

President Clinton's FY 2001 Climate Change Budget

The President's climate change package for FY 2001 totals over \$4.1 billion – an increase of \$760 million from the amount enacted for FY 2000. This includes \$2.4 billion for programs directly aimed at combating global warming – a 43 percent increase over FY 2000 enacted levels. This includes a series of new initiatives, such as accelerated efforts to promote the development and deployment of clean energy technologies around the world; a stepped-up program to develop bioenergy and bio-based products; and a new Clean Air Partnership Fund to boost state and local efforts to reduce both greenhouse gases and ground-level air pollutants. It also includes the Climate Change Technology Initiative (CCTI), which mixes tax incentives and direct spending to spur the research, development, and deployment of energy efficient technology and renewable energy and other climate-related investments, such as R&D of highly efficient technologies for the combustion and use of coal and natural gas, weatherization, and state energy grants. The President is also proposing over \$1.7 billion for the United States Global Change Research Program, to enhance our understanding of the human and natural forces that influence the Earth's climate system.

Table 1. Climate Change-Related Domestic Programs (\$ in Millions)

	FY 2000 Enacted	FY 2001 Request	Change
Climate Change Solutions			
International Clean Energy Initiative	98	201	+103
Biofuels & Bioproducts Initiative	196	289	+93
Clean Air Partnership Fund	0	85	+85
Climate Change Technology Initiative--tax incentives ¹	N/A	201	+201
Climate Change Technology Initiative--investments	1,095	1,432	+337
Other Climate-Related Investments (cleaner coal & Natural gas; weatherization; state energy grants)	413	424	+11
Subtotal, Climate Solutions ²	1,665	2,386	+721
Global Change Research Program	1,701	1,740	+39
TOTAL	3,366	4,126	+760

¹ First year of a proposed five year, \$4.0 billion package.

2 Subtotal excludes double counts for funds included in new initiatives and cleaner coal which are also part of the CCTI.

International Clean Energy Initiative

To accelerate the development and deployment of clean energy technologies around the world, President Clinton is proposing the International Clean Energy Initiative – a \$200 million multi-agency effort (a more than 100 percent increase over FY 2000 enacted levels) to encourage open competitive markets and remove market barriers to clean energy technologies in developing and transition countries and to provide new incentives for clean energy technology innovation and export. This initiative will promote U.S. exports and create high-value jobs, and will assist countries to power their economic development while fighting air pollution and climate change.

Window of Opportunity for America and the World. Developing country energy use will overtake that of industrial countries by 2020. These energy technology markets are projected to total \$4 to \$5 trillion over the next 20 years and \$15 to \$25 trillion over the next 50 years. Developing country energy use is expected to account for three-fourths of the increase in global energy use between now and 2050.

Advanced, low-polluting energy technologies, developed and manufactured in the United States, can provide these energy services efficiently, but existing markets often do not value environmental and efficiency benefits. In addition, environmentally superior options often carry higher up-front costs, may be unfamiliar, or are perceived as more risky by decision-makers in developing countries. The initiative builds on a recent set of recommendations by the President's Committee of Advisors on Science and Technology (PCAST) and is directed at leveling the playing field between cleaner U.S. energy technologies and services and polluting alternatives.

Real Benefits At Home and Abroad. The initiative will help lay the technical and policy foundation that will allow developing and transition countries to build a clean energy future, leapfrogging past the polluting energy technologies used by the industrial countries, while building competitive markets open to U.S. firms. The goals of this initiative include:

Doubling clean energy technology exports by 2005, creating as much as \$5 billion in new export revenues for U.S. companies and as many as 100,000 new U.S. jobs.

Cutting energy use in targeted country buildings and appliances in half through advanced building design tools and building equipment codes and standards.

Developing integrated renewable energy technologies that have the potential to power the full range of energy services for the 2 billion people in developing countries that do not now have electricity.

Sharply reducing sulfur, particulate, and greenhouse gas emissions by developing advanced coal-fired power plants and low-cost hydrogen fuels.

