Appendix B
Policies and Measures

Energy: Commercial and Residential
Energy: Industrial
Energy: Supply
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Industry (Non-CO_2)
Agriculture
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Cross-sectoral Policies and Measures

Energy: Commercial and Residential

ENERGY STAR® for the Commercial Market[1]

Description: Commercial buildings account for more than 15 percent of total U.S. carbon dioxide emissions. Many commercial buildings could effectively operate with 30 percent less energy if owners invested in energy-efficient products, technologies, and best management practices. ENERGY STAR® in the commercial sector is a partnership program that promotes the improvement of the energy performance of entire buildings.

Objectives: ENERGY STAR® provides information and motivation to decision makers to help them improve the energy performance of their buildings and facilities. The program also provides performance benchmarks, strategies, technical assistance, and recognition.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Voluntary agreement.

Status of implementation: ENERGY STAR® has been underway since 1991 with the introduction of Green Lights. The program developed a strong partnership with large and small businesses and public organizations, such as state and local governments and school systems. The program's strategy has evolved substantially since the 1997 *U.S. Climate Action Report*, with the major program focus now on promoting high-performing (high-efficiency) buildings and providing decision makers throughout an organization with the information they need to undertake effective building improvement projects.

An innovative tool introduced in 1999 allows the benchmarking of building energy performance against the national stock of buildings. This tool is being expanded to represent the major U.S. building types, such as office, school (K–12), retail, and hospitality buildings. This national building energy performance rating system also allows for recognizing the highest-performing buildings, which can earn the ENERGY STAR® label. By the end of 2001, the program expects to be working with more than 11 billion square feet of building space across the country and to show over 7,000 rated buildings and more than 1,750 buildings labeled for excellence. EPA estimates that the program avoided 23 teragrams of CO_2 in 2000 and projects reductions of 62 teragrams of CO_2 in 2010.

Implementing entities: The partnership is a national program, managed by the Environmental Protection Agency (EPA). Implementing entities include a wide range of building owners and users, such as retailers, healthcare organizations, real estate investors, state and local governments, schools and universities, and small businesses.

Costs of policy or measure: Costs are defined as those monetary expenses necessary for participants' implementation of the program. Participants evaluate the cost-effective opportunities for improved energy performance and upgrade their facilities and operations accordingly. While energy-efficiency improvements require an initial investment, these costs are recovered over a period of time.

Non-GHG mitigation benefits of policy or measure: By reducing energy demand and use, ENERGY STAR® also reduces emissions of nitrogen oxides and sulfur dioxide.

Interaction with other policies or measures: By developing established energy performance benchmarks for commercial buildings, ENERGY STAR® in the commercial sector complements other measures at the national level, such as the Department of Energy's (DOE's) Rebuild America.

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[1] Actions 1 and 2 in the 1997 *U.S. Climate Action Report*, continuing.

Commercial Buildings Integration: Updating State Building Codes

Description: This program provides the technical assistance for implementing the energy-efficiency provisions of building codes and applicable standards that affect residential and commercial construction. These efforts involve partnerships with federal agencies, state and local governments, the building industry, financial institutions, utilities, public interest groups, and building owners and users. This measure is supported by Residential Building Codes, which is part of the Residential Buildings Integration program; Commercial Buildings Codes, which is part of the Commercial Buildings Integration Program; and Training and Assistance for Codes, which is part of the Community Energy Program.

Objectives: This program aims to improve the energy efficiency of the nation's new residential and commercial buildings, as well as additions and alterations to existing commercial buildings. Within applicable residential building codes, it incorporates the most technologically feasible, economically justified energy conservation measures. It also provides state and local governments with the technical tools and information they need for adopting, using, and enforcing efficient building codes for residential construction.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Regulatory.

Status of implementation: Implemented.

Implementing entities: DOE and state legislatures.

Non-GHG mitigation benefits of policy or measure: This program increases energy efficiency; builds cooperation among stakeholders; shares information between federal and state entities; and educates builders, consumers, and homeowners.

Interaction with other policies or measures: The program complements DOE's efforts to develop and introduce advanced, highly efficient building technologies.

Commercial Buildings Integration: Partnerships for Commercial Buildings and Facilities

Description: This program develops and demonstrates advanced technologies, controls, and equipment in collaboration with the design and construction community; advances integrated technologies and practices to optimize whole-building energy performance; and helps reduce energy use in commercial multifamily buildings by promoting construction of efficient buildings and their operation near an optimum level of performance. It also performs research on energy-efficient, sustainable, and low-cost building envelope materials and structures. This program is supported by a number of DOE programs: Commercial Buildings R&D, which is part of the Commercial Buildings Integration program, and Analysis Tools and Design Strategies and Building Envelope R&D, which are parts of the Equipment, Materials, and Tools program.

Objectives: This program aims to develop high-performance building design, construction, and operation processes; provide the tools needed for replicating the processes and design strategies for creating high-performance buildings; research new technologies for high-performance buildings; define the criteria and methods for measuring building performance; measure and document building performance in high-profile examples; and develop a fundamental understanding of heat, air, and moisture transfer through building envelopes and insulation materials, and apply the results to develop construction technologies to increase building energy efficiency.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Research.

Status of implementation: Implemented.

Implementing entities: Federal government R&D in partnership with the private sector.

Non-GHG mitigation benefits of policy or measure: This program increases energy efficiency, shares information with and educates stakeholders, builds criteria for industry use, and collects useful data. It also has environmental benefits not related to greenhouse gases.

ENERGY STAR® for the Residential Market[2]

Description: Residential buildings account for over 18 percent of total U.S. carbon dioxide emissions. Many homes could use 30 percent less energy if owners purchased efficient technologies, incorporated efficiency into home improvement projects, or demanded an efficient home when buying a new home. EPA's ENERGY STAR® -labeled new homes, and EPA's Home Improvement Toolkit featuring ENERGY STAR®, deliver the information consumers need beyond labels on efficient products and equipment to make these decisions.

Objective: ENERGY STAR® provides information to consumers and homeowners so that they can make sound investments when buying a new home or when undertaking a home improvement project. This includes information on which products to purchase, how to achieve a high-performing home, the current energy performance of a home, and the improved performance that results from improvement projects.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Voluntary agreements and outreach.

Status of implementation: The ENERGY STAR® label for new homes has been available since 1995, building upon the success of the ENERGY STAR® label in a variety of product areas. The ENERGY STAR® program has been underway since 1992, with the introduction of the ENERGY STAR®-labeled computer. The ENERGY STAR® label is now on more than 25,000 U.S. homes that are averaging energy savings of about 35 percent higher than the model energy code. Since the 1997 *U.S. Climate Action Report*, this residential effort has expanded significantly to home improvement projects in the existing homes market. The program now provides guidance for homeowners on designing efficiency into kitchens, additions, and whole-home improvement projects. It offers a Web-based audit tool and a home energy benchmark tool to help homeowners get underway and monitor progress. The program is also working with energy efficiency program partners around the country so that they can use this unbiased information at consumer transaction points to promote energy efficiency. EPA projects the program will avoid 20 teragrams of CO_2 annually by 2010.

Implementing entities: ENERGY STAR® is a national program. EPA implements this effort with partners around the country.

Costs of policy or measure: All costs are recovered over a period of time.

Non-GHG mitigation benefits of policy or measure: By reducing energy demand and use, ENERGY STAR® also reduces nitrogen oxides and sulfur dioxide.

Interaction with other policies or measures: ENERGY STAR® for new homes works closely with DOE's Rebuild America program.

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[2] Part of Action 6 in the 1997 *U.S. Climate Action Report;* continuing.

Community Energy Program: Rebuild America

Description: Rebuild America connects people, resources, proven ideas, and innovative practices through collaborative partnerships with states, small towns, large metropolitan areas, and Native American tribes, creating a large network of peer communities. The program provides one-stop shopping for information and assistance on how to plan, finance, implement, and manage retrofit projects to improve energy efficiency. Rebuild America supports communities with access to DOE regional offices, state energy offices, national laboratories, utilities, colleges and universities, and nonprofit agencies.

Objective: Rebuild America aims to assist states and communities in developing and implementing environmentally and economically sound activities through smarter energy use.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Voluntary, information, and education.

Status of implementation: As of May 2001, Rebuild America had formed 340 partnerships with approximately 550 million square feet of buildings complete or underway in all 50 states and two U.S. territories.

Implementing entities: State and local community partnerships with the federal government.

Non-GHG mitigation benefits of policy or measure: Rebuild America expands knowledge and technology base through education, improves energy efficiency, promotes private–public cooperation and information sharing, creates peer networks, preserves historic buildings, builds new facilities, retrofits existing buildings, stimulates economic development, promotes community development, and avoids urban sprawl.

Interaction with other policy or measure: Rebuild America helps to promote many of the resources made available by other DOE programs, such as Updating State Building Codes and ENERGY STAR®.

Residential Building Integration: Energy Partnerships for Affordable Housing (Building America)

Description: The Residential Buildings Integration program operates Energy Partnerships for Affordable Housing. This new program consolidates the formerly separate systems-engineering programs of Building America, Industrialized Housing, Passive Solar Buildings, Indoor Air Quality, and existing building research into a comprehensive program. Systems-integration research and development activities analyze building components and systems and integrate them so that the overall building performance is greater than the sum of its parts. Building America is a private–public partnership that provides energy solutions for production housing and combines the knowledge and resources of industry leaders with DOE's technical capabilities to act as a catalyst for change in the home building industry.

Objective: This program aims to accelerate the introduction of highly efficient building technologies and practices through research and development of advanced systems for production builders.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Voluntary, research, and education.

Status of implementation: Implemented.

Implementing entities: DOE and private industry partners.

Non-GHG mitigation benefits of policy or measure: This program increases energy efficiency, and software and information sharing; incorporates renewable resources and distributed generation; improves builder productivity; reduces construction time; provides new product opportunities to manufacturers and suppliers; and promotes teamwork within the segmented building industry.

ENERGY STAR®-Labeled Products[3]

Description: Many homeowners and businesses could use 30 percent less energy, without sacrificing services or comfort, by investing in energy efficiency. Introduced by EPA in 1992 for computers, the ENERGY STAR® label has been expanded to more than 30 product categories. Since the mid-1990s, EPA has collaborated with DOE, which now has responsibility for certain product categories. The ENERGY STAR® label is now recognized by more than 40 percent of U.S. consumers, who have purchased over 600 million ENERGY STAR® products. The program has developed a strong partnership with business, representing over 1,600 manufacturers with more than 11,000 ENERGY STAR®-labeled products.

Objective: The ENERGY STAR® label is used to distinguish energy-efficient products in the marketplace so that businesses and consumers can easily purchase these products, save money on energy bills, and avoid air pollution.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Voluntary agreement.

Status of implementation: The program's strategy has evolved substantially since the 1997 *U.S. Climate Action Report*, not only with its addition of new products to the ENERGY STAR® family, but also with its expanded outreach to consumers in partnership with their local utility or similar organization. ENERGY STAR® works in partnership with utilities, representing about 50 percent of U.S. energy customers. To date, more than 600 million ENERGY STAR®-labeled products have been purchased. EPA estimates that the program avoided 33 teragrams of CO_2 in 2000 and projects it will reduce 75 teragrams of CO_2 in 2010.

Implementing entities: ENERGY STAR® is a national program. EPA and DOE implement the ENERGY STAR® label on products with partners across the country.

Costs of policy or measure: All costs are recovered over a period of time.

Non-GHG mitigation benefits of policy or measure: By reducing energy demand and use, ENERGY STAR® also reduces nitrogen oxides and sulfur dioxide.

Interaction with other policies or measures: ENERGY STAR® is implemented in concert with the minimum efficiency standards developed by DOE, where those standards exist, such as with household appliances and heating and cooling equipment.

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[3] Part of Action 6 in the 1997 *U.S. Climate Action Report*; continuing.

Building Equipment, Materials, and Tools: Superwindow Collaborative

Description: The Superwindow Collaborative develops commercially viable, advanced electrochromic windows and Superwindows for competing producers. These programs intend to reward industry through market mechanisms for their investments in the research, development, and deployment of energy-efficient windows. In an area that is less suited to national standards and that has a growing international market, significant investments are required to establish a technical basis for performance standards recognized for their scientific excellence. The Superwindow Collaborative is supported by two DOE programs—Building Envelope: Electrochromic Windows and Building Envelope: Superwindows—both of which are part of DOE's Equipment, Materials, and Tools program.

