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Energy Efficiency: Budget, Oil Conservation, and Electricity Conservation Issues

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Energy Efficiency: Budget, Climate Change, and Electricity Restructuring Issues

SUMMARY

Energy security, a major driver of federal energy efficiency programs in the past, came back into play as oil and gas prices rose late in the year 2000. The terrorist attack of September 11, 2001, and the Iraq war of 2003 heightened concern for energy security and raised further concerns about the vulnerability of energy infrastructure and the need for alternative fuels. Further, the 2001 electricity shortages in California brought a renewed emphasis on energy efficiency and energy conservation to dampen electricity demand.

Also, worldwide emphasis on environmental problems of air and water pollution and global climate change, and the related development of clean energy technologies in western Europe and Japan, may remain important influences on energy efficiency policymaking. Concern about technology competitiveness may also remain a factor in the debate.

In the 108th Congress, debate over energy efficiency programs is focusing on the budget, oil and electricity issues, and provisions in the omnibus energy policy bill, H.R. 6.

The Bush Administration's FY2003 budget request for the Department of Energy's (DOE's) Energy Efficiency Program sought $901.6 million. The Consolidated Appropriations Resolution for FY2003 (P.L. 108-7, H.J.Res. 2) contains $891.8 million for the DOE Energy Efficiency Program, which is $19.9 million less than the request. Compared to FY2002, the FY2003 level cuts $4.7 million.

The Bush Administration's FY2004 budget request for the Department of Energy's (DOE's) Energy Efficiency Program seeks $875.8 million, an $16.0 million (2%) overall decrease relative to the FY2003 appropriation. The main proposed increases are $64.7 million for Weatherization grants and $22.4 million for Fuel Cell Vehicles. The request reduces R&D by $74.7 million, with proposed cuts that include $34.1 million for Industrial Technologies, $19.7 million for Vehicle Technologies, $15.8 million for Biomass and Biorefinery R&D, and $9.4 million for Distributed Energy Resources.

The House-passed omnibus energy bill (H.R. 6) has efficiency standards for consumer and commercial products, efficiency goals for federal buildings, tax incentives for efficiency and conservation, and several other energy efficiency provisions. Also, three energy efficiency-related floor amendments were adopted, involving reduced oil dependence, federal telecommuting, and bicycling to conserve fuels. The Senate has begun consideration of its bill, S. 14, which is expected to incorporate the energy tax bill, S. 597. S. 14 also has standards, goals, tax incentives (S. 597), and other energy efficiency provisions, but with some significant differences from the House bill. Some floor amendments on energy efficiency are likely.

MOST RECENT DEVELOPMENTS

On May 6, 2003, the Senate began consideration of the omnibus energy bill, S. 14. It has efficiency standards for consumer and commercial products, efficiency goals for federal buildings, tax incentives for efficiency and conservation, housing efficiency measures, and other energy efficiency provisions. An amendment to address automobile fuel economy standards was defeated in Committee, but may come up again on the floor. On April 10, 2003, the House passed the omnibus energy bill (H.R. 6). It also has standards, goals, tax incentives, and other energy efficiency provisions, but with some differences from the Senate bill. Further, the House adopted three energy efficiency-related floor amendments. One (H.Amdt. 70) expresses a "sense of the Congress" to reduce oil imports from 58% to 45%. The second (H.Amdt. 71) requires a study of the energy conservation benefits of telecommuting by federal employees. The third (H.Amdt. 78) establishes a "Conserve by Bicycling" pilot program at the Department of Transportation. (For a comparison of the House and Senate provisions, see "Energy Efficiency in Omnibus Energy Bills, 108th Congress" hereafter.)

On February 3, 2003, the Bush Administration issued its FY2004 budget request. For DOE's Energy Efficiency Program, it seeks $875.8 million, which is $21.8 million, or 2%, less than the FY2003 appropriation, not including inflation. It contains $57.0 million more for Grants and $79.7 million less for R&D. It also includes $29.5 million more for Fuel Cell Vehicles for the first year of the President's five-year Hydrogen Initiative and $9.5 million for a new National Climate Change Technology Initiative. The request presents a new budget structure.

(The DOE FY2004 Budget Request is available on the DOE web site [http://www.cfo.doe.gov/budget/04budget/index.htm/]; and the EPA FY2004 Annual Performance Plan and Congressional Justification is available on the EPA web site [http://www.epa.gov/ocfo/budget/2004/2004cj.htm] .)