Maximizing use of combined heat & power systems through technical and policy assistance.

Reducing methane emissions from pipelines and other fossil sources by an amount equal to as much as 100 million metric tons of carbon per year by 2005.

Providing technical and policy support to encourage the development of natural gas grids.

Reducing energy use in the industrial sector through the introduction of best practice methods, including advanced sensors and controls, and energy efficient motor drive systems.

Conducting research in nuclear energy to address cost, waste, safety, and proliferation concerns.

Providing technical and policy assistance in support of energy sector reform that creates open, competitive markets while protecting the public interest.

Initiative Structure. This initiative will strengthen efforts to streamline current bureaucratic procedures to better assist U.S. firms wishing to invest in clean energy projects in developing and transition countries. This initiative will also encourage public-private partnerships with foreign counterparts to demonstrate clean energy technologies, drive down their cost, and facilitate private sector financing for their large-scale deployment. The initiative will employ a range of proven policy tools, including U.S. technical and policy assistance to developing countries through personnel exchanges, conducting collaborative R&D with key foreign research groups, developing integrated renewable energy, energy efficiency, and advanced fossil energy technologies and pilot projects, and providing a range of trade supports to expand clean energy exports.

The initiative's requested \$100 million increase for these activities includes an additional \$46 million for the Department of Energy (DOE); \$30 million for the U.S. Agency for International Development; \$15 million for the Export-Import Bank; \$5 million for the Trade and Development Agency; and \$4 million for the Department of Commerce. A \$3 million increase in base programs is also requested at DOE, bringing the total increase to \$103 million.

Bioenergy & Bioproducts Initiative

President Clinton's FY 2001 Budget includes \$289 million to accelerate the development and use of bio-based technologies, which convert crops, trees, and other "biomass" into fuels, power, chemicals, and other products. This initiative supports the President's August 1999 Executive Order 13134 and Memorandum on Promoting Biobased Products and Bioenergy, aimed at tripling U.S. use of biobased products and bioenergy by 2010. The initiative provides an increase of more than \$93 million (47 percent) over the amounts available for FY 2000, with \$49 million directed towards the Department of Energy (DOE) and \$44 million for stepped-up efforts at the Department of Agriculture (USDA). (Funding in DOE is also considered part of the Climate Change Technology Initiative.) In addition to this increase in R&D, the Commodity Credit Corporation will provide \$100 million in FY 2000 and up to \$150 million in FY 2001 and 2002 in incentive payments to encourage production of biobased fuels. The initiative will increase the viability of alternative energy sources and help meet environmental challenges like global warming, while diversifying and strengthening the rural economy.

New Economic Opportunities for a New Century. Continuing advances in forest and farm technology, molecular biology, and other areas are fueling a revolution in the use of biomass to make low-polluting products, such as:

transportation fuels, like cellulosic ethanol from agricultural waste;
electricity, by burning wood chips and switchgrass along with coal in existing plants and by converting paper industry wastes into fuel gases for advanced gas turbines;
commercial products, such as chemicals, glues, paints, packing materials, and textiles.

Already, creative companies such as **Cargill-Dow Polymers** are making this vision a reality, recently announcing plans to build a \$300 million production facility that will convert corn based sugars into plastic fibers than can be used to make products that are all natural and biodegradable.

Meeting the President's goal of tripling U.S. use of bioenergy and bioproducts will add billions in new income for farmers, producing 50,000 new, high-technology jobs in small processing plants in rural American and up to 130,000 such jobs in biopower, bioproducts, and biofuels industries.

Cleaner Energy, Cleaner Environment. Bioenergy and bioproducts can dramatically reduce greenhouse gas emissions that contribute to global warming. Since crops absorb carbon during growth, their use for energy and other applications results in near zero net carbon release. Tripling our use of bioenergy and bioproducts by 2010 will reduce annual greenhouse gas emissions by up to 100 million tons – the equivalent of taking over 70 million cars off the road.