Objectives: The Superwindow Collaborative aims to change windows from net energy loss centers to net energy savers across the United States; to strengthen the market position of U.S. industry in global markets; and to provide building owners cost-effective savings, a more comfortable building climate, and possible productivity improvements.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Research.

Status of implementation: Implemented.

Implementing entities: Federal government R&D in partnership with the private sector. The electrochromic participants include two national laboratories and four industrial partners. Supporting research on materials, durability, and energy performance is performed at DOE's national laboratories.

Non-GHG mitigation benefits of policy or measure: The Superwindow Collaborative increases economic competitiveness, energy efficiency, and building climate comfort, and provides possible productivity improvements for buildings.

Building Equipment, Materials, and Tools: Lighting Partnerships

Description: Lighting Partnerships supports research and development in three areas:

- Advanced light sources, consisting of research that is heavily cost-shared with industry to advance lighting technology, with the goal of developing replacements for the inefficient incandescent lamp. The program supports improvements in compact fluorescent lamps and in new lamps using improved incandescent, fluorescent, high-intensity-discharge, and electrode-less technologies.
- Lighting fixtures, controls, and distribution systems consisting of cost-shared research on lighting controls in commercial buildings and light fixtures for advanced light sources, primarily compact fluorescent lamps.
- The impact of lighting on vision, consisting of industry cost-shared research on outdoor lighting.

Objectives: The program aims to develop and accelerate the introduction of advanced lighting technologies and to make solid-state lighting more efficient than conventional sources and more easily integrated into building systems. Additional goals are to develop lighting technologies that last for 20,000 to 100,000 hours and to significantly reduce greenhouse gas emissions from coal-fired power plants.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Research.

Status of implementation: Implemented.

Implementing entities: Lighting Partnerships is a federal research and development program that collaborates with manufacturers, utilities, user groups, and trade and professional organizations.

Building Equipment, Materials, and Tools: Partnerships for Commercial Buildings and Facilities

Description: This program develops and demonstrates advanced technologies, controls, and equipment in collaboration with the design and construction community; advances integrated technologies and practices to optimize whole-building energy performance; and helps reduce energy use in commercial multifamily buildings by promoting the construction of efficient buildings and their operation near an optimum level of performance. It also performs research on energy-efficient, sustainable, and low-cost building-envelope materials and structures. The program is supported by a number of DOE programs, including Commercial Buildings R&D, which is part of the Commercial Buildings Integration program; and Analysis Tools and Design Strategies and Building Envelope R&D, which are parts of the Equipment, Materials, and Tools program.

Objectives: This program aims to develop high-performance building design, construction, and operation processes; provide the tools needed for replicating the processes and design strategies for creating high-performance buildings; research new technologies for high-performance buildings; define the criteria and methods for measuring building performance; measure and document building performance in high-profile examples; and develop a fundamental understanding of heat, air, and moisture transfer through building envelopes and insulation materials, and apply the results to develop construction technologies to increase building energy efficiency.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Research.

Status of implementation: Implemented.

Implementing entities: Federal government R&D in partnership with the private sector.

Non-GHG mitigation benefits of policy or measure: This program increases energy efficiency, shares information with and educates stakeholders, builds criteria for industry use, and collects useful data. It also has environmental benefits not related to greenhouse gases.

Building Equipment, Materials, and Tools: Collaborative Research and Development

Description: This program researches, develops, and commercializes food display and storage technologies that use less energy and less refrigerant; new, super-efficient electric dryers; low-cost, high-reliability heat pump water heaters; and energy-efficient heating, ventilation, and air conditioning systems. It also brings new products to market and provides an independent third-party evaluation of highly efficient products. The Space Conditioning and Refrigeration program and the Appliances and Emerging Technologies program are part of the Equipment, Materials, and Tools program.

Objectives: This program aims to develop and promote the use of low-cost, energy-efficient equipment, materials, and tools.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Research.

Status of implementation: Implemented.

Implementing entities: State and local partnerships with the federal government.

Non-GHG mitigation benefits of policy or measure: This program promotes energy efficiency, evaluates energy-efficient products and accelerates their commercialization, and improves economic competitiveness and data collection.

Residential Appliance Standards

Description: Administered by DOE's Office of Codes and Standards, the Residential Appliance Standards program periodically reviews and updates efficiency standards for most major household appliances.

Objective: The program's standards aim to ensure that American consumers receive a minimum practical energy efficiency for every appliance they buy.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Regulatory.

Status of implementation: Implemented.

Implementing entities: DOE and other federal entities. DOE promulgates revised or new regulations, while the Federal Trade Commission prescribes the labeling rules for residential appliances.

Non-GHG mitigation benefits of policy or measure: The program enhances energy security, increases competitiveness and reliability, and improves energy efficiency.

State and Community Assistance: State Energy Program; Weatherization Assistance Program; Community Energy Grants; Information Outreach

Description: Several programs and initiatives support DOE's State and Community Assistance efforts:

- The *State Energy Program* provides a supportive framework with sufficient flexibility to enable the states to address their energy priorities in concert with national priorities, and supports the federal–state partnerships that are crucial to energy policy development and energy technology deployment.
- The *Weatherization Assistance Program* provides cost-effective, energy-efficiency services to low-income constituencies who otherwise could not afford these services and who stand to benefit greatly from the cost savings of energy-efficient technologies.
- The *Community Energy Grants* program provides funding to competitively selected communities to support community-wide energy projects that improve energy efficiency and implement sustainable building design and operation concepts.
- The *Information Outreach* program helps to conceptualize, plan, and implement a systematic approach to marketing and communication objectives and evaluation.

Objectives: The objectives of DOE's State and Community Assistance efforts are based on the combined objectives of its major programs and initiatives:

- *State Energy*: To maximize energy, environmental, and economic benefits through increased collaboration at the federal, state, and community levels; to increase market acceptance of energy-efficient and renewable-energy technologies, practices, and products; and to use innovative approaches to reach market segments and meet policy goals not typically addressed by market-based solutions.
- *Weatherization*: To develop new weatherization technologies, further application of best methods and practices throughout the national weatherization network, leverage and integrate weatherization with other energy efficiency resources, and demonstrate program effectiveness.
- *Community Energy Grants*: To save energy, create jobs, promote growth, and protect the environment.
- *Information Outreach*: To provide technical assistance needed to conduct the various planned activities that will educate target audiences; to follow strategic plan goals and support long-term success in developing energy-efficient systems and processes; to improve technology-transfer and information-exchange processes; and to emphasize partnering with strategic allies, communications, education and training, and information support.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Economic, information.

Status of implementation: Implemented.

Implementing entities: States and local communities through partnerships with the federal government. For example, DOE makes grants to states through its Weatherization Assistance Program, which in turn awards grants to local agencies—usually community action agencies or other nonprofit or government organizations—to perform the actual weatherization services.

Non-GHG mitigation benefits of policy or measure: These programs enhance energy efficiency; create jobs and boost economic development; have non-greenhouse gas environmental benefits; increase collaboration at federal, state, and local levels; provide health benefits; educate consumers; promote technology transfer to industry; and provide training.

Heat Island Reduction Initiative[4]

Description: This initiative is a multi-agency effort to work with communities and state and local officials to reduce the impacts of urban heat islands. It promotes common-sense measures, such as planting shade trees, installing reflective roofs, and using light-colored pavements to reduce ambient temperature, ozone pollution, cooling energy demand, and greenhouse gas emissions. This initiative also supports research to quantify the air quality, health, and energy-saving benefits of measures for reducing the impacts of urban heat islands.

Objective: The program's objective is to work with state and local governments to reverse the effects of urban heat islands by encouraging the widespread use of mitigation strategies.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Voluntary, information exchange, and research.

Status of implementation: The program was redesigned in 1997 and is currently ongoing. EPA performs research on the up-front costs, potential savings, and options for reflective surfaces, to assist with implementing measures for reducing the demands of heat islands. In addition, information on the air quality benefits may allow states to incorporate these measures into their air quality plans. Pilot projects have been established in five cities that have agreed to assist with research and work to implement the measures. For example, several cities in Utah have implemented ordinances with measures for reducing the impacts of urban heat islands. And California's state legislature and governor have authorized using over $24 million for measures to reduce peak summer heat island demand for electricity.

Implementing entities: EPA, in partnership with state and local governments.

Costs of policy or measure: Reflective surfaces are generally implemented during new construction or when replacing old materials. While initial costs are comparable between nonreflective and reflective surfaces, cost savings can be expected when evaluating life-cycle costs (as energy savings and reduced maintenance are considered).

Non-GHG mitigation benefits of policy or measure: The program's measures can reduce emissions of volatile organic compounds and nitrogen oxides due to reduced energy use and ambient temperatures. Lower temperatures may also help reduce ozone concentrations due to the heat-dependent reaction that forms this pollutant. In addition, energy savings can be expected from implementing heat-island reduction measures.

Interaction with other policies or measures: The program interacts with the ENERGY STAR® Roofs Program and state implementation plans.

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[4] Action 9 in the 1997 *U.S. Climate Action Report*; continuing.

Economic Incentives/Tax Credits

Description: Current law provides a 10 percent business energy investment tax credit for qualifying equipment that uses solar energy to generate electricity, to heat or cool, to provide hot water for use in a structure, or to provide solar process heat. No credit is available for nonbusiness purchases of solar energy equipment. The Administration is proposing a new tax credit for individuals of photovoltaic equipment and solar water-heating systems for use in a dwelling that the individual uses as a residence. Equipment would qualify for the credit only if used exclusively for purposes other than heating swimming pools. An individual would be allowed a cumulative maximum credit of $2,000 per residence for photovoltaic equipment and $2,000 per residence for solar water-heating systems. The credit for solar water-heating equipment would apply only if placed in service after December 31, 2001, and before January 1, 2006, and to photovoltaic systems placed in service after December 31, 2001, and before January 1, 2008.

Objective: This proposed tax credit aims to expand the future market of residential solar energy systems.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Economic.

Status of implementation: This measure is in the proposal stage.

Energy: Industrial

Industries of the Future

Description: Industries of the Future creates partnerships among industry, government, and supporting laboratories and institutions to accelerate technology research, development, and deployment. Led by DOE's Office of Industrial Technologies, this strategy is being implemented in nine energy- and waste-intensive industries. Two key elements of the strategy include an industry-driven document outlining each industry's vision for the future, and a technology roadmap to identify the technologies that will be needed to reach that industry's goals.

Objective: This strategy aims to help nine key energy-intensive industries reduce their energy consumption while remaining competitive and economically strong.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Voluntary, research, and information.

Status of implementation: Implemented.

Implementing entities: Partnerships among industry, government, and supporting laboratories and institutions.

Non-GHG mitigation benefits of policy or measure: This strategy enhances economic security and energy efficiency, allows for competitive restructuring, has non-GHG environmental benefits, forms cooperative alliances, increases productivity, and disseminates information.

Best Practices Program

Description: This initiative of DOE's Office of Industrial Technologies offers industry the tools to improve plant energy efficiency, enhance environmental performance, and increase productivity. Selected best-of-class large demonstration plants are showcased across the country, while other program activities encourage the replication of these best practices in still larger numbers of large plants.

Objective: Best Practices is designed to change the ways industrial plant managers make decisions affecting energy use by motors and drives, compressed air, steam, combustion systems, and other plant utilities.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Voluntary, information.

Status of implementation: Implemented.

Implementing entities: DOE and industrial partners.

Non-GHG mitigation benefits of policy or measure: Best Practices enhances economic security and energy efficiency, has non-greenhouse gas environmental benefits, increases productivity and industry cooperation, and disseminates knowledge.

ENERGY STAR® for Industry (Climate Wise)[5]

Description: Nearly one-third of U.S. carbon dioxide emissions result from industrial activities. The primary source of these emissions is the burning of carbon-based fuels, either on site in manufacturing plants or through the purchase of generated electricity. Recently, ENERGY STAR® and Climate Wise were integrated under ENERGY STAR® to compose a more comprehensive partnership for industrial companies. Through established energy performance benchmarks, strategies for improving energy performance, technical assistance, and recognition for accomplishing reductions in energy, the partnership contributes to a reduction in energy use for the U.S. industrial sector.