BACKGROUND AND ANALYSIS

Energy Efficiency Concept

Energy efficiency is increased when an energy conversion device, such as a household appliance, automobile engine, or steam turbine, undergoes a technical change that enables it to provide the same service (lighting, heating, motor drive) while using less energy. The energy-saving result of the efficiency improvement is often called "energy conservation." The energy efficiency of buildings can be improved through the use of certain materials such as attic insulation, components such as insulated windows, and design aspects such as solar orientation and shade tree landscaping. Further, the energy efficiency of communities and cities can be improved through architectural design, transportation system design, and land use planning. Thus, energy efficiency involves all aspects of energy production, distribution, and end-use.

These ideas of "efficiency" and "conservation" contrast with energy curtailment, which involves a decrease in output (e.g., turning down the thermostat) or services (e.g., driving less) to curb energy use. That is, energy curtailment occurs when saving energy causes a reduction in services or sacrifice of comfort. Curtailment is often employed as an emergency measure.

Energy efficiency is often viewed as a resource option like coal, oil, or natural gas. In contrast to supply options, however, energy efficiency puts downward pressure on energy prices by curbing demand instead of by increasing supply. As a result, energy efficiency can reduce resource use and effects on the environment. (See CRS Report RL31188, *Energy Efficiency and the Rebound Effect.*)

History

From 1974 through 1992, Congress established several complementary programs, primarily at the Department of Energy (DOE), to implement energy saving measures in virtually every sector of societal activity. These energy efficiency and energy conservation programs were created originally in response to national oil import security and economic stability concerns. In the early 1980s, states and utilities took an active role in promoting energy efficiency as a cost-saving "demand-side management" tool for avoiding expensive powerplant construction. Since 1988, national interest in energy efficiency has focused increasingly on energy efficiency as a tool for mitigating environmental problems such as air pollution and global climate change. This aspect spawned new programs at DOE and at several other agencies including the Environmental Protection Agency (EPA), the Agency for International Development (AID), and the World Bank's Global Environment Facility (GEF). Energy efficiency is increasingly viewed as a critical element of sustainable development and economic growth.

The DOE energy efficiency program includes R&D funding, grants to state and local governments, and a regulatory framework of appliance efficiency standards and voluntary guidelines for energy-efficient design in buildings. In addition, its budget supports regulatory programs for energy efficiency goals in federal agencies and standards for consumer products. (Detailed descriptions of DOE programs appear in DOE's *FY2003 Congressional Budget Request*, DOE/ME-0007, v. 5, February 2002; it appears at [http://www.cfo.doe.gov/budget/03budget/index.htm]

From FY1973 through FY2002, DOE spent about $11.1 billion in 2002 constant dollars for energy efficiency R&D, which amounts to about 9% of the total federal spending for energy supply R&D during that period. In 2002 constant (real) dollars, energy efficiency R&D funding declined from $795 million in FY1979 to $227 million in FY1988 and then climbed to $556 million in FY1994. For FY2002, $638 million was appropriated, which is $82 million, or 15%, above the FY1994 mark in 2002 constant dollars. Also, in 2002 constant dollars, since FY1973, DOE has spent about $7.4 billion on grants for state and local conservation programs.

This spending history can be viewed within the context of DOE spending for the three major energy supply R&D programs: nuclear, fossil, and renewable energy R&D. From FY1948 through FY1972, in 2002 constant dollars, the federal government spent about $24.3

billion for nuclear (fission and fusion) energy R&D and about $5.5 billion for fossil energy R&D. From FY1973 through FY2002, the federal government spent $49.1 billion for nuclear (fission and fusion), $24.8 billion for fossil, $14.2 billion for renewables, and $11.1 billion for energy efficiency. Total energy R&D spending from FY1948-FY1998, in 2002 constant dollars, reached $128.9 billion, including $73.4 billion, or 57%, for nuclear, $30.2 billion, or 23%, for fossil, $14.2 billion, or 11%, for renewables, and $11.1 billion, or 9%, for energy efficiency.

Since 1985, national energy use has climbed about 20 Q (quads — quadrillion Btus, British thermal units), reaching a record high of 99 Q in 2000. DOE's 1995 report *Energy Conservation Trends* finds that energy efficiency and conservation activities from 1973 through 1991 curbed the pre-1973 growth trend in annual primary energy use by about 18 Q, an 18% reduction. In 1992, this was saving the economy about $150 billion annually in total U.S. energy expenditures, a one-fourth reduction from the previous trend. Further, assuming fossil and other fuels were displaced in proportion to their actual use in 1992, then energy efficiency and conservation were providing about 300 million metric tons of carbon (MMTC) emission reductions that year.

DOE's Strategic and Performance