Making Biomass Competitive With Fossil Fuels. A major goal of this initiative is to make biomass a viable competitor to fossil fuels as an energy source and chemical feedstock while protecting the environment. This goal is achievable, but it will require an unprecedented effort to

support research in universities, companies, and our national laboratories. In the past few years, for example, federal research has developed techniques that greatly accelerate the production of sugars and other useful chemicals from materials like corn stover and wood. The research funded under this initiative will ensure a continuing flow of the basic innovations on which such investments can be made.

Many uses for biomass materials are possible in the near future and this initiative will support research concepts on a competitive basis. This will include support for integrated systems capable of processing feedstocks simultaneously into a variety of products such as fuels, chemicals, and electricity. Much like today's petroleum-based refineries, the mix of products from these facilities will depend on market conditions. The research aims to understand the basic chemistry of cellulose and other materials in biomass, and develop new thermal, chemical, and bio-chemical techniques for converting these materials into useful forms.

Initiative Structure. The President's August 1999 Executive Order instructs DOE, USDA, the National Science Foundation, the Environmental Protection Agency and other agencies, to work closely together in supporting the broad range of needed research and development efforts. These efforts will support research partnerships linking industry, university, and government research facilities selected on a competitive basis. Key areas of new research activity will include:

Development of inexpensive systems to break down cellulose into low-cost sugars, allowing woody and grassy crops and agricultural waste, such as corn stalks, to take the place of high-value grain and food crops as biofuel feedstocks.

Renewable bioproducts, using multi-disciplinary and university/industry partnerships to develop and accelerate adoption of possible "leap-frog" technologies for converting crops, trees and residues into chemical feedstocks and consumer products.

Biopower, promoting both the integration of biomass gasification systems with modern gas-turbine/steam-turbine generation systems, and the co-firing of biomass with coal.

Expanded Forest Service research on faster-growing trees and the use of small-diameter trees for commercial, biobased products.

Methane gas recovery pilots to reduce greenhouse gas emissions from livestock operations and provide assistance to farmers that want to produce or market biobased products.

Expanded Agricultural Research Service research to develop biobased materials from commodities and bioproducts, and convert biomass to energy.

Competitive resources for research partnerships with universities, complementing the new Initiative for Future Agriculture and Food Systems announced by USDA earlier this month.

Rural development grants to rural electric cooperatives to develop pilot projects to demonstrate the commercial viability of small-scale biomass fuel generation, grants for technical assistance for processing and marketing biobased products, and loans for facilities and operating capital for organizations engaged in biobased production activities.

Clean Air Partnership Fund

To help protect public health and ease the threat of global warming, President Clinton is proposing \$85 million for the creation of a new Clean Air Partnership Fund. The Fund will provide grants to states, localities, and tribes to support efforts that achieve reductions in both greenhouse gas emissions and ground-level air pollutants. First proposed as part of last year's FY 2000 budget, the Fund will be administered by the Environmental Protection Agency under existing authority.

Integrated Pollution Control. The Fund will stimulate integrated, cost-effective pollution control strategies. It directs new resources to state, local, and tribal governments to finance projects and programs that achieve accelerated reductions in both air pollutants, such as soot, smog, and air toxics, and in greenhouse gases.

A Quicker Path to Cleaner Air. By providing new resources for projects that accelerate pollution reductions, the Fund will enable communities to achieve multi-pollutant clean air goals sooner and reduce greenhouse gas emissions at the same time.

Technological Innovation. The Fund will help spur both public and private sector innovations in next-generation pollution control technology.

A Magnet for Local Investment & Innovation. The Fund will encourage public-private partnerships to demonstrate ways to create a cleaner environment at the local level. The Fund can be used to support local revolving funds, low-interest loan programs, matching grants, and

other mechanisms that will leverage the original Federal investment, greatly increasing its impact.

