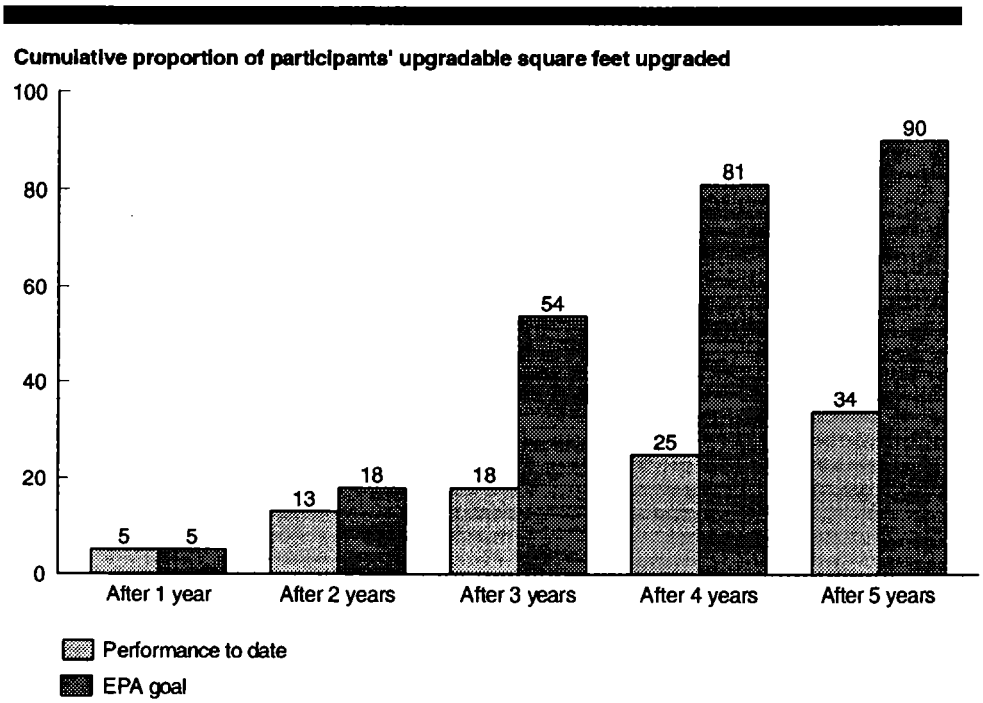
Green Lights Program

EPA estimates that the Green Lights Program will result in 3.9 MMTCE in annual greenhouse gas reductions in 2000; the estimate is based on several assumptions, including the amount of floorspace that will be upgraded with new lighting technology. When they join the Green Lights Program, the participants agree to survey the floorspace in all of their facilities and to upgrade 90 percent of the space which is considered upgradable and for which it is cost-effective to do so.

EPA established year-by-year goals, leading up to the 90-percent level after 5 years. For example, the goal is to upgrade 18 percent after 2 years and 54 percent after 3 years. In addition, EPA tracks the participants' accomplishments relative to these goals. According to EPA, the organizations that participated in the program for 5 years had upgraded

only 34 percent of their upgradable floor space within that time period. (See fig. 1.)

Figure 1: The Results of the Green Lights Program for the First 5 Years Were Below EPA's Goals



Source: EPA's data.

Program officials believe that in the future the participants will be able to achieve the 90-percent level because EPA has increased its level of support for the participants. For example, they are contacting participants more often to see if there is additional information that EPA can provide or if there are particular impediments that EPA can help them overcome. Program officials noted that the companies joining in 1995 exceeded the 18-percent goal established for upgrades through the second year of program participation. However, for participants joining in the 4 earlier years (1991-94), EPA's data show that the participants did not meet the 18-percent goal after participating for 2 years.

It may be difficult for EPA to achieve its Green Lights goals for two other reasons. The first reason relates to electricity prices. The Energy Information Administration projects that the average price of electricity will decline over the next 20 years by 0.6 percent per year after inflation, which would tend to make lighting investments less attractive. Moreover, the widespread discussion of deregulating electricity at the retail level, and the possible substantial cost decreases for larger users, create uncertainty about future electricity prices. An EPA program official noted that lighting investments are highly cost-effective and that any marginal decrease in electricity prices should make little difference to organizations that have joined the program. However, we note that decreasing or uncertain prices could make lighting investments appear less attractive to prospective Green Lights participants.