Objectives: ENERGY STAR® enables industrial companies to evaluate and cost-effectively reduce their energy use. This reduction, in turn, results in decreased carbon dioxide emissions when carbon-based fuels are the source of that energy.

Greenhouse gas affected: Carbon dioxide.

Types of policy or measure: Voluntary agreement.

Status of implementation: This program has been underway since 1994 with the launch of Climate Wise. In 2000, ENERGY STAR®and the Climate Wise Partnership were integrated to provide the industrial sector with a more comprehensive set of industrial benchmarking and technical assistance tools. The partnership currently has more than 500 industrial partners representing a large share of energy use in the industrial sector. EPA estimates that the program avoided 11 teragrams of CO_2 in emissions in 2000 and projects reductions of 16 teragrams of CO_2 in 2010.

Implementing entities: The partnership is primarily a national program, managed by EPA. State and local governments voluntarily participate by promoting the program to industries within their jurisdictions.

Costs of policy or measure: Costs are defined as the monetary expenses necessary for an industrial participant to implement the program. Participants evaluate the cost-effective opportunities for energy performance and complete adjustments to their operation. While an initial outlay of funds is possible, these costs are recovered over a period of time.

Non-GHG mitigation benefits of policy or measure: The burning of fossil fuels creates airborne pollutants, including nitrogen oxides and sulfur dioxide. By reducing energy demand and use, ENERGY STAR® helps to decrease emissions of these pollutants.

Interaction with other policies or measures: ENERGY STAR® is the only national program that offers industrial companies the ability to evaluate and minimize energy use through established energy performance benchmarks, strategies, and technical assistance. ENERGY STAR® complements programs managed by DOE. DOE oversees partnerships with nine energy-intensive industrial sectors to accelerate technology research, development, and deployment, with a goal of reducing energy use and the environmental impacts of these industries. DOE also manages a program to improve a plant's technical systems, or components of a plant, including the motors, steam, compressed air, combined heat and power, and process heat. ENERGY STAR® complements these programs with a system for evaluating plant-wide energy performance.

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[5] Foundation action 9 in the 1997 *U.S. Climate Action Report*; continuing.

Industrial Assessment Centers

Description: Teams of engineering faculty and students from 26 universities around the country conduct free comprehensive energy audits or industrial assessments and provide recommendations to eligible small and medium-sized manufacturers to help them identify opportunities to improve productivity, reduce waste, and save energy.

Objectives: The assessments aim to improve energy efficiency and productivity, minimize waste, and prevent pollution.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Voluntary, information, and education.

Status of implementation: Implemented.

Implementing entities: DOE and universities.

Non-GHG mitigation benefits of policy or measure: The program has non-greenhouse gas environmental benefits, improves energy efficiency, economic productivity, and competitiveness; encourages public–private-sector interaction and cooperation and information sharing within industry; provides student educational experience; and collects industry data for industry progress assessments, thereby enabling the quantification of the state of energy, waste, and productivity management in small and medium-sized industries.

Enabling Technologies: Industrial Materials for the Future

Description: DOE's Industrial Materials for the Future program is the combination of the Advanced Industrial Materials and Continuous Fiber Ceramic Composite programs. The new program focuses on areas that offer major improvements in energy efficiency and emission reductions across all industries.

Objective: Consistent with the mission of DOE's Office of Industrial Technologies, this program's mission is to lead a national effort to research, design, develop, engineer, and test new and improved materials for the Industries of the Future.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Types of policy or measure: Research.

Status of implementation: Implemented.

Implementing entities: DOE and industry partners.

Non-GHG mitigation benefits of policy or measure: This program reduces emissions of non-greenhouse gas pollutants; improves energy efficiency, economic productivity, and competitiveness; encourages public–private-sector interaction and cooperation; and facilitates information sharing within industry.

Financial Assistance: NICE^3 (National Industrial Competitiveness through Energy, Environment, & Economics)

Description: Sponsored by DOE's Office of Industrial Technologies, NICE^3 is an innovative, cost-sharing grant program that provides funding to state and industry partnerships (large and small businesses) for projects that develop and demonstrate advances in energy efficiency and clean production technologies.

Objectives: The NICE^3 program was authorized to improve the energy efficiency and cost-effectiveness of pollution prevention technologies and processes, including source-reduction and waste-minimization technologies and processes. It also aims to advance the global competitiveness of U.S. industry.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Voluntary, research.

Status of implementation: Implemented.

Implementing entities: State agencies, industry, and universities.

Non-GHG mitigation benefits of policy or measure: The NICE^3 program increases economic production, energy efficiency, industry competitiveness, and cooperation between the public and private sectors. It also has non-greenhouse gas environmental benefits.

Energy: Supply

Renewable Energy Commercialization: Wind; Solar; Geothermal; Biopower

Description: DOE's Office of Power Technologies maintains several programs on individual renewable energy technologies, including wind, solar, geothermal, and biomass. Renewable technologies use naturally occurring energy sources to produce electricity, heat, fuel, or a combination of these energy types.

Objectives: The program aims to develop clean, competitive power technologies; to diversify the nation's energy supply portfolio; to use abundant domestic resources; to help the nation meet its commitments to curb greenhouse gas emissions; and to achieve tax incentives for renewable energy production and use.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Research, regulatory.

Status of implementation: Implemented.

Implementing entities: DOE and industry partners.

Non-GHG mitigation benefits of policy or measure: The program enhances the nation's energy and economic security; has non-greenhouse gas environmental benefits; builds energy infrastructure; creates jobs; increases industrial competitiveness and energy reliability; and diversifies the nation's energy portfolio.

Climate Challenge

Description: The Climate Challenge program is a joint, voluntary effort of DOE and the electric utility industry to reduce, avoid, or sequester greenhouse gases. Utilities, in partnership with DOE, developed individual agreements to identify and implement cost-effective activities for reducing greenhouse gas emissions. Electric utility trade associations are active in promoting the program and in developing industry-wide initiatives. Details on the program are available at http://www.eren.doe.gov/climatechallenge/.

Objective: Established as a Foundation Action under the 1993 *Climate Change Action Plan*, Climate Challenge persuaded electric utilities to develop Participation Accords with DOE. These individual agreements identified cost-effective activities for the utility to implement, with the goal of reducing emissions in 2000. Each utility must annually report its results to DOE's Energy Information Administration Voluntary Reporting of Greenhouse Gases Program (http://www.eia.doe.gov/oiaf/1605/frntvrgg.html), consistent with the voluntary reporting of greenhouse gas emission guidelines developed under Section 1605(b) of the Energy Policy Act of 1992. Reductions will continue to be reported beyond 2000.

Greenhouse gases affected: Primarily carbon dioxide, but also other greenhouse gases, such as methane and sulfur hexafluoride. Carbon dioxide activities include both reductions in emissions and increases in carbon sequestration.

Type of policy or measure: DOE and the individual utilities sign Voluntary Participation Accords (or Letters of Participation for smaller utilities), describing the utilities' commitments in the form of specific projects, entity-wide actions, and/or industry-wide initiatives.

Status of implementation: Implemented.

Implementing entities: The program is a joint, voluntary effort between the electric utility industry and the DOE. Parameters of the Climate Challenge program were defined in a 1994 Memorandum of Understanding between DOE and all the national utility trade associations.

Non-GHG mitigation benefits of policy or measure: The reduction in carbon dioxide emissions from Climate Challenge projects often results in a concurrent reduction in sulfur dioxide, oxides of nitrogen, and other emissions associated with fossil fuel combustion. Other projects have reduced landfill requirements by recycling and reusing coal combustion by-products and other materials. Participating utilities have indicated that corporate learning about climate change and mitigation opportunities has been a significant benefit of the program. Climate Challenge has helped shift the thinking of electric utility management and strategic planners to include the mitigation of greenhouse gas emissions into their corporate culture and philosophy.

Interaction with other policies or measures: As a Foundation Action under the 1993 Climate Change Action Plan, Climate Challenge was designed as a platform from which participating utilities could undertake a broad range of activities (individually, through industry-wide initiatives, and through other federal voluntary programs. In addition, Climate Challenge utilities agree to report their results annually to DOE's Energy Information Administration, consistent with the voluntary reporting of greenhouse gas emission guidelines developed under Section 1605(b) of the Energy Policy Act of 1992.

Distributed Energy Resources

Description: This program directs and coordinates a diverse portfolio of research and development, consolidating programs and staff from across DOE's Office of Energy Efficiency and Renewable Energy related to the development and deployment of distributed energy resources (DER). It focuses on technology development and the elimination of regulatory and institutional barriers to the use of DER, including interconnection to the utility grid and environmental siting and permitting. DER partners with industry to apply a wide array of technologies and integration strategies for on-site use, as well as for grid-enhancing systems. Successful deployment of DER technologies affects the industrial, commercial, institutional, and residential sectors of our economy—in effect, all aspects of the energy value chain.

Objectives: This program aims to develop a cleaner, more reliable, and affordable U.S. energy resource portfolio to reduce pollution and greenhouse gas emissions; enhance electric grid operations; boost local economic development; and increase energy and economic efficiency.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Research, information, education, and regulatory.

Status of implementation: Implemented.

Implementing entities: DOE, industry.

Non-GHG mitigation benefits of policy or measure: This program has non-greenhouse gas environmental benefits, improves energy reliability, reduces the strain on the electric grid infrastructure, allows energy choices among consumers (creating a more dynamic energy market), and hedges against peak power prices.

High-Temperature Superconductivity

Description: This program investigates the properties of crystalline materials that become free of electrical resistance at the temperature of liquid nitrogen. The lack of resistance makes possible electrical power systems with super-efficient generators, transformers, and transmission cables that reduce energy losses associated with electricity transmission.

Objectives: The next few years may see the beginning of the widespread utilization of superconductivity technologies. This program leads the DOE research and development effort geared toward making this happen. It supports aggressive projects to design advanced electrical applications. The industry-led Second-Generation Wire Development exploits breakthroughs at national laboratories that promise unprecedented current-carrying capacity.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Types of policy or measure: Research.

Status of implementation: Implemented.

Implementing entities: DOE, industry.

Non-GHG mitigation benefits of policy or measure: This program has non-greenhouse gas environmental benefits, such as reducing SO_x emissions; improves energy reliability; reduces strain on the electric grid infrastructure; cuts transmission losses by half; and allows electrical equipment to be reduced in size dramatically (which opens more potential site applications).

Hydrogen Program

Description: This program has four strategies to carry out its objective: (1) expand the use of hydrogen in the near term by working with industry, including hydrogen producers, to improve efficiency, lower emissions, and lower the cost of technologies that produce hydrogen from natural gas for distributed filling stations; (2) work with fuel cell manufacturers to develop hydrogen-based electricity storage and generation systems that will enhance the introduction and penetration of distributed, renewable-energy-based utility systems; (3) coordinate with the Department of Defense and DOE's Office of Transportation Technologies to demonstrate safe and cost-effective fueling systems for hydrogen vehicles in urban nonattainment areas and to provide onboard hydrogen storage systems; and (4) work with the national laboratories to lower the cost of technologies that produce hydrogen directly from sunlight and water.

Objective: The program's mission is to enhance and support the development of cost-competitive hydrogen technologies and systems that will reduce the environmental impacts of energy use and enable the penetration of renewable energy into the U.S. energy mix.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Research, education.

Status of implementation: Implemented.

Implementing entities: DOE, industry, and national laboratories.

Non-GHG mitigation benefits of policy or measure: This program has non-greenhouse gas environmental benefits, develops new infrastructure, creates jobs, enhances the nation's energy and economic security, diversifies the nation's energy portfolio, and expands our technology base.

Clean Energy Initiative: Green Power Partnership; Combined Heat and Power Partnership

Description: Increased economic growth has been fueled in large part by energy produced from fossil fuels, with the unintended consequence of increased air pollution and an increased threat of climate change. EPA's Clean Energy Initiative is designed to reduce greenhouse gas emissions associated with the energy supply sector by promoting available technologies. EPA's strategy includes: (1) increasing corporate and institutional demand for renewable energy, (2) facilitating combined heat and power (CHP) and other clean "distributed generation" technologies in targeted markets, and (3) working with state and local governments to develop policies that favor clean energy.