“Win-Win” Clean Air Projects. The Fund will support a wide range of practical projects that will mean cleaner air, reduced greenhouse gas emissions, and real savings for taxpayers and consumers. These could include projects such as building combined heat and power facilities that put waste heat to work, reducing emissions of both sulfur dioxide and carbon dioxide; retrofitting municipal buildings to make them more energy efficient, reducing pollution resulting from electricity generation; and upgrading municipal vehicle fleets to make them more fuel efficient.

Climate Change Technology Initiative: \$4.0 Billion in Tax Incentives

The President is proposing a new \$4.0 billion package in tax incentives over five years to help reduce greenhouse gas emissions by spurring the purchase of energy efficient products and the use of renewable energy (see Table 2). This year's CCTI tax package is \$400 million greater than last year's proposed five-year package.

Table 2. CCTI Tax Incentives (\$ in Millions)	Revenue Effect	
	FY 2001	Total FY01-05
Homes and Buildings		
Provide tax credit for energy efficient building equipment	-18	-201
Provide tax credit for new energy efficient homes	- 82	-633
Provide tax credit for solar energy systems	-9	-132
Vehicles		
Extend tax credit for electric and fuel cell vehicles and provide tax credits for qualified hybrid vehicles	0	-2078
Clean Energy		
Extend tax credit for electricity produced from wind and closed- loop biomass; provide credits for open-loop biomass facilities and coal-biomass cofiring; and provide credits for methane from certain landfills	-91	-976
Industry		
Provide 15-year recovery period for distributed power property	-1	-10
TOTAL*	-201	-4030

*Totals may not add due to rounding.

HOMES AND BUILDINGS

Tax credit to consumers who purchase new energy efficient homes. To encourage the purchase of new energy efficient homes, consumers would receive a tax credit of \$1,000 for homes purchased from 2001-2003 that use at least 30 percent less energy than the standard under the 1998 International Energy Conservation Code (IECC) and a credit of \$2,000 for homes purchased from 2001-2005 that use at least 50 percent less energy than the IECC standard.

Tax credit for energy efficient equipment in new and existing homes or buildings. This credit will encourage the purchase of electric heat pump water heaters, natural gas heat pumps, and fuel cells. The credit would apply to both residential and commercial equipment. The credit would be 20 percent of the cost of the investment, subject to a cap, for equipment purchased from 2001-2004.

Tax credit for solar energy systems. A 15 percent tax credit will encourage the purchase by consumers and businesses of solar energy systems. The maximum credit would be \$2,000 for rooftop photovoltaic systems placed in service from 2001-2007 and \$1,000 for solar water heating systems placed in service from 2001-2005.

VEHICLES

Tax credits for electric, fuel cell, and qualified hybrid vehicles. Cars and light trucks (including minivans, sport utilities, and pickups) currently account for 20 percent of greenhouse gas emissions. Tax credits for electric, fuel cell, and hybrid vehicles will help to move advanced technologies from the laboratory to the highway. These technologies can significantly reduce emissions of carbon dioxide, the most prevalent greenhouse gas.

-- **Extend the current tax credit for electric vehicles and fuel cell vehicles.** Under current law, a 10 percent credit, up to \$4,000, is provided for the cost of qualified electric vehicles and fuel cell vehicles. The credit begins to phase down in 2002 and phases out in 2005. The President's proposal would extend the tax credit at its \$4,000 maximum level through 2006.

-- **Tax credits for hybrid vehicles.** The credit – available for all qualifying vehicles, including cars, minivans, sport utility vehicles, and pickup trucks – would range from \$500 to \$3,000 for qualified hybrid vehicles purchased from 2003-2006, depending upon the vehicle's design performance.

CLEAN ENERGY

Tax credit for electricity produced from wind. Current law encourages the production of electricity from wind, which emits no greenhouse gases, through a tax credit of 1.5 cents per kilowatt hour (adjusted for inflation after 1992). The current tax credit covers facilities placed in service before January 1, 2002. The President proposes a 2.5-year extension of this tax credit.