The second reason relates to possible "self-selection" bias among the initial Green Lights participants. In this context, self-selection is the likelihood that the organizations that voluntarily join a program may have been most likely to undertake those activities even if there were no program. Self-selection bias is a concern in evaluating the effectiveness of voluntary energy-efficiency programs, according to a paper on evaluating such programs.[11] To the extent that the organizations most likely to upgrade were the ones that joined the program initially, it may be difficult for EPA to continue to recruit large numbers of organizations into the program. However, EPA officials said they believe that a continued education campaign, coupled with successful upgrades by businesses, will make recruitment easier.

Source Reduction and Recycling Program

EPA estimated that the program's WasteWise and Unit-Based Pricing elements would both achieve substantial reductions in 2000. For WasteWise, the reductions were estimated to range from 1.9 to 6.7 MMTCE. The lower estimate is based on the assumptions that a higher proportion of participants will reduce waste at the source and recycle in the future and that their average levels of source reduction will increase. Specifically, EPA assumes that the proportion of WasteWise participants that reduce waste will increase from 40 percent in 1995 to 90 percent in 2000 and that the proportion that recycle will increase from 75 percent in 1995 to 90 percent in 2000. Moreover, EPA assumes that the amount of waste reduced per participant will increase by 50 percent between 1995 and 2000. The higher level (6.7 MMTCE—more than three times the lower level)

[11]Gretchen B. Jordan and Darrell A. Beschen, "Planning for Evaluation of the U.S. Department of Energy's Energy Partnership/Climate Change Programs," presented at the 1995 International Energy Program Evaluation Conference, Chicago, IL (Aug. 1995).

is based on additional assumptions designed to adjust for the reductions that EPA believes were underreported in 1995.

For Unit-Based Pricing, EPA estimated in 1995 that it would achieve reductions of 2.2 MMTCE in greenhouse gases in 2000. This projected level was based on an assumption that 575 communities would adopt a unit-based pricing approach to waste disposal each year. However, EPA program officials later found that only 72 communities adopted unit-based pricing in 1995. Program officials believe that the lower results for 1995 were the result of underestimating the time needed for the communities to implement unit-based pricing. The officials said that they now have the tools to promote a much greater adoption of unit-based pricing and that enrollments in 1996 and 1997 increased substantially.

Agency Comments

We provided copies of a draft of this report to EPA for review and comment. We received responses from three EPA offices. We received a letter from the Director, Office of Atmospheric Programs, Office of Air and Radiation, whose office manages the Green Lights and Coalbed Methane Outreach programs. (App. II contains the complete text of his letter, along with our detailed responses.) We also obtained comments from the Director, Climate Policy and Programs Division, Office of Policy and Program Evaluation; and the Director, Municipal and Industrial Solid Waste Division, Office of Solid Waste and Emergency Response. The former office manages the State and Local Outreach Program, and both offices are involved in the Source Reduction and Recycling Program.

The Director, Office of Atmospheric Programs, discussed the difficulties of evaluating the effects of voluntary programs. Also, he said that the draft report inaccurately used EIA's survey data to suggest that EPA overstated the reductions achieved by the Green Lights Program. We believe that we used these data fairly. We cited them to demonstrate that some companies with commercial office space had undertaken energy audits and installed energy-efficient lighting by 1992, when the Green Lights Program was just beginning. We believe that the factors that induced companies to take such actions before 1992 would likely have continued beyond 1992 and may, in part, account for some companies' decisions to join the Green Lights Program and to undertake upgrades. However, as noted in the report, EPA's reported reductions did not account for nonprogram factors that may have induced Green Lights participants to undertake upgrades.

The Director, Office of Atmospheric Programs, also stated that the climate-change programs are improving over time and that he does not believe that the projected reductions are optimistic. We noted that the projections are not consistent with experience to date. It is possible that, with the improvements he mentioned, the programs could meet their goals for 2000.

The Director, Climate Policy and Programs Division, objected to our including the State and Local Outreach Program in this review because it is considered a foundation program. That is, the program is not primarily intended to achieve reductions in greenhouse gas emissions. Rather, it is intended, among other things, to motivate state and local officials to understand the rationale behind taking actions to reduce emissions. As noted in the report, we included the program because, according to EPA's data, it was responsible for substantial reductions in greenhouse gas emissions in 1996 and is projected to achieve even more substantial reductions in 2000.