EPA's Green Power Partnership works with businesses and other institutions to facilitate bulk purchases of renewable energy. This involves setting green power standards, providing recognition, and quantifying the environmental benefits. EPA's CHP Partnership targets candidate sites in key state markets, and provides these facilities with information about the benefits of CHP, as well as technical assistance. The Policy Team produces a database that quantifies the environmental impacts of power generation, along with other policy tools to help reduce the environmental impacts of electricity generation.

Objective: The Clean Energy Initiative will focus on the energy supply sector, as well as industrial, commercial, and residential energy customers. The approach will aim to remove market barriers to the increased penetration of cleaner, more efficient energy supply through education, technical assistance, demonstration, and partnerships.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Voluntary agreement, education, and technical assistance.

Status of implementation: This effort is currently being implemented. EPA will conduct annual reviews of the program's performance at the end of each calendar year. EPA projects the program will reduce greenhouse gas emissions by about 30 teragrams of CO_2 in 2010.

Implementing entity: EPA.

Non-GHG mitigation benefits of policy or measure: This initiative will reduce criteria air pollutants, which contribute to local and regional air quality problems, and will reduce land and water impacts due to the decrease in fossil fuel use.

Interaction with other policies or measures: This initiative requires interaction with ongoing initiatives at DOE, particularly efforts to commercialize renewable energy and CHP technologies. DOE will continue to play the lead role in research and development and performance benchmarking, while EPA will primarily be involved with market transformation activities for these technologies.

Contact: Tom Kerr, EPA, Climate Protection Partnerships Division, (202) 564-0047, kerr.tom@epa.gov.

Nuclear Energy Plant Optimization

Description: The Nuclear Energy Plant Optimization (NEPO) program conducts scientific and engineering research to develop advanced technologies to manage the aging of nuclear plants. The cost-shared program is part of a comprehensive approach to ensure that the United States has the technological capability to produce adequate supplies of baseload electricity while minimizing greenhouse gas emissions and other harmful environmental impacts. Details on the NEPO program are available at http://nuclear.gov.

Objective: The program aims to ensure that current U.S. nuclear power plants can continue to deliver adequate and affordable energy supplies up to and beyond their initial license period by resolving critical issues related to long-term plant aging and by developing advanced technologies for improving plant reliability, availability, and productivity.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Research, information.

Status of implementation: DOE began the NEPO program in fiscal year 2000 and continues to initiate cooperative R&D projects, which are identified through input from electric utilities, the Nuclear Regulatory Commission, and other stakeholders.

Implementing entities: The program is a cost-shared partnership between the nuclear industry and the federal government.

Non-GHG mitigation benefits of policy or measure: The NEPO program and other nuclear energy R&D programs conducted by DOE support the goal in the President's *National Energy Policy* of increasing the development and use of nuclear power as non-greenhouse gas-emitting source of electricity for the nation.

Interaction with other policies or measures: Operation of existing nuclear power plants annually avoids emissions of over 150 teragrams of carbon dioxide, five million tons of sulfur dioxide, and 2.4 million tons of nitrogen oxides. Continued operation of existing nuclear plants through their original license term and a 20-year renewed license term would partly mitigate the need to build more baseload power plants.

Development of Next-Generation Nuclear Energy Systems: Nuclear Energy Research Initiative; Generation IV Initiative

Description: DOE's support for next-generation nuclear energy systems comes primarily from two programs: the Nuclear Energy Research Initiative (NERI) and the Generation IV Initiative (Gen-IV). Complete details on the Gen-IV and NERI programs are available at http://nuclear.gov.

Objectives: NERI is funding small-scale research efforts on promising advanced nuclear energy system concepts, in areas that will promote novel next-generation, proliferation-resistant reactor designs, advanced nuclear fuel development, and fundamental nuclear science. In the future, there is likely to be NERI research in the use of nuclear energy to produce hydrogen fuel for fuel cells.

The present focus of Gen-IV is on the preparation of a technology roadmap that will set forth a plan for research, development, and demonstration of the most promising next-generation advanced reactor concepts. These reactor designs hold high potential for meeting the needs for economic, emission-free, sustainable power generation. R&D will be conducted to increase fuel lifetime, recycle used nuclear fuel, establish or improve material compatibility, improve safety performance, reduce system cost, effectively incorporate passive safety features, enhance system reliability, and achieve a high degree of proliferation resistance.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Research, information.

Status of implementation: As ongoing programs, both the NERI and Gen-IV initiatives are under implementation.

Implementing entities: NERI features a cooperative, peer-reviewed selection process to fund researcher-initiated R&D proposals from universities, national laboratories, and industry. The Gen-IV program is an international effort, in which the United States and other member countries of the Generation IV International Forum (GIF) are jointly developing nuclear energy systems that offer advantages in the areas of economics, safety, reliability, and sustainability and that could be deployed commercially by 2030. A major advantage of this arrangement is that funding for the projects is leveraged among the GIF member countries.

Non-GHG mitigation benefits of policy or measure: With the NERI and Gen-IV programs, DOE is addressing issues that will enable the expanded use of nuclear energy. For the longer term, the DOE believes that Gen-IV nuclear energy and fuel cycle technologies can play a vital role in fulfilling the nation's long-term energy needs. Growing concerns for the environment will favor energy sources that can satisfy the need for electricity and other energy-intensive products on a sustainable basis with minimal environmental impact.

Interaction with other policies or measures: The Gen-IV and NERI programs, and other nuclear energy R&D programs conducted by DOE, support the goal stated in the President's *National Energy Policy* of increasing the development and use of nuclear power as a non-greenhouse gas-emitting source of electricity for the nation.

Support Deployment of New Nuclear Power Plants in the United States

Description: To cope with U.S. near-term needs for nuclear energy, DOE organized a Near-Term Deployment Group (NTDG). The group was tasked with developing a Near-Term Deployment Roadmap ("NTD Roadmap") that would provide conclusions and recommendations to facilitate deployment of new nuclear plants in the United States by 2010. Implementation of these recommendations will be realized through DOE's Nuclear Energy Technologies Program—Nuclear Power 2010.

Objectives: The NTD Roadmap provides DOE and the nuclear industry with the basis for a plan to ensure the availability of near-term nuclear energy options that can be in operation in the United States by 2010. It focuses on making available by 2010 a range of competitive, NRC-certified and/or ready to construct nuclear energy generation options of a range of sizes to meet variations in market need.

The NTD Roadmap identifies the technological, regulatory, and institutional gaps and issues that need to be addressed for new nuclear plants to be deployed in the United States in this time frame. It also identifies specific designs that could be deployed by 2010, along with the actions and resources needed to ensure their availability.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Information.

Status of implementation: The NTDG submitted the NTD Roadmap to DOE on October 31, 2001. The Nuclear Energy Research Advisory Committee unanimously endorsed the NTD Roadmap recommendations on November 6, 2001.

Implementing entities: As part of the Nuclear Energy Technologies Program, DOE NE-20 has been in working in collaboration with industry and the Nuclear Regulatory Commission to implement near-term needs identified by the NTDG during fiscal year 2001. Fiscal year 2002 activities include continued DOE/industry cost-shared projects to demonstrate the Early Site Permitting process, support advanced gas-cooled reactor fuel qualification and testing, and conduct preliminary advanced reactor technology R&D recommended in the NTD Roadmap.

Non-GHG mitigation benefits of policy or measure: The deployment of new nuclear power plants could substantially resolve the growing U.S. energy supply deficit. It would also provide for an appropriate and secure energy mix that could help achieve Clean Air Act requirements without harming the U.S. economy.

Interaction with other policies or measures: The NTD Roadmap supports the goal stated in the President's *National Energy Policy* of increasing the development and use of nuclear power as a non-greenhouse gas-emitting source of electricity for the nation.

Carbon Sequestration

Description: This program develops strategies for the removal of carbon dioxide from man-made emissions or the atmosphere; the safe, essentially permanent storage of carbon dioxide or other carbon compounds; and the reuse of carbon dioxide through chemical or biological conversion to value-added products. The program has five major components: separation and capture, ocean storage, storage in terrestrial ecosystems, storage in geological formations, and conversion and utilization.

Objectives: The primary objectives of the carbon sequestration program are to lower the cost of capturing carbon dioxide, to ensure that the storage of carbon dioxide in geological formations is safe and environmentally secure, and to enhance the productivity and storage of carbon in terrestrial systems.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Research.

Status of implementation: Terrestrial sequestration is underway, and field experiments in geological sequestration are imminent.

Implementing entities: Federal government R&D in partnership with private sector.

Non-GHG mitigation benefits of policy or measure: This program increases the production of oil and natural gas (geological sequestration), reclaims poorly managed lands, and prevents soil erosion and stream sedimentation (terrestrial sequestration).

Hydropower Program

Description: DOE's Hydropower Program develops, conducts, and coordinates hydropower research and development with industry and other federal agencies. Hydropower is a mature technology and has long provided a significant contribution to the national energy supply. Hydropower research today centers on boosting the efficiency of existing hydropower facilities, including incremental hydropower gains. In addition, the program works on developing advanced turbines that reduce fish mortality, use improved sensor technology to understand conditions inside operating turbines, improve compliance with federal water quality standards, and reduce greenhouse gas emissions.

Objective: This program aims to improve the technical, societal, and environmental benefits of hydropower.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Research, information.

Status of implementation: Implemented.

Implementing entities: DOE, other federal agencies, and industry partners. DOE's Office of Biopower and Hydropower Technologies administers the program through the DOE Idaho Operations Office.

Non-GHG mitigation benefits of policy or measure: This program has non-greenhouse gas environmental benefits, improves power reliability, and increases the nation's energy security.

International Programs

Description: DOE's International Programs fall under the Office of Technology Access, which promotes exports of renewable energy and energy-efficient products and services and facilitates private-sector infrastructure development to support the delivery and maintenance of these technologies worldwide. The office also provides these same information and technical assistance services to Native Americans on a government-to-government basis.

Objectives: The International Programs aim to service DOE's many Memoranda of Understanding on international energy issues, provide diplomatic and technical assistance to the White House and State Department, and establish a framework to assist Native American governments.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Outreach, education.

Status of implementation: Implemented.

Implementing entities: DOE, industry, other government agencies, and international government and nongovernment agencies.

Non-GHG mitigation benefits of policy or measure: This program has non-greenhouse gas environmental benefits, such as reducing SO_x emissions; improves energy reliability; and educates the public internationally on the benefits of energy efficiency and renewable energy and all the benefits associated with overall energy efficiency and renewable energies.

Economic Incentives/Tax Credits

Description: Current law provides taxpayers a 1.5 cent-per-kilowatt-hour (adjusted for inflation after 1992) tax credit for electricity produced from wind, "closed-loop" biomass, and poultry waste. Biomass refers to trees, crops, and agricultural wastes used to produce power, fuels, or chemicals. The electricity must be sold to an unrelated third party, and the credit applies to the first 10 years of production. The current tax credit covers facilities placed in service before January 1, 2002, after which it expires. The new proposal would:

- Extend for three years the 1.5 cent-per-kilowatt-hour biomass credit for facilities placed in service before July 1, 2005.
- Expand the definition of eligible biomass to include certain forest-related resources and agricultural and other sources for facilities placed in service before January 1, 2002. Electricity produced at such facilities from newly eligible sources would be eligible for the credit only from January 1, 2002, through December 31, 2004. The credit for electricity from newly eligible sources would be computed at a rate equal to 60 percent of the generally applicable rate. And the credit for electricity produced from newly eligible biomass co-fired in coal plants would be computed at a rate equal to 30 percent of the generally applicable rate.
- In the case of a wind or biomass facility operated by a lessee, the proposal would permit the lessee, rather than the owner, to claim the credit. This rule would apply to production under the leases entered into after the date on which the proposal is enacted.

Objective: These tax credits aim to accelerate the market penetration of wind- and biomass-based electric generators.

Greenhouse gases affected: Carbon dioxide, nitrous oxide, and carbon monoxide.

Type of policy or measure: Economic.

Status of implementation: These tax credits are in the proposal stage.