Tax credits for electricity produced from biomass. Biomass refers to trees, crops and agricultural wastes used to produce power, fuels or chemicals. This package of credits would:

-- **Extend current “closed-loop” biomass credit.** This proposal extends for 2.5 years the current 1.5 cent per kilowatt hour tax credit (adjusted for inflation after 1992), which covers facilities placed in service before January 1, 2002.

-- **Provide credits for “open loop” biomass facilities.** This proposal expands the definition of biomass eligible for the 1.5 cent tax credit to include certain forest-related resources and agricultural and other sources for facilities placed in service from 2001-2005, and provides a 1.0 cent credit for electricity produced from 2001-2003 from facilities placed in service prior to January 1, 2001.

-- **Provide a credit for cofiring biomass and coal.** This proposal adds a 0.5 cent per kilowatt hour tax credit for electricity produced by cofiring biomass in coal plants from 2001-2005.

-- **Provide credit for methane from landfills.** This proposal adds a 1.5 cent per kilowatt hour credit for electricity produced from landfills not subject to EPA’s 1996 New Source Performance Standards/Emissions Guidelines (NSPS/EG) and 1.0 cent per kilowatt hour for landfills subject to NSPS/EG. Qualified facilities would be facilities placed in service after December 31, 2000 and before January 1, 2006.

INDUSTRY

15-year recovery period for distributed power property. The development of distributed power technologies has made it possible to generate electricity locally at dispersed industrial, commercial, and residential locations. Such technologies can be more energy efficient and generate fewer greenhouse gases than conventional generation methods. This proposal would simplify and rationalize the current depreciation system by assigning a single 15-year recovery period to distributed power property.

Climate Change Technology Initiative: \$1.4 Billion for Efficient Energy and Clean Energy

The President's FY 2001 budget proposes over \$1.4 billion for the research, development, and deployment of renewable energy technologies, energy efficient products and buildings that will help reduce U.S. greenhouse gas emissions. This represents a \$337 million increase (30 percent) over FY 2000 spending (see Table 3). The President's proposed investment package covers the four major carbon-emitting sectors of the economy -- buildings, transportation, industry, and electricity -- as well as carbon sequestration (see Table 4). The following sections highlight selected programs in each of these areas of effort. The full agency programs extend well beyond what is described here.

Table 3. CCTI Funding by Agency (\$ in Millions)

	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Request	Change from 2000
Energy	902	980	1,169	+189
EPA	109	103	227	+124
Housing & Urban Development	10	10	12	+2
Agriculture	0	0	24	+24
Commerce	0	2	0	-2
TOTAL*	1,021	1,095	1,432	+337

*Totals may not add due to rounding.

Table 4. CCTI Funding by Area of Activity (\$ in Millions)

	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Request	Change from 2000
Buildings	176	194	275	+81
Transportation	285	309	382	+73
Industry	187	189	251	+62
Electricity	310	321	406	+85
Carbon Sequestration	14	30	52	+22
Management, Planning & Analysis	48	51	65	+14
TOTAL*	1,021	1,095	1,432	+337

* Totals may not add due to rounding.

BUILDINGS

Partnership for Advancing Technology in Housing. PATH is a partnership between the Federal government and building industry to develop and deploy housing technologies to make new homes 50 percent more energy efficient and to make at least 15 million existing homes 30 percent more energy efficient within a decade. PATH has established five pilot communities in Denver, Los Angeles, Pittsburgh, and Tuscon. The program coordinates work in the Department of Housing and Urban Development, the Department of Energy (DOE), the Environmental

Protection Agency (EPA), FEMA, the Department of Commerce and other agencies, ensuring, for example, that research conducted in DOE's enhanced residential buildings program is quickly transferred into practice. The FY 2001 budget request for building efficiency efforts, such as PATH, Energy Star, and Building America, totals \$275 million, a 42 percent increase over FY 2000 appropriations.

Energy Efficient Appliances and Products. Various DOE and EPA programs aim to promote the dissemination of energy efficient appliances and products:

-- DOE will accelerate its program to establish **energy efficiency standards** for commercial heating and cooling, water heaters, and electrical distribution transformers, and will begin efforts to harmonize international energy-efficiency standards and test methods to promote exports of efficient U.S. products.