The Director, Municipal and Solid Waste Division, as well as the other two directors who commented on the report, provided updated data and technical corrections, which we incorporated in the report as appropriate.

We conducted our review from September 1996 through June 1997 in accordance with generally accepted government auditing standards. See appendix III for the details of our scope and methodology.

As arranged with your offices, we plan no further distribution of this report until 15 days after the date of this letter unless you publicly announce the report's contents earlier. At that time, we will send copies to the appropriate congressional committees and the Administrator of EPA. We will also make copies available to others upon request. If you have any questions or need additional information, please call me at (202) 512-6111. Major contributors to this report are listed in appendix IV.

Peter F. Guerrero
Director, Environmental Protection
Issues

Contents

Abbreviations

CCAP	Climate Change Action Plan
EIA	Energy Information Administration
EPA	Environmental Protection Agency
GAO	General Accounting Office
MMTCE	million metric tons of carbon equivalent
OIG	Office of Inspector General

Participants, Funding, and Other Details About Four CCAP Programs

Dollars in millions

	Green Lights	Source Reduction and Recycling	Coalbed Methane Outreach	State and Local Outreach[a]
Targeted gas(es)	Carbon dioxide	Carbon dioxide and methane	Methane	Various
Type of participants	Businesses and governments	Businesses and local governments	Coal companies	States, territories, and local governments
Number of participants	2,308	513	13[b]	29 states, Puerto Rico, 42 cities
FY 1996 funding	$20.1	$2.9	$1.7	$5.3
Greenhouse gas reductions through FY 1996 (MMTCE)	0.6	0.9-2.4[c]	2.7[d]	0.8
Greenhouse gas reductions estimated in 2000 (MMTCE)	3.9	4.1-8.9	6.1[d]	1.7

[a]The State and Local Outreach Program was primarily intended to help lay a foundation for greenhouse gas emission reductions beyond 2000, not to achieve greenhouse gas reductions by 2000. However, according to EPA, the program did achieve substantial reductions through 1996 and is expected to achieve even greater reductions in 2000.

[b]Represents number of projects.

[c]Data for the Source Reduction and Recycling Program are for fiscal year 1995.

[d]Represents "gross" reductions. "Net" reductions are estimated to be about 40 percent of the "gross" reductions—1.1 MMTCE in 1996 and 2.6 MMTCE in 2000.

Comments From the Environmental Protection Agency

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

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

JUN -9 1997

OFFICE OF
AIR AND RADIATION

Mr. Peter F. Guerrero
Director
Environmental Protection Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Guerrero:

See comment 1.

I appreciate the opportunity to review and comment upon the draft GAO Report, Information on Results of Four EPA Voluntary Climate Change Programs. My first comment is that the initial scope of your review, as presented in a Memorandum from GAO to EPA (August 27, 1996), was a much broader review of the Climate Change Action Plan (CCAP) programs than what you refer to in the Report. This original scope included first a determination of "the types of performance measures EPA has developed for CCAP programs." It is therefore disappointing that the draft Report fails to mention EPA's significant accomplishments in measuring, evaluating, and reporting on the progress of CCAP programs.

EPA has developed a successful and extensive system of performance measures and program evaluation. EPA devotes considerable effort to obtaining the best possible information upon which to evaluate the programs. For example, EPA reports the results of the Green Lights program based exclusively on detailed reports submitted by the program's partners on over 14,000 completed projects around the country. These efforts and the efforts of other programs have provided maximum accountability and valuable information for program development. EPA's performance measures have been reviewed in detail by your staff and are largely the basis for GAO's Report.

See comment 2.

I would like to draw your attention to a recent report by the EPA Office of the Inspector General (OIG). The OIG recently completed a review of some of EPA's important CCAP programs (Risk Reduction Through Voluntary Programs, Audit Report No. E1KAF6-05-0080-7100130, 3/19/97). The OIG found that the programs "effectively estimated the impact their activities had on reducing risks to health and the environment," and that the programs "used good management practices," including good planning, progress evaluation, and program adjustment. The report concluded that "future voluntary programs could benefit from using similar measurement techniques." The revised, narrow focus presented in GAO's draft Report does not sufficiently recognize the high standard of accountability that EPA uses in evaluating and reporting on its CCAP programs.