Transportation

FreedomCAR Research Partnership

Description: This partnership seeks to substantially improve vehicle fuel efficiency and reduce carbon emissions associated with cars, light trucks, and sport-utility vehicles. FreedomCAR focuses on the long-term, high-risk research needed to achieve a vision of emission- and petroleum-free passenger vehicles, without sacrificing freedom of mobility and freedom of vehicle choice.

Objective: FreedomCAR's mission is to develop a technology and fuel that will reduce consumption of petroleum-based fuel and reduce carbon emissions.

Greenhouse gases affected: Carbon dioxide and other vehicle-related criteria pollutants.

Type of policy or measure: Research and development.

Status of implementation: Adopted.

Implementing entities: This partnership is between DOE and the U.S. Council for Automotive Research (USCAR). Other U.S. government agencies, including EPA and the Department of Transportation (DOT), will participate through related advances in their own programs. The government will seek a cooperative relationship with suppliers and other companies conducting substantial automotive research and development activities in the United States.

Non-GHG mitigation benefits of policy or measure: The maturation of fuel cell technologies for transportation is a major focus of FreedomCAR. Fuel cell vehicles will be free of petroleum, criteria pollutants, and carbon dioxide emissions.

Interaction with other policies or measures: The new partnership supersedes and builds upon the successes of the Partnership for a New Generation of Vehicles (PNGV), which began in 1993. However, FreedomCAR is different in scope and breadth. It shifts government research to more fundamental, higher-risk activities, with applicability to multiple-passenger vehicle models and special emphasis on development of transportation fuel cells and related hydrogen fuel infrastructure.

The transition to a hydrogen fuel cell-powered energy system requires significant investment in order to successfully overcome critical remaining barriers. Since considerable time will be required before fuel cells in transportation become a reality, FreedomCAR also continues support for other technologies that have the potential in the interim to dramatically reduce oil consumption and environmental impacts, and/or are applicable to both fuel cell and hybrid approaches—e.g., batteries, electronics, and motors.

Vehicle Systems R&D

Description: DOE's Office of Heavy Vehicle Technologies works with its industry partners and their suppliers to research and develop technologies that make heavy vehicles more energy efficient and able to use alternative fuels, while reducing vehicle emissions.

Objective: This program aims to encourage optimum performance and efficiency in trucks and other heavy vehicles.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Research, information.

Status of implementation: Implemented.

Implementing entities: DOE and national laboratories.

Non-GHG mitigation benefits of policy or measure: This program increases energy and national security, boosts energy efficiency, reduces reliance on foreign energy sources, supports the economy through more efficient transportation of goods, and improves safety through advanced truck materials.

Clean Cities

Description: DOE's Clean Cities program supports public–private partnerships that deploy alternative-fuel vehicles (AFVs) and build supporting infrastructure, including community networks. Clean Cities works directly with local businesses and governments, guiding them through each step in the process of building the foundation for a vibrant local organization, including goal-setting, coalition-building, and securing commitments. Current and potential members of the Clean Cities network also help each other by sharing local innovations, addressing and relaying obstacles they encounter in pursuing alternative-fuel programs, and exchanging "do's" and "don'ts," based on experiences in these programs. Clean Cities continually pioneers innovations and aspires to make strides nationally as well as locally.

Objective: By encouraging AFV use, Clean Cities aims to help cities enhance their energy security and air quality.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Voluntary, information.

Status of implementation: Implemented.

Implementing entities: DOE, local stakeholders, and local governments.

Non-GHG mitigation benefits of policy or measure: Clean Cities increases energy efficiency, promotes private–public cooperation and information sharing, provides answers to complex issues, builds a network of contacts, and educates the public.

Biofuels Program

Description: Sponsored by DOE's Office of Fuels Development, the Biofuels Program researches, develops, demonstrates, and facilitates the commercialization of biomass-based, environmentally sound, cost-competitive U.S. technologies to develop clean fuels for transportation, leading to the establishment of a major biofuels industry. The program is currently pursuing the development of conversion technologies for bioethanol and biodiesel fuels. It encourages the use of biomass sources, such as wastepaper and wood residues, to serve near-term niche markets as a bridging strategy to position the biofuels industry for the long-term bulk fuel markets. To meet these ends, the program focuses on researching and developing integrated biofuels systems; creating strategic partnerships with U.S. industry and other stakeholders; and improving the program's operations through well-defined metrics, communication, and coordination with stakeholders and customers.

Objective: The Biofuels Program aims to encourage the large-scale use of environmentally sound, cost-competitive, biomass-based transportation fuels.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Research, information.

Status of implementation: Implemented.

Implementing entities: DOE, national laboratories and private-sector partners (industry, individuals, and research organizations).

Non-GHG mitigation benefits of policy or measure: The Biofuels Program increases energy efficiency; reduces reliance on foreign energy sources; promotes the industry internationally, the commercialization of bio-based products, and renewable resources; creates jobs; and provides a larger market for agricultural goods.

Commuter Options Programs: Commuter Choice Leadership Initiative; Parking Cash-Out; Transit Check; Telecommute Initiative; Others[6]

Descriptions:[7] EPA sponsors a number of voluntary commuter initiatives to reduce emissions of greenhouse gases and criteria pollutants from the transportation sector:

- The *Commuter Choice Leadership Initiative* is a voluntary employer-adopted program that helps to increase commuter flexibility by expanding mode options, arranging flexible scheduling, and offering work location choices. EPA provides a variety of technical support measures and recognition. Commuter Choice has also been implemented for workers at all federal agencies.
- *Parking Cash-Out* is a benefit in which employers offer employees the option to receive taxable income in lieu of a free or subsidized parking space at work. A similar set of tax law changes allows employers to offer nontaxable transit/vanpool benefits, currently up to $100 monthly.
- The *National Environmental Policy Institute* (NEPI) initiated an incentive-based pilot Telecommuting Initiative that provides employers with tradable criteria pollutant emission credits for reducing vehicle miles traveled from telecommuting workers and is working to include greenhouse gases. Given rapid technological advances, telecommuting offers substantial opportunity to reduce the need for some employees to travel to work.

Objective: These programs help to reduce growth in single-occupant-vehicle commuting by providing incentives and alternative modes, timing, and locations for work.

Greenhouse gases affected: The principal greenhouse gas affected in the transportation sector is carbon dioxide. However, transportation actions also contribute to reductions of nitrous oxide and methane.

Type of policy or measure: Voluntary and negotiated agreements, tax incentives to employers and employees, information, education, and outreach.

Status of implementation: Launched in 2000, EPA's Commuter Choice Leadership Initiative intends to sign up 550 employers by end of 2002. The Taxpayer Relief Act of 1997 put Parking Cash Out and Transit Check into effective practice. A number of states, notably California, have implemented measures to encourage Parking Cash Out. NEPI is launching the Telecommuting Initiative effort in 2001 in five major metropolitan areas. EPA estimates greenhouse gas emission reductions of 3.5 teragrams of CO_2 in 2000, and projects reductions of more than 14 teragrams of CO_2 in 2010.

Implementing entities: Commuter Choice—EPA and DOT, in partnership with employers; Parking Cash Out and Transit Check—individual employers, through the revision in the Internal Revenue Service Code; Telecommuting Initiative—NEPI in collaboration with EPA, DOT, and DOE.

Costs of policy or measure: These programs impose modest, voluntarily borne costs on businesses, which are largely offset by other savings. Commuter option programs generate benefits through increased employee productivity, satisfaction, and lower taxes. Participants in the telecommuting initiative can sell emission credits on the open market or to states for use in state implementation plans. Educational and outreach programs pose no direct costs on businesses.

Non-GHG mitigation benefits of policy or measure: These programs will reduce energy use, traffic congestion, and criteria pollutant emissions, including nitrogen oxides and volatile organic compounds (which are ozone precursors considered to have indirect global warming potential).

Interaction with other policies or measures: These programs are synergistic with one another, with "smart growth" and transit programs, and with state implementation plans and other required measures under the Clean Air Act.

[6] Part of Action 20 in the 1997 *U.S. Climate Action Report*.
[7] These commuter options replace EPA's *Transportation Partners Program*.

Smart Growth and Brownfields Policies

Description: EPA began the Air-Brownfields Pilot Program in response to concerns that air regulations were preventing the redevelopment of brownfields, which are abandoned industrial properties that may be moderately contaminated. The program demonstrated that brownfield redevelopment and local land-use policies, such as infill and transit-oriented development, could help reduce vehicle miles traveled.

EPA issued *Improving Air Quality Through Land Use Activities* in 2001 on how to take credit in a state implementation plan (SIP) for local land-use policies that reduce emissions. Many cities have launched initiatives to encourage such development and plan to increase development beyond what was anticipated in their Clean Air Act SIP submissions.

Other brownfield initiatives include three types of grants: Assessment Demonstration Pilots, to assess brownfield sites and test cleanup and redevelopment models; Job Training Pilots, to train residents of affected communities to facilitate cleanup and work in the environmental field; and Cleanup Revolving Loan Fund Pilots, which capitalize loan funds for cleaning up brownfields.

The Smart Growth Network funds and facilitates a variety of smart growth-supportive activities and forums. The American Planning Association's Growing Smarter Program plans to target state government officials with a National Planning Statute Clearinghouse and Database, and the *Growing Smart℠ Legislative Guidebook*, which will include model statutes for transportation demand management. Additionally, a consensus has emerged that shifting funding to transit, nonmotorized modes, and other alternatives more compatible with Smart Growth can increase demand for these alternatives, facilitate infill development, and decrease vehicle miles traveled and greenhouse gas emissions. Federal research and outreach have increased the inclusion of these induced demand/land-use issues into transportation models and planning processes.

Objective: These initiatives help to reduce the length and number of motorized trips.

Greenhouse gases affected: Primarily carbon dioxide, but also nitrous oxide and methane.

Type of policy or measure: Technical assistance, outreach, and voluntary acceptance of air- quality credits based on meeting guidance standards.

Status of implementation: The Air-Brownfields Pilot Program is complete, the land-use SIP guidance based on it has been pilot-tested in four cities, and credit issuance begins in 2001. Technical assistance underway includes over 350 Assessment Demonstration pilot programs, over 100 Loan Fund pilot programs, and nearly 50 Job Training and Development pilot programs. EPA estimates reductions of 2.7 teragrams of CO_2 in 2000, and projects 11 teragrams of CO_2 by 2010.

Implementing entity or entities: EPA, states, municipalities, and planning agencies.

Costs of policy or measure: Federal guidance for voluntary credits imposes no cost. Private infill and brownfields development remain voluntary market-based decisions, and so impose no private costs.

Non-GHG mitigation benefits of policy or measure: These initiatives reduce energy use, congestion, infrastructure costs, criteria air pollutants, and health threats from contaminated land; increase the tax base; and return contaminated land to productive use.

Interaction with other policies or measures: These initiatives interact with SIPs.

Ground Freight Transportation Initiative

Description: This initiative is a voluntary program aimed at reducing emissions from the freight sector through the implementation of advanced management practices and efficient technologies. It will focus on four areas: (1) assessing the most promising technology and management practices and identifying their savings potential; (2) inviting stakeholder participation (associations, independent truckers, fleet managers, state and local governments, manufacturers, etc.) to determine the feasibility of these opportunities and set program performance goals; (3) designing an emissions calculation tool that helps companies determine their environmental impact and identify cost-effective options for reaching the program's performance goals; and (4) developing, implementing, and publicizing a partnership initiative with these stakeholders.

Objective: This program facilitates reductions in the growth of emissions associated with ground freight (truck and rail) through the increased use of efficient management practices, such as speed management, intermodal use and load matching, and advanced technologies, such as idle control systems and aerodynamics.

Greenhouse gases affected: The principal greenhouse gas affected in the transportation sector is carbon dioxide. However, transportation actions also contribute to reductions of nitrous oxide.

Type of policy or measure: Voluntary and negotiated agreements, shipper policy changes, information, education, and outreach.

Status of implementation: The program was kicked off in December 2001; a full program launch will occur in the summer of 2002. EPA projects greenhouse gas emission reductions of 66 teragrams of CO_2 in 2010.

Implementing entities: EPA and possibly DOT. Other organizations, such as the American Trucking Association and the American Association of Railroads, will prove to be valuable allies in encouraging their members to join the initiative as member companies.