-- EPA and DOE's **Energy Star Products** program saves consumers money and reduces greenhouse gas emissions at the same time by promoting the use of energy efficient products – everything from computers to refrigerators to central air-conditioning units. New funding will support the launch of new Energy Star product lines and will promote the Energy Star labeling program in 6-10 export markets.

· ***Energy Efficient Commercial Buildings.*** DOE and EPA work in partnership with industry to research, develop, and deploy new technologies and practices to improve the energy performance of commercial buildings. Participants include the Empire State Building, the World Trade Center, and Chicago's Sears Tower. Buildings in the top 25 percent in energy efficiency qualify for EPA's "**Energy Star Buildings**" label.

· ***Energy Smart Schools/Energy Star Label for Schools.*** DOE and EPA have two programs that are working in coordination to improve energy efficiency in U.S. primary and secondary schools, bringing together public and private sector resources to cut schools' energy bills so that the savings can be reinvested in students and their education.

TRANSPORTATION

Partnership for a New Generation of Vehicles. PNGV is a government-industry effort that aims to develop attractive, affordable cars that meet all applicable safety and environmental standards and get up to three times the fuel efficiency of today's cars. Since 1993, great strides have been made in producing lower-cost, light-weight materials, inexpensive fuel cells, and advanced internal combustion engines for use in hybrid vehicles. The program aims to produce a prototype mid-sized family car capable of 80 miles per gallon with a two-thirds reduction in carbon emissions by 2004. In January 2000, the auto-industry partners unveiled their PNGV "concept cars" at the Detroit Auto Show, which keeps the program on schedule for meeting its 2004 goal. The FY 2001 budget includes \$255 million for PNGV-related work, an increase of \$30 million over the amount appropriated for FY 2000.

Light and Heavy Trucks. Similar government-industry efforts are aimed at developing cleaner, more efficient diesel engines for both light and heavy trucks.

-- By 2003, DOE aims to develop **advanced diesel cycle engine technologies** for pickup trucks, vans, and sport utility vehicles which achieve at least a 35 percent fuel efficiency improvement relative to current gasoline-fueled trucks while meeting strict emission standards.

-- By 2004, DOE, in coordination with EPA and the Department of Defense, aims to develop **engine and vehicle technologies for heavy trucks** that will increase the fuel economy to 10 mpg from the current average of 7 mpg.

INDUSTRY

· **Industries of the Future.** This DOE program works cooperatively with the nation's most energy-intensive industries – such as aluminum, glass, chemicals, forest products, mining, petroleum refining, and steel – developing technologies that increase energy and resource efficiency. Promising collaborative efforts include improvements in the process of making steel, pulp and paper, and other energy-intensive products that could dramatically increase efficiency, lower greenhouse gas emissions, and improve competitiveness.

· **Industrial Combined Heat and Power (CHP) Systems.** DOE is developing new industrial CHP systems to capture thermal heat would otherwise be wasted. These systems are expected to be 15 percent more energy efficient and 80 percent cleaner than conventional power systems and cut electricity costs by 10 percent. In addition, EPA and DOE are also working to eliminate barriers to the rapid dissemination of combined heat and power technology.

· **Voluntary Industrial Partnerships.** EPA will expand its industry partnership programs, such as **Climate Wise** and the **Voluntary Aluminum Industrial Partnership**, to encourage businesses to take advantage of cost-effective emissions reductions opportunities -- including emissions of the most potent greenhouse gases, such as methane, perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF6).

· **Agriculture and Forestry.** The Department of Agriculture (USDA) will undertake R&D and support demonstration projects aimed at both lowering greenhouse gas emissions from agriculture and forestry and reducing their vulnerability to climate change.

--The **Natural Resources Conservation Service** will invest \$3 million in projects to demonstrate and test various means of reducing greenhouse gas emissions in agriculture, such as compost-based waste-handling facilities, rotational grazing systems, and improved feed and forage systems.