See comment 3.

While the GAO draft Report does include important issues regarding measuring program success, they are ones that are difficult for all market transformation efforts. EPA has always recognized that there are many difficult analytical issues in evaluating the success of voluntary, market-based programs, and has therefore conservatively estimated the impacts of the CCAP programs. EPA has openly discussed these issues with your staff. There is some uncertainty, for example, in isolating the effects of a program such as Green Lights from other factors within the market. This uncertainty can work in either direction -- leading programs to overestimate or underestimate results -- depending on the measurement techniques used. In order to address this uncertainty, EPA has either adjusted a program's numbers or chosen methodologies that would likely underestimate the net impact of a program. For two of the four programs examined, GAO points to the absence of specific "adjustments" as, in itself, a significant conclusion. For some programs, however, EPA has instead decided to use a generally conservative approach rather than make arbitrary "adjustments" where sufficient data is not available. GAO should recognize in the final Report that there are different means of handling uncertainty, that EPA has addressed these issues in a reasonable manner, and that EPA does not overstate its program accomplishments.

For example, the Green Lights program's reported accomplishments likely significantly underestimates the actual accomplishments for a number of reasons. The Green Lights program is an informational program that generates broad awareness and provides technical informational to everyone who is willing to use it, regardless of whether or not they join the program. EPA monitors the program's performance based exclusively on completed projects reported by those who join the program and fill out annual reports. EPA believes that this methodology is highly conservative. Although a majority of lighting technologies purchased today for buildings remain the least efficient technologies, there has nevertheless been substantial improvement in the market share of the more efficient technologies promoted by Green Lights since the program began in 1991 (based on U.S. Census manufacturing and sales data that we have shared with your staff). EPA is reporting only a fraction of this larger market improvement as being attributable to the accomplishments of the Green Lights program.

The true program impact of the Green Lights program is likely much larger than what EPA has been reporting to date, and EPA intends to study improved means of measuring this impact. We have provided your staff with evidence to support the many reasons that the Green Lights program estimates are conservative. The main reasons are summarized as follows:

(1) The impacts of Green Lights' efforts to generate awareness of cost-effective investment opportunities for energy efficiency are widely dispersed, with only a portion of those who make such investments joining the program.

(2) EPA widely distributes its important technical information on lighting. A large number of people who attend the Green Lights' lighting upgrade workshops, for example, do not belong to the program.

(3) Because partner reports are submitted once a year, there is up to a one-year time lag in measuring program performance. This is especially significant because the program's accomplishments are now rapidly accelerating; 40 percent of the program's current accomplishments have been generated by upgrades that were reported within the last year, despite the fact that the program is 6 years old. This alone suggests that true program impact is underestimated by 20% or more because of the reporting delay.

(4) Not all partners complete and submit reports once they've completed lighting upgrades, resulting in under-reporting of partners' true accomplishments. EPA is studying alternative methods for information collection.

See comment 4.

The GAO Report raises some of the many important issues regarding measuring program results that EPA attempts to address in evaluating its CCAP programs. As the programs' market impact increases and better information becomes available, we intend to better isolate the broader market impact of the programs, rather than relying exclusively on techniques such as measuring direct program participation. EPA intends to study the issue further this coming year. EPA does not believe that asking a few partners retrospectively whether or not they would have completed the upgrade is an appropriate means of completing a study. The intent of the Green Lights and other CCAP programs is to generate awareness and provide the support and technical information needed to allow partners to invest in profitable energy efficiency. After realizing extremely high returns on their investments, while improving the quality of their lighting, it is not surprising that partners' hindsight includes "20/20" vision. We view this as a major accomplishment -- making energy efficiency investments part of the normal business practices is the ultimate measure of program success. However, we know from experience, and from the continued inefficient practices of a majority of businesses today, that getting partners to devote their capital to non-traditional investments, such as facility energy, is anything but normal business practice. This is also widely documented outside of our own program experience (including the Office of Technology Assessment study referenced in the GAO Report). Although GAO has not shared with us the names of the companies that it finally interviewed, I encourage you to discuss with my staff that supports these partners the considerable efforts it took to turn each of those partners into a success story.