Costs of policy or measure: Similar programs impose modest, voluntarily borne costs on businesses, which are largely offset by other savings. Some options may have substantial financial investments, such as truck stop electrification. Three different stakeholder groups, including shippers, carriers, and manufacturers, will decide which strategies are most effective in their implementation and return on investments. Educational and outreach programs pose no direct costs on businesses.

Non-GHG mitigation benefits of policy or measure: The program will reduce energy use, traffic congestion, and criteria pollutant emissions, including nitrogen oxides and volatile organic compounds—ozone precursors considered to have indirect global warming potential.

Interaction with other policies or measures: This program is synergistic with state implementation plans and other required measures under the Clean Air Act.

Clean Automotive Technology

Description: EPA's Clean Automotive Technology (CAT) program is a research and partnership program with the automotive industry to develop advanced clean and fuel-efficient automotive technology.

Objectives: The program's objectives are to develop break-through engine and powertrain technologies to provide dramatic fuel economy improvement in cars and trucks—without sacrificing affordability, performance, or safety while meeting emissions standards.

Greenhouse gases affected: Primarily carbon dioxide, but also nitrous oxide and methane.

Type of policy or measure: Voluntary, research.

Status of implementation: EPA has demonstrated the CAT program's potential to meet its objectives. EPA is collaborating with its partners to transfer the unique EPA-patented highly efficient hybrid engine and powertrain components, originally developed for passenger car applications, to meet the more demanding size, performance, durability, and towing requirements of sport utility vehicles and urban delivery vehicle applications, while being practical and affordable with ultra-low emissions and ultra-high fuel efficiency. In 2001, the program signed a historic Cooperative Research and Development Agreement and License Agreement with the Ford Corporation to invest further develop hydraulic hybrid and high-efficiency engine technology with an aim toward putting a pilot fleet of vehicles on the road by the end of the decade.

Implementing entities: EPA and the National Vehicle and Fuel Emissions Laboratory working in collaboration with the Ford and Eaton Corporations.

Non-GHG mitigation benefits of policy or measure: This partnership increases energy efficiency, economic productivity, and competitiveness; reduces energy dependence; expands the nation's energy portfolio; has non-GHG environmental benefits; strengthens public–private cooperation and interaction; and creates jobs.

Interaction with other policies or measures: CAT could interact with state implementation plans and other Clean Air Act requirements.

DOT Emission-Reducing Initiatives

DOT provides funding for and oversees transportation projects and programs that are implemented by the states and metropolitan areas across the country. Funding is provided under numerous programs that have specific purposes broadly encompassed by DOT's five main goals in the areas of: safety, mobility, economic growth and trade, national security, and human and natural environment.

Flexibility exists under the law to use program funds for a variety of different project types that are consistent with the overall purposes of those funds. As such, highway funds may be used for transit, pedestrian improvements, bikeways, ride-sharing programs, and other transportation-demand-management projects, a well as system improvements on the road network. The approach is decentralized in that, based on their own needs assessments, state and local governments determine what projects should be implemented and use DOT funds in ways consistent with the purpose of the funding program.

From 1998 and through 2003, approximately $218 billion is available to the states and metropolitan areas under DOT's surface transportation programs. While none of these programs specifically targets greenhouse gas reduction, many of them reduce greenhouse gases as an ancillary benefit. Estimating the amount of greenhouse gases reduced is very difficult, since project selection is left to the individual states and metropolitan areas, and this benefit will vary among projects. Following is a sampling of some of the more significant DOT programs that are likely to have ancillary greenhouse gas-reduction benefits.

- *Transit Programs:* Under the current authorization, transit programs will receive $41 billion between fiscal years 1998 and 2003. Programs that allow funding for new starts of transit systems, fixed guideway modernization, bus system improvements and expansions, and high-speed rail development can have greenhouse gas reduction benefits. However, not all of the transit funding will have these benefits, since projects that help to operate or maintain the current system will probably not attract new riders.
- *Congestion Mitigation and Air Quality Improvement:* This program is targeted at reducing ozone, carbon monoxide, and particulate matter generated by transportation sources. As the most flexible program under the current law, it funds new transit services, bicycle and pedestrian improvements, alternative fuel projects, traffic flow improvements, and other emission-reducing projects. As such, several projects funded under the program will likely reduce greenhouse gases as well. This program provides about $1.35 billion a year to the states.
- *Transportation Enhancements:* Historically, about half of all Enhancement funding has been for bicycle and pedestrian improvements, which certainly have some greenhouse gas reduction benefits. The Transportation Equity Act for the 21st Century has authorized about $560 million a year is for Enhancement activities over a six-year period.
- *Transportation and Community System Preservation Pilot Program:* This unique pilot program helps develop more livable communities by addressing environmental, economic, and equity needs. States, local governments, and metropolitan planning organizations are eligible for discretionary grants to plan and implement strategies that improve the efficiency of the transportation system, reduce environmental impacts and the need for costly future public infrastructure investments, and ensure efficient access to jobs, services, and centers of trade. A total of $120 million is authorized for this program from fiscal years 1999 through 2003.
- *Corporate Average Fuel Economy (CAFE) Standards:* U.S. fuel economy standards for automobiles and light trucks were adopted primarily to save energy. Compliance is based on average performance, and additional credit toward compliance is available to alternatively fueled vehicles. New vehicles offered for sale are also required to display labels that give consumers a clear indication of fuel economy. DOT is currently examining other market-based approaches to increase the average fuel economy of new vehicles, and will review and provide recommendations on future CAFE standards.

Industry (Non-CO_2)

Natural Gas STAR[8]

Description: This a voluntary partnership between EPA and the U.S. natural gas industry is designed to overcome barriers to the adoption of cost-effective technologies and practices that reduce methane emissions.

Objective: The program's primary objective is to reduce methane emissions from U.S. natural gas systems.

Greenhouse gas affected: Methane.

Type of policy or measure: Voluntary/negotiated agreement.

Status of implementation: Launched in 1993 with the transmission and distribution sectors, Natural Gas STAR has since expanded twice—to the production sector in 1995 and the processing sector in 2000. The program includes 88 corporate partners representing 40 percent of U.S. natural gas production, 72 percent of transmission company pipeline miles, 49 percent of distribution company service connections, and 23 percent of processing throughput.

Natural Gas STAR has developed a range of tools designed to help corporate partners implement best management practices to reduce leakage. These include an implementation guide, streamlined electronic reporting, a series of "lessons learned" studies, focused workshops, and partner-to-partner information exchanges. Extensive partner support for and continued expansion of the program, combined with ongoing feedback from partners, demonstrate the effectiveness of these tools in promoting methane reduction activities.

EPA estimates that the program reduced 15 teragrams of CO_2 equivalent (38 Bcf methane) in 2000. Because of the expanded program's tremendous success, EPA projects the program will reduce 22 teragrams of CO_2 equivalent by 2010.

Implementing entities: EPA, in partnership with the U.S. natural gas industry.

Costs of policy or measure: Through Natural Gas STAR, partner companies implement only cost-effective methane reduction practices. Practices implemented since the program's launch have saved U.S. natural gas companies billions of dollars worth of gas that would otherwise have leaked to the atmosphere.

Non-GHG mitigation benefits of policy or measure: Many of the practices that partner companies undertake to reduce methane emissions also reduce emissions of air pollutants and improve safety.

Interaction with other policies or measures: None.

Contact: Paul Gunning, EPA, Climate Protection Partnerships Division, (202) 564-9736, gunning.paul@epa.gov.

[8] Action 32 in the 1997 *U.S.Climate Action Report;* continuing.

Coalbed Methane Outreach Program[9]

Description: This program reduces methane emissions associated with coal mining operations by (1) working with the coal industry and other stakeholders to identify and remove obstacles to increased investment in coalbed methane recovery projects, and (2) raising awareness of opportunities for profitable investments.

Objective: The program aims to cost-effectively reduce methane emissions from U.S. coal mining operations.

Greenhouse gas affected: Methane.

Type of policy or measure: Information, education, and outreach.

Status of implementation: EPA began working with the coal mining industry in1990 and officially launched the Coalbed Methane Outreach Program (CMOP) in 1994. In 1990, coal mines captured and utilized only 25 percent of the methane produced from their degasification systems. By 1999, the recovery fraction had grown to over 85 percent. To eliminate the remaining methane emitted from degasification systems, CMOP is working with industry to demonstrate the use of flare technology, which has never been employed at a U.S. mine.

With the program's tremendous success in reducing methane emissions from degasification systems, CMOP has expanded its focus to the methane emitted from coal mine ventilation systems. Ventilation air from coal mines typically contains methane at concentrations of just a few percent, yet accounts for 94 percent of the remaining methane emissions from underground coal mines—over 90 billion cubic feet of methane (about 36.6 teragrams of CO_2 equivalent) annually. CMOP is working with industry to demonstrate and deploy newly developed technologies that can reduce these emissions substantially over the next few years.

CMOP has developed a range of tools designed to overcome barriers to recovery and combustion of coal mine methane. These include numerous technical and economic analyses of technologies and potential projects; mine-specific project feasibility assessments; state-specific analyses of project potential; guides to state, local, and federal assistance programs; and market evaluations. CMOP has worked with operators of virtually every U.S. underground coal mine to apply these tools and nurture each project.

In 2000, EPA estimates that CMOP reduced methane emissions by more than 7 teragrams of CO_2 equivalent (19 Bcf methane). Because of unanticipated mine closures, EPA projections of reductions for the CMOP program have been reduced slightly since the 1997 submission, from 11 to 10 teragrams of CO_2 equivalent in 2010. However, CMOP's expected success in reducing ventilation air methane over the next few years may lead to an upward revision in the projected reductions for 2010 and beyond.

Implementing entities: EPA, in partnership with the U.S. coal industry.

Costs of policy or measure: Coal mines implement only cost-effective methane recovery and utilization projects. Projects implemented since the program's launch have earned U.S. coal companies million of dollars in energy sales.

Non-GHG mitigation benefits of policy or measure: CMOP improves both the efficiency of methane recovery from coal mines and mine safety.

Interaction with other policies or measures: None.

Contact: Karl Schultz, EPA, Climate Protection Partnerships Division, (202) 564-9468, schultz.karl@epa.gov.

[9] Action 35 in the 1997 *U.S.Climate Action Report*; continuing.

Significant New Alternatives Program[10]

Description: Section 612 of the Clean Air Act authorized EPA to develop a program for evaluating alternatives to ozone-depleting chemicals.

Objective: The Significant New Alternatives Program (SNAP) facilitates the smooth transition away from ozone-depleting chemicals in major industrial and consumer sectors, while minimizing risks to human health and the environment. Sectors that the program focuses on include air conditioning, refrigeration, aerosols, solvent cleaning, foams, fire suppression and explosion protection, adhesives, coatings and inks, and sterilants.

Greenhouse gases affected: Hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Type of policy or measure: While SNAP actions are regulatory, the program also serves as an information clearinghouse on alternative chemicals and technologies, and collaborates extensively with industry and other government partners on various research activities.

Status of implementation: Hundreds of alternatives determined to reduce overall risks to human health and the environment have been listed as acceptable substitutes for ozone-depleting chemicals. EPA has also used the authority under Section 612 to find unacceptable uses or narrow the scope of uses allowed for HFCs and PFCs with high global warming potentials for specific applications where better alternatives exist. EPA estimates that the program has reduced emissions by 50 teragrams of CO_2 equivalent in 2000 and projects reductions of 156 teragrams of CO2 equivalent in 2010.

Implementing entity: SNAP regulations are promulgated by EPA and enforced when needed at the national level.

Costs of policy or measure: Costs are considered to be neutral in aggregate. SNAP either expands lists of available alternatives to ozone-depleting chemicals that have been, or are being, phased out under the *Montreal Protocol*, or restricts the use of potential substitutes. In the first case, potential users are not required to use any one particular alternative listed as acceptable. Where SNAP finds the use of alternatives (e.g., PFCs) unacceptable, the decision is based on the fact that other viable (i.e., effective and affordable) alternatives are available that pose less risk to human health or the environment.

Non-GHG mitigation benefits of policy or measure: In addition to encouraging responsible use of greenhouse gases as substitutes for ozone-depleting chemicals, SNAP has increased worker and consumer safety by restricting the use of flammable or toxic chemicals, has encouraged the overall reduction in chemicals used in various applications (e.g., solvent cleaning), and, in some cases, has restricted the use of volatile organic chemicals that generate ground-level ozone.