--The **Agricultural Research Service** will devote \$8.5 million towards climate change related activities, including the development of new technology and expertise for reducing agriculture's vulnerability to a changing climate. Field experiments will seek to measure various potential effects of climate change, such as varying amounts and patterns of rainfall on forage production.

The FY 2001 budget also includes important USDA funding for developing advanced biomass energy technologies; R&D and demonstration projects for carbon sequestration; research to

study the role of farms, forests, and other natural or managed lands in capturing and storing carbon; and a comprehensive U.S. soil carbon inventory (see p.16 below).

ELECTRICITY

- **Photovoltaic (PV) Energy Systems.** Over the past 20 years, Federal R&D has resulted in a 90 percent cost reduction in solar photovoltaics. DOE will accelerate R&D of the next-generation photovoltaic cells; increase manufacturing R&D; increase research in buildings-integrated applications; and fund efforts to develop new, unconventional technologies.

- -- **Million Solar Roofs.** In June, 1997, the President announced an initiative to encourage the installation of one million solar systems by 2010, which would reduce carbon emissions equivalent to the annual emissions from 850,000 cars. To date, DOE has received commitments for over 900,000 solar rooftop installations. In FY 2001, DOE expects 40,000 systems to be installed under this program, bringing the total to 90,000.

- -- **Technology Advances.** By 2004, DOE aims to increase the efficiency of thin-film PV modules in multi-megawatt production from 7 percent to 12 percent and to reduce module manufacturing costs by 40 percent (from \$2.50/watt to \$1.50/watt). Specific performance measures for FY 2001 include achieving 14 percent stable efficiency in prototype thin-film modules and, in a new initiative begun in FY 2000, identifying at least three promising non-conventional PV technologies for further development.

- **Biomass Power.** DOE supports biopower systems R&D addressing three major technology areas: co-firing biomass with fossil fuels such as coal and natural gas, small modular biopower systems, and advanced biomass gasification. This work is also included in the Bioenergy and Bioproducts Initiative described in above (see pp.4-5 above).

- **Wind Powering America.** This initiative, announced in June 1999, will accelerate DOE's research, development, testing and field validation of next-generation wind technologies, with a goal of supplying 5 percent of U.S. electricity through wind technologies by 2020. This will be supported by an aggressive R&D program that will reduce the cost of electricity in favorable wind sites to 2.5 cents per kilowatt hour by 2002, and will move specialized cold-weather wind turbines from development to demonstration in 2000, leading to commercialization in 2001.

- **Hydrogen.** DOE will accelerate research on low-cost hydrogen production and storage, prerequisites to the widespread use of hydrogen as a fuel.

- **High Temperature Superconductivity.** DOE supports industry-led projects to capitalize on recent breakthroughs in superconducting wire technology, aimed at developing devices such as advanced motors, power cables, and transformers. These technologies would allow more electricity to reach the consumer without an increase in fossil fuel input.

CARBON SEQUESTRATION

· **R&D for Sequestration.** Research initiatives are being funded to find ways to sequester (store) carbon. Examples include:

-- **Enhancing Forest and Farmland Sinks.** The **Forest Service**, in conjunction with other USDA agencies, will spend \$3 million for R&D and demonstration projects for optimizing forest, farmland, and rangeland carbon sinks. The focus of such projects will include storage of carbon in forest soils and increased durability and use of wood products to sequester carbon.

-- **Enhancing natural geological and oceanic processes.** DOE will support research into the feasibility of capturing and storing carbon dioxide in underground geological structures and in the deep ocean.