See comment 5.

With regard to estimating the future impact of the programs, EPA does assume that, for some programs, current and future partners will do better than initial partners in the program. For example, the Green Lights program expects that partners who have recently joined the program will do better in meeting their full commitments than the partners that joined in the first year (i.e., the partners that have been in the program for the full five years of the commitment). As you acknowledge in the Report, EPA has demonstrated that this improvement is already occurring. After two years in the program, for example, partners that joined ion 1995 have done considerably better than the first year's partners, achieving four times the energy and pollution reductions (despite smaller commitments). This success has improved steadily since the beginning of the program, and current partners are well ahead of the program's targets. This is in part due to changes made in the program to improve partner support. EPA is pleased that the

programs are improving through time, and does not believe that the forecasted program impacts are optimistic. As mentioned previously, the program impact is increasing rapidly: 40 percent of the program's current accomplishments have been generated by upgrades that were reported within the last year, despite the fact that the program is 6 years old.

See comment 6.

Finally, I would like to point out that the draft report inaccurately uses the Energy Information Administration's (EIA's) survey of commercial floorspace to suggest that EPA overstates the reductions achieved by the Green Lights program. The EIA survey is based on 1992 data. EPA only measures additional energy savings for the Green Lights program that would be above and beyond the pre-existing "conservation features" identified in EIA's survey. Also, as we have noted to you in the past, EIA has only asked respondents to indicate the presence of some energy conservation features in their buildings. They have not evaluated the effectiveness of these energy conservation features. In fact, EIA found that the energy intensities for buildings with conservation features, as defined by EIA, are "the same or even greater than the energy intensities of buildings without those features" (p. 11). In contrast, Green Lights program partners are, on average, reducing their lighting energy consumption by 48 percent through comprehensive lighting retrofits.

There are some additional numbers and references that appear somewhat inconsistent with information that we have provided to you. My staff is providing these clarifying comments separately.

Sincerely,

Paul M. Stolpman
Director
Office of Atmospheric Programs

The following are GAO's comments on the Environmental Protection Agency's letter dated June 9, 1997.

GAO Comments

1. When we began our work on this assignment, one of our objectives related to the types of performance measures used for EPA's climate change programs. As agreed with the requesters' offices, we did not pursue this issue in detail. However, our report does provide information about EPA's performance targets, collection of data from participants, and related matters.

2. As part of our review, we considered the Office of the Inspector General's (OIG) report. The OIG's report differs somewhat from our report in terms of both scope and objectives. Whereas we reviewed only voluntary climate change programs, the OIG reviewed voluntary climate change programs, as well as the Radon Action Program, which is not related to climate change. In terms of objectives, we focused exclusively on the reported and projected reductions of greenhouse gas emissions for the four climate change programs. The OIG's objectives were to determine (1) the management practices that worked well and areas in which improvements are needed and (2) whether voluntary programs achieve environmental benefits. Although the second OIG objective sounds similar to our objectives, the OIG did not attempt to determine whether nonprogram factors may account for some of the reductions reported by EPA. The OIG's report states that "it is difficult to directly attribute changes in the environment to a particular statute, regulation, or program." For these reasons, we believe that the OIG's report is not directly comparable to ours, and we therefore did not change our report to address this comment.

3. EPA noted that measuring the success of programs to bring about change in specific markets is difficult. We agree. EPA characterized its approach in estimating the effects of its programs as "conservative" and stated that the "true program impact of the Green Lights program is likely much larger" than the reductions reported by EPA. While EPA states that the program's total impact is likely to be much larger than its reported impact, this can be true only if the unreported reductions that are due to the program are larger than the reported reductions that are due to nonprogram factors. However, EPA has not attempted to measure either of these indicators.

With respect to the issue of evaluating the net effect of the Green Lights Program, we are pleased to learn that EPA "intends to study improved

means of measuring" the program's total impact. Successful completion of this study and implementation of its suggestions should help ensure that, in the future, there will be more reliable information on the program's gross and net impacts.