Interaction with other policies or measures: SNAP compliments the phase-out of ozone-depleting chemicals mandated under the *Montreal Protocol* and Clean Air Act. The program has worked to maintain balance between the need to find safe and effective alternatives to ozone-depleting chemicals, while mitigating the potential effects of those alternatives on climate. HFCs, and in some cases, PFCs, have been listed as acceptable substitutes for specific end uses where safer or effective alternatives are not available. Depending on the end use, efficacy has been defined as effectiveness in suppressing or preventing fires and explosions, thermal insulation value, or heat transfer efficiency.

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[10] Action 40 in the 1997 *U.S.Climate Action Report*.

HFC-23 Partnership[11]

Description: This partnership works to cost-effectively reduce emissions of the potent greenhouse gas HFC-23, which is a by-product in the manufacture of HCFC-22.

Objective: Through this program, EPA encourages companies to develop and implement technically feasible, cost-effective processing practices or technologies to reduce HFC-23 emissions.

Greenhouse gas affected: HFC-23.

Type of policy or measure: Voluntary/negotiated agreement.

Status of implementation: This is an ongoing program with all the U.S. producers of HCFC- 22. The program partners have effectively reduced emissions of HFC-23 through process optimization, reaching the total reductions that can likely be achieved through this technique. In addition, some companies have used thermal destruction to reduce or eliminate their emissions. The partnership has encouraged the industry to reduce the intensity of HFC-23 emissions (the amount of HFC-23 emitted per kilogram of HCFC-22 manufactured) by 35 percent. Thus, despite an estimated 35 percent increase in production since 1990, total emissions have declined by 15 percent. EPA estimates reductions of 17 teragrams of CO_2 equivalent in 2000 and projects reductions of 27 teragrams of CO_2 equivalent in 2010.

Implementing entity: EPA is the sole government entity implementing this program. The program is open to all producers of HCFC-22 operating in the United States.

Costs of policy or measure: Emission reductions achieved through process optimization are cost-effective.

Non-GHG mitigation benefits of policy or measure: None.

Interaction with other policies or measures: None.

Contact: Sally Rand, EPA, Global Programs Division, (202) 564-9739, rand.sally@epa.gov.

[11] Action 41 in the 1997 *U.S.Climate Action Report.*

Partnership with Aluminum Producers[12]

Description: This partnership program with the primary aluminum smelting industry is designed to reduce perfluorocarbons emitted as a by-product of the smelting process.

Objective: EPA is partnering with primary aluminum producers to reduce perfluoromethane and perfluoroethane where technically feasible and cost-effective. The overall goal of the partnership is to reduce emissions by 30–60 percent from 1990 levels by 2000. Future reduction goals are being set.

Greenhouse gas affected: Perfluoromethane and perfluoroethane.

Type of policy or measure: Voluntary/negotiated agreement.

Status of implementation: Since the partnership was formed in 1996, it has had great success in further characterizing the emissions from smelter operations and reducing overall emissions. As of 2000, a new agreement has been negotiated to continue to explore and implement emission reduction options through 2005. The overall goal for the program in 2000 has been met, with emissions reduced by about 50 percent relative to 1990 levels, on an emissions per unit of product basis. Absolute emissions have been reduced by an even greater percentage because some facilities have closed due to high energy costs in the Northwest. EPA estimates reductions of 7 teragrams of CO_2 equivalent in 2000 and projects reductions of 10 teragrams of CO_2 equivalent in 2010.

Implementing entity: EPA is the sole government entity implementing this program. The program is open to all U.S. primary aluminum producers.

Costs of policy or measure: Factors that cause these emissions are a sign of efficiency loss. Emission reductions result in process enhancements.

Non-GHG mitigation benefits of policy or measure: None.

Interaction with other policies or measures: None.

Contact: Sally Rand, EPA, Global Programs Division, (202) 564-9739, rand.sally@epa.gov.

[12] Action 42 in the 1997 *U.S. Climate Action Report*.

Environmental Stewardship Initiative[13]

Description: Environmental Stewardship Initiative was a new action proposed as part of the 1997 *U.S. Climate Action Report*, based on new opportunities to reduce emissions gases with high global warming potentials.

Objective: The objective initially was to limit emissions of hydrofluorocarbons, perfluororcarbons, and sulfur hexafluoride (which are potent greenhouse gases) in three industrial applications: semiconductor production, electric power systems, and magnesium production. Additional sectors are being assessed for the availability of cost-effective emission reduction opportunities and are being added to this initiative.

Greenhouse gases affected: Hydrofluorocarbons, perfluororcarbons, and sulfur hexafluoride.

Type of policy or measure: Voluntary/negotiated agreement.

Status of implementation: EPA launched the semiconductor partnership in 1996 and launched the electric power system and magnesium partnerships in 1999. Implementation of the magnesium and electric power system partnerships is ongoing, with no sunset date. The semiconductor partnership will be ongoing through 2010. EPA currently projects that the programs will reduce emissions by 93 teragrams of CO_2 equivalent in 2010. Because resource constraints delayed implementation of the electric power system and magnesium partnerships, EPA's estimate of the reduction in 2000, 3 teragrams of CO_2 equivalent, is less than expected.

Implementing entity: EPA is the sole government entity implementing this initiative. Partnerships are open to manufacturers operating in the United States and to electric power systems with equipment containing greater than 15 pounds of sulfur hexafluoride and all primary and die-casting magnesium operations.

Costs of policy or measure: Emission reductions are believed to be possible through inexpensive and cost-effective means.

Non-GHG mitigation benefits of policy or measure: None.

Interaction with other policies or measures: None.

Contact: Sally Rand, EPA, Global Programs Division, (202) 564-9739, rand.sally@epa.gov.

[13] New in the 1997 *U.S. Climate Action Report*.

Agriculture

Agriculture Outreach Programs: AgSTAR; Ruminant Livestock Efficiency Program[14]

Description: Specific practices aimed at directly reducing greenhouse gas emissions are developed, tested, and promoted through such outreach programs as AgSTAR and the Ruminant Livestock Efficiency Program (RLEP).

Objectives: Through outreach to the agricultural community, these programs aim to demonstrate the technical feasibility of the practices they promote.

Greenhouse gases affected: All greenhouse gases, but the focus has been on methane.

Type of policy or measure: Voluntary, information.

Status of implementation: These programs have been implemented. Their assessed impacts have changed since the 1997 submission. While their impact on greenhouse gas emissions has been small on a national scale, program stakeholders in the agricultural community have demonstrated that the practices promoted by the programs can be effective in reducing greenhouse gas emissions and increasing productivity.

Twelve digesters have been installed on AgSTAR charter farms, resulting in a 37,000 teragrams of CO_2 equivalent per year reduction of emissions. An additional 13 facilities are in various stages of planning, pending additional funding. Installations at charter farms have demonstrated the technical and economic feasibility of biogas production and utilization on livestock production facilities with a wide range of manure-handling systems. Workshops related to the program have been held around the country to further promote biogas production and utilization technology. In all, 31 systems are operating in the United States, resulting in a total annual reduction of approximately 110,000 teragrams of CO_2 equivalent.

The RLEP has funded the establishment of 50 demonstration farms throughout the Southeast. Production efficiency improvements have been recorded at these farms, and numerous field days have been held to transfer this knowledge to others. The RLEP has also supported the development of a cow/calf management course aimed at improving animal performance measures directly related to greenhouse gas emissions. In addition, with the support of state-level nongovernment organizations, such as the Virginia Forage and Grassland Council, the RLEP has helped to improve forage and pasture management by encouraging the effective use of rotational grazing practices.

EPA and the U.S. Department of Agriculture (USDA) will continue to evaluate these and other barriers and identify appropriate actions to address them.

Implementing entities: EPA and USDA.

Non-GHG mitigation benefits of policy or measure: Technologies used at certain confined animal feeding operations to reduce methane concentrations are achieving other environmental benefits, including odor control and nutrient management opportunities. In addition, many of the practices recommended by the RLEP for improving forage production remove carbon dioxide from the atmosphere by storing carbon in the soil as organic matter.

[14] Actions 38 and 39 in the 1997 *U.S. Climate Action Report*.

Nutrient Management Tools[15]

Description: The Nitrogen Leaching and Economic Assessment Package (NLEAP) was enhanced to include the ability to quantify nitrous oxide losses to the atmosphere. USDA began collaborating with partners on the development of two nutrient management tools that could be used to improve overall nitrogen fertilizer use efficiency at the farm level.

Objectives: This effort aims to build and make available to producers a database that documents nitrous oxide emissions from different types of nitrogen fertilizer management. These efforts are intended to improve the overall efficiency of nitrogen fertilizer use at the farm level and to reduce nitrous oxide emissions from the application of nitrogen fertilizer.

Greenhouse gas affected: Nitrous oxide.

Type of policy or measure: Research, information.

Status of implementation: The NLEAP model has been implemented. USDA is working with Purdue University to develop and implement the Manure Management Planner (MMP), a nutrient budgeting tool. MMP enables producers, and others who provide producers nutrient management assistance, to allocate nutrients based on a crop-specific nutrient budget that matches actual nutrient application rates with recommended application rates or crop removal rates. The combination of MMP and NLEAP will enable producers to both develop a detailed crop nutrient budget as well as assess its impact on nitrous oxide emissions. Proper use and crediting of the nitrogen contributed by legume crops, and the availability and use of both NLEAP and MMP, will assist in reducing nitrous oxide emissions. In the 1997 submission, projected reductions from this action were 18.3 teragrams of CO_2 equivalent. At this time, more analysis is needed to develop estimates and projections of emissions from this action.

Implementing entities: USDA, working with partners in 20 states.

[15] Part of Action 17 in the 1997 *U.S. Climate Action Report*.

USDA Commodity Credit Corporation Bioenergy Program

Description: USDA's Commodity Credit Corporation (CCC) Bioenergy Program pays U.S. commercial bioenergy producers to increase their bioenergy production from eligible commodities. Payments are based on the increase in bioenergy production compared to the previous year's production fiscal year to date. To receive payments, producers must provide CCC evidence of increased purchase of agricultural commodities and increased production of bioenergy. The program provides up to $150 million for fiscal years 2001 and 2002, which is paid out on a quarterly fiscal year-to-date basis. A payment limitation restricts the amount of funds any single producer may obtain annually under the program to 5 percent, or $7.5 million.

Objective: The program's goal is to expand industrial consumption of agricultural commodities by promoting their use in the production of bioenergy.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Economic.

Status of implementation: The program was implemented at $15 million in fiscal year 2001 and will receive $150 million in fiscal year 2002.

Implementing entities: The program is administered by USDA's Farm Service Agency and funded by CCC.

Non-GHG mitigation benefits of policy or measure: The program provides incentives for agriculture to be part of the nation's energy solutions by promoting the industrial consumption of agricultural commodities for bioenergy production; expands demand for corn and other grains used in ethanol production and creates new markets for oilseed crops; and increases net returns for ethanol and biodiesel processors, which will encourage expanded production capacity for these fuels and enhance rural development.

Conservation Reserve Program: Biomass Project

Description: USDA has implemented Section 769 of the Agriculture, Rural Development, Food and Drug Administration and Related Agencies Appropriations Act of 2000. This act authorizes Conservation Reserve Program (CRP) land for pilot biomass projects for the harvesting of biomass to be used for energy production. The program restricts all land subject to CRP contracts that participates in a biomass pilot project from being harvested for biomass more than once every other year. No more than 25 percent of the total acreage enrolled in any crop-reporting district may be harvested in any year. And participants in a project must agree to a 25 percent reduction in their normal CRP annual rental payment for each year in which the acreage is harvested.

Objective: The project's objective is to provide biomass for energy production.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Economic.

Status of implementation: The program has been implemented. The Secretary of Agriculture has approved four projects that will produce electricity using grasses in Iowa, hybrid poplar trees in Minnesota, willows in New York, and switchgrass in New York and Pennsylvania.

Implementing entity: USDA.

Non-GHG mitigation benefits of policy or measure: This project enhances rural development.