Other Climate-Related Investments

There are a number of additional programs for which funding is proposed in the FY 2000 budget that – while not part of the Climate Change Technology Initiative (CCTI) per se – contribute to improving energy efficiency and reducing greenhouse gas emissions. These programs include:

- **Cleaner Coal and Natural Gas.** The FY 2000 budget includes a total of \$232 million (of which \$56 million is part of CCTI) to support the Department of Energy's (DOE) aggressive R&D effort to develop next-generation technologies for the combustion and use of coal and natural gas. For example, research and development of integrated gasification combined cycle technology could lead to ultra-high efficiency coal plants with significantly lower greenhouse gas emissions.
- **Low Income Weatherization and State Energy Grants.** These DOE programs facilitate energy efficiency investments at the State and local level. The **Weatherization Assistance Program**, for example, delivers energy conservation services, such as insulation, to low-income Americans, reducing energy costs for consumers, improving health and safety, and reducing carbon emissions. The total FY 2001 budget request for these two programs is \$191 million – a \$22 million increase over FY 2000 appropriations.
- **Agricultural & Forestry Conservation Programs.** The Administration's 2001 Farm Safety Net Initiative proposes an increase of \$1.3 billion in FY 2001 funding for Department of Agriculture conservation programs. Many of these same programs have the co-benefit of reducing carbon emissions resulting from agriculture and forestry and enhancing the ability of "sinks," such as forests and farmlands, to sequester or store carbon. This includes programs such as the **Conservation Reserve Program**, the **Environmental Quality Incentives Program**, and the **Farmland Protection Program**. In general, these programs assist farmers, ranchers, and other landowners in conserving and improving soil, water, and other natural resources associated with rural land.

U.S. Global Change Research Program

The United States Global Change Research Program (USGCRP) seeks to provide a sound scientific understanding of both the human and natural forces that influence the Earth's climate system. USGCRP science results provide useful information for environmental decision-making on issues such as climate change, ozone depletion, changes in ecosystems, and land use. This multi-agency effort is coordinated through the National Science and Technology Council.

For FY 2001, the President is requesting \$1.74 billion for the USGCRP, an increase of \$39 million above the amount enacted for FY 2000. \$843 million is for scientific research and improvements to surface-based monitoring, (an increase of \$79 million, or about 10 percent). \$923 million is for NASA's development of Earth observing satellites to monitor climate change and other global changes (a decrease of \$34 million, reflecting the phasing of funding for large development projects). Important USGCRP budget highlights include:

Improved Climate Observations. The FY 2001 budget provides \$26 million to enhance NOAA surface-based observations, including creation of a climate reference network to provide, for the first time, automated, simultaneous, and ideally located measurements of changing temperatures, precipitation, and soil moisture. Measurements of atmospheric trace gases, aerosols, ocean temperatures, and ocean currents will also be expanded.

The Global Water Cycle. The FY 2001 budget provides \$308 million (an increase of \$35 million, or about 13 percent) for research on changes in the Earth's water cycle, which is one of the primary determinants of the Earth's climate. The water cycle is emerging as a top research priority because changes appear to be occurring already. The launch of NASA's EOS Aqua spacecraft in December 2000 will support this research by providing new global measurements of humidity, cloud properties, precipitation, snow, and sea ice.

Ecosystem Changes. The FY 2001 budget provides \$224 million for research on the potential impacts of climate change and other stresses on forests, coastal areas, croplands, and other ecosystems (an increase of \$19 million, or 9 percent). New studies will improve our understanding of the relationships among land cover, land use, climate, and weather, and help identify "thresholds" for significant changes in ecosystems.

Carbon Cycle Initiative. The FY 2001 budget request continues strong support for the multi-agency carbon cycle science initiative begun in FY 2000, providing \$227 million (an increase of \$23 million or 11 percent). This request includes funds to study how carbon cycles between the atmosphere, the oceans, and land, and the role of farms, forests, and other natural or managed lands in capturing carbon. Such carbon "sinks" may help the United States and other nations offset greenhouse gas emissions. Key agencies include the Departments of Agriculture (USDA), Energy, Interior, NASA, the National Science Foundation, and the Smithsonian Institution. Included in the request is \$13.5 million (an increase of over \$12 million) to significantly expand USDA Natural Resources Conservation Service soil carbon inventory and analysis efforts.