4. EPA raises questions about both the purpose and the results of our discussions with the organizations that participated in the Green Lights Program. The purpose was to ask them about their experience with the program, including the extent to which the program contributed to their lighting upgrades. By contacting only those organizations that had participated successfully, we were dealing with a group that was likely to be relatively favorable toward the program. The result of the discussions was that, rather than exhibiting perfect hindsight, as EPA's response suggests, all gave credit to EPA for providing valuable and reliable information and for being responsible for some or all of their upgrades. We believe this information, along with the other information presented, supports the point that only some, but not all, of these organizations' upgrades were due to the program.

5. With respect to possible improvements in the program's effectiveness, we presented data from EPA on results through 2 years for organizations that joined in 1995 (the class of 1995). The future implications of this reported improvement are unclear for two reasons. First, we also noted that, unlike the four previous classes, the class of 1995 was the only one to meet EPA's goal of upgrading 18 percent of upgradable floorspace after 2 years. Second, the reason for the improvement is not clear. EPA claimed that its improved efforts accounted for the improvements. However, it is also possible that a change in reporting practices may have contributed to the reported improvement. Specifically, starting in 1993, organizations joining the program were permitted to claim credit for upgrades they had completed prior to joining the program. Initially, they were permitted to claim credit for upgrades made in the previous 12 months; later, they were permitted to claim credit for upgrades made in the previous 18 months. Thus, the larger reported results for the class of 1995 may, in part, reflect a change in reporting practices.

6. We cited the 1992 Energy Information Administration's survey data for the same reason we interviewed former participants (see comment 4). We wanted to see whether there was evidence that companies with commercial office space were undertaking energy audits and installing energy-efficient lighting independent of the Green Lights Program. The survey data confirmed that there was substantial activity in the years

before the program was established. If energy-efficient lighting was installed in some buildings before the program was established, we believe that energy-efficient lighting installed afterwards in other buildings may have been due, at least in part, to nonprogram factors.

Scope and Methodology

As agreed with your offices, of the Environmental Protection Agency's (EPA) 20 Climate Change Action Plan (CCAP) programs, we selected the following four for our review: Green Lights, Source Reduction and Recycling, Coalbed Methane Outreach, and State and Local Outreach. These four programs represent about one-third of EPA's CCAP funding and about one-third of the estimated greenhouse gas reductions planned by EPA for 2000—the year in which the action plan hoped to stabilize greenhouse gas emissions at about the 1990 level. Although the State and Local Outreach Program was not intended primarily to achieve reductions through 2000, we included it in our review because EPA reported that it did achieve substantial reductions through 1996 and was expected to achieve even greater reductions in 2000.

To address our objectives for all four programs, we met with EPA program officials for the four programs to discuss their reported program reductions and the steps they take to ensure that the reductions reflect the program's actions, rather than other factors. We also reviewed the reported results from the organizations that have joined the programs and the program offices' methods for calculating actual and planned greenhouse gas reductions. We also reviewed other available reports, from GAO and other organizations, on EPA's voluntary programs. In those cases where EPA adjusted reported or projected reductions (to remove the effects of nonprogram factors), we did not attempt to determine the reasonableness of those adjustments.

In addition, as noted below, we discussed the programs with selected current or former participants and nonparticipants. Although we tried to select a mix of organizations, in terms of size and geographic location, the organizations we contacted may not be representative of all such organizations. Finally, as noted below, we used other data sources.

For the Green Lights program, we interviewed officials at seven former participants, which had graduated from the program, about their motivations for joining the program and their experiences in the program. We picked these seven from a list of about 300 program graduates provided by EPA. The seven included small, medium, and large organizations, which are located in various regions of the country and are in different industries. Because program officials said they were concerned that our contacting current Green Lights participants might discourage participation, we did not contact any current participants. We also interviewed officials at two major corporations that were not participating in the program, to determine whether they had undertaken

lighting upgrades. To review the extent of the lighting upgrades already under way, we reviewed the results of a 1992 Energy Information Administration survey on commercial buildings and energy-saving features. We also reviewed data provided by the Edison Electric Institute on electric utilities that sponsored energy-efficient lighting rebate programs.

For the Source Reduction and Recycling Program, we interviewed officials at seven current program participants about their motivations for joining the WasteWise component. We also reviewed EPA's March 1996 report, Characterization of Municipal Solid Waste in the United States: 1995 Update, to determine the historical trends in the recycling of waste. For the Coalbed Methane Program, we interviewed representatives from two coal mining companies about their motivation for joining the program and their satisfaction with EPA's efforts.