Forestry

Forest Stewardship[16]

Description: USDA's Forest Stewardship and Forest Stewardship Incentive Programs provide technical and financial assistance to nonindustrial, private forest owners. The Forest Stewardship Program helps such owners prepare integrated management plans, and the Stewardship Incentives Program cost-shares up to 75 percent of approved management practices, such as afforestation and reforestation. USDA's Forest Service manages both programs, in cooperation with state forestry agencies. A recent survey of landowners with Forest Stewardship Plans found that they were three times as likely to implement these plans if they received financial and technical assistance.

Objective: The programs' intent is to improve conservation of our lands through enhanced planning and management. An original goal of the Stewardship Incentive Program was to increase tree planting in the United States by over 94,000 hectares (232,180 acres) a year within five years and to maintain this expanded level of planting for another five years.

Greenhouse gas affected: Carbon dioxide.

Type of policy or measure: Voluntary, information.

Status of implementation: The programs have been implemented. During fiscal years 1991–99, 150,964 hectares (372,881 acres) of trees were planted.

Implementing entities: USDA Forest Service in cooperation with state forestry agencies.

Costs of policy or measure: The cost of the program during this same period was about $23.5 million. The program was not funded for fiscal years 1999 through 2001.

Non-GHG mitigation benefits of policy or measure: About 147 million hectares of U.S. forests are nonindustrial, private forestlands. Private forests provide many ecological and economic benefits. They currently provide about 60 percent of our nation's timber supply, with expectations of increases in the future. Improved planning and management on nonindustrial, private forestlands and marginal agricultural lands can help meet resource needs and provide important ancillary benefits that improve environmental quality—e.g., wildlife habitat, soil conservation, water quality protection and improvement, and recreation. Additionally, tree planting and forest management increase the uptake of carbon dioxide and the storage of carbon in living biomass, soils, litter, and long-life wood products.

[16] Action 44 in the 1997 *U.S. Climate Action Report*.

Waste Management

Climate and Waste Program[17]

Preserving Resources, Preventing Waste

Description: This program encourages recycling and source reduction for the purpose of reducing greenhouse emissions. EPA is implementing a number of targeted efforts within this program to achieve its climate goals. WasteWise is EPA's flagship voluntary waste reduction program. EPA initiatives on extended product responsibility and biomass further reduction efforts through voluntary or negotiated agreements with product manufacturers and market development activities. The Pay-As-You-Throw initiative provides information to community-based programs on cost incentives for residential waste reduction.

Objective: The program aims to reduce greenhouse gas emissions through progressive waste management activities.

Greenhouse gases affected: The program takes a life-cycle perspective on greenhouse gas emissions from waste management practices, accounting for emissions and sinks from energy use, forest management, manufacturing, transportation, and waste management. The principal greenhouse gases affected are carbon dioxide and methane; nitrous oxide and perfluorocarbons are also affected.

Type of policy or measure: The program is a voluntary effort, using partnerships, information dissemination, technical assistance, and research to promote greenhouse gas reductions.

Status of implementation: WasteWise currently has over 1,200 partners, representing 53 civic and industrial sectors and ranging from Fortune 1000 companies to small local governments. Extended product responsibility is facilitating negotiations between industry and state leaders on product stewardship systems (e.g., carpets and electronics). The biomass effort includes a compost quality seal program, compost use for state highway projects, and market development for bio-based products. Over 5,000 communities are participating in the program's Pay-As-You-Throw educational initiative, which provides ongoing technical assistance to stakeholders ranging from industry to governments and international organizations. EPA estimates reductions of 8 teragrams of CO_2 equivalent in 2000 and projects reductions of 20 teragrams of CO_2 equivalent in 2010.

Implementing entities: EPA, working with government, industry, and nongovernment organizations, acts as the primary implementing agency.

Costs of policy or measure: Most of the waste-reduction measures result in cost savings or minimal costs when viewed from a full-cost accounting perspective.

Non-GHG mitigation benefits of policy or measure: Measures under this program yield collateral benefits, including energy savings, and reduced emissions from raw materials acquisition, virgin materials manufacturing, and waste disposal.

Interaction with other policies or measures: EPA's Climate and Waste Program has assisted organizations interested in quantifying and voluntarily reporting greenhouse gas emission reductions (e.g., through DOE's 1605b Program) from waste management activities. Also, EPA's activities under Initiative 16 complement its methane reduction programs (Actions 33 and 34), including the Landfill Methane Outreach Program.

[17] Part of Action 16 in the 1997 *U.S. Climate Action Report*, continuing.

Stringent Landfill Rule[18]

Description: Landfill gas, which is the largest contributor to U.S. anthropogenic methane emissions, also contains significant quantities of nonmethane organic compounds. Landfill New Source Performance Standards and Emissions Guidelines (Landfill Rule) require large landfills to capture and combust their landfill gas emissions. Due to climate concerns, this rule was made more stringent (i.e., by lowering the emissions level at which landfills must comply with the rule from 100 to 50 megagrams of nonmethane organic compounds per year), resulting in greater landfill gas recovery and combustion.

The rule works hand-in-hand with EPA's Landfill Methane Outreach Program to promote cost-effective reductions in methane emissions at larger landfills. The Landfill Methane Outreach Program provides landfills with technical, economic, and outreach information to help them comply with the rule in a way that maximizes benefits to the environment while lowering costs.

Objective: The rule requires U.S. landfills to capture and combust their landfill gas emissions. This reduces their emissions of methane, as well as nonmethane organic compounds.

Greenhouse gas affected: Methane.

Type of policy or measure: Regulatory.

Status of implementation: The Landfill Rule was promulgated under the Clean Air Act in March 1996, and implementation began at the state level in 1998. Preliminary data on the impact of the rule indicate that increasing its stringency has significantly increased the number of landfills that must collect and combust their landfill gas. EPA estimates reductions in 2000 at 15 teragrams of CO_2 equivalent. The current projection for 2010 is 33 teragrams of CO_2 equivalent, although the preliminary data suggest that reductions from the more stringent rule may be even greater over the next decade.

Implementing entities: EPA promulgated the Landfill Rule, and individual states implement it.

Costs of policy or measure: The rule's objective is to reduce nonmethane organic compound emissions because of their contribution to local air pollution. Combustion of the of nonmethane organic compound-containing landfill gas also reduces the methane it contains, at no incremental cost.

Non-GHG mitigation benefits of policy or measure: Combusting landfill gas reduces emissions of nonmethane organic compounds as well as methane. It also can reduce odors and improve safety by stopping landfill gas migration.

Interaction with other policies or measures: The rule interacts with the Landfill Methane Outreach Program.

[18] Action 33 in the 1997 *U.S. Climate Action Report*; continuing.

Landfill Methane Outreach Program[19]

Description: Landfills are the largest source of U.S. anthropogenic methane emissions. Capture and use of landfill gas reduce methane emissions directly and carbon dioxide emissions indirectly by displacing the use of fossil fuels. The Landfill Methane Outreach Program (LMOP) works with landfill owners, state energy and environmental agencies, utilities and other energy suppliers, industry, and other stakeholders to lower the barriers to landfill gas-to-energy project development.

While LMOP works hand-in-hand with EPA's Landfill Rule to promote cost-effective reductions in methane emissions at larger landfills, it focuses its outreach efforts on smaller landfills not regulated by the rule, encouraging the capture and use of methane that would otherwise be emitted to the atmosphere. LMOP has developed a range of tools to help landfill operators overcome barriers to project development, including feasibility analyses, software for evaluation project economics, profiles of hundreds of candidate landfills across the country, a project development handbook, and energy end-user analyses.

Objective: The program aims to reduce methane emissions from U.S. landfills.

Greenhouse gases affected: Methane and carbon dioxide.

Type of policy or measure: Voluntary/negotiated agreements, information, education, and outreach.

Status of implementation: Launched in December 1994, LMOP has achieved significant reductions through 2000, reducing methane emissions from landfills by an estimated 11 teragrams of CO_2 equivalent in that year alone. The program includes over 240 allies and partners, and the number of landfill gas-to-energy projects has grown from less than 100 in the early 1990s to almost 320 projects by the end of 2000. EPA projects reductions of 22 teragrams of CO_2 equivalent in 2010.

Implementing entities: EPA, in partnership with landfills and the landfill gas-to-energy industry.

Costs of policy or measure: LMOP participants implement only cost-effective landfill gas-to-energy projects. Projects implemented since the program's launch have created millions of dollars of revenue for public and private landfill owners and others.

Non-GHG mitigation benefits of policy or measure: Combusting landfill gas reduces emissions of nonmethane organic compounds as well as methane. It also can reduce odors and improve safety by stopping landfill gas migration.

Interaction with other policies or measures: The program interacts with the Landfill Rule.

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[19] Action 34 in the 1997 *U.S.Climate Action Report;* continuing.

Cross-sectoral

Federal Energy Management Program

Description: The Federal Energy Management Program (FEMP) is a separate DOE sector. It reduces energy use in federal buildings, facilities, and operations by advancing energy efficiency and water conservation, promoting the use of renewable energy, and managing the utility choices of federal agencies. FEMP accomplishes its mission by leveraging both federal and private resources to provide technical and financial assistance to other federal agencies. FEMP helps agencies achieve their goals by providing alternative financing tools and guidance to use the tools, technical and design assistance for new construction and retrofit projects, training, technology transfer, procurement guidance, software tools, and reporting and evaluation of all agencies' programs.

Objective: The program aims to promote energy efficiency and renewable energy use in federal buildings, facilities, and operations.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Types of policy or measure: Economic, information, and education.

Status of implementation: Implemented.

Implementing entities: DOE and other federal agencies.

Non-GHG mitigation benefits of policy or measure: The program has non-greenhouse gas environmental benefits, improves energy efficiency, promotes interaction and information sharing across federal agencies, provides education and training to federal personnel, and supports technology development and deployment.

State and Local Climate Change Outreach Program

Description: This program provides a variety of technical and outreach/education services related to climate change, including guidance documents, impacts information, modeling tools, policy and technology case studies, electronic newsletters and communications, technical assistance, networking opportunities, and modest financial support for analysis and activities. The expected results are increased awareness about climate change, well-informed policy choices, and accelerated reductions in greenhouse gas emissions, as well as additional economic and clean air benefits achieved from lower emissions.

Objective: The program aims to enable state and local decision makers to incorporate climate change planning into their priority planning, so as to help them maintain and improve their economic and environmental assets.

Greenhouse gases affected: Carbon dioxide, carbon monoxide, nitrous oxide, methane, and volatile organic compounds.

Type of policy or measure: Information, education, and research (policy analysis).

Status of implementation: The program has been ongoing since the early 1990s and has recently expanded its focus to encourage comprehensive, multi-pollutant policy planning. The program's budget for fiscal year 2000 was $0.8 million; for fiscal year 2001, it was $1.23 million.

Implementing entities: EPA provides technical and financial support to state and local governments through this effort. The state and local governments, in turn, develop greenhouse gas inventories and action plans where they set reduction targets for themselves. They also conduct outreach and demonstration projects in their jurisdictions to increase awareness about climate change and facilitate replication of successful mitigation opportunities.

Costs of policy or measure: State and local governments have identified tremendous potential and actual opportunities from greenhouse gas emission reductions. For example, 12 of the state plans completed so far have forecast reductions of 2010 emissions by 13 percent (256 teragrams of CO_2 equivalent) cumulatively, with a cost savings exceeding $7.8 billion if the actions are implemented as recommended. Local governments are reporting actual savings of about 7 teragrams of CO_2 equivalent per year from their efforts, with cost savings of $70 million.

Non-GHG mitigation benefits of policy or measure: Local governments are reporting actual savings of 28,000 tons of air pollution and $70 million in energy and fuel costs each year. State plans have identified annual potential energy and fuel savings of almost $8 billion, plus the creation of more than 20,000 jobs from climate change mitigation policies. One state plan identified mitigation policies that would reduce cumulative acid rain precursors and ground-level ozone precursors by 24 and 30 percent, respectively, through 2020.

Interaction with other policies or measures: Rather than trying to be an expert at all levels, the program serves as a one-stop shop for state and local governments looking to reduce greenhouse gases. When governments express interest in particular activities and technologies that are covered under a national program, the program refers them to the appropriate program so they may acquire additional information and move forward under the guidance of national experts.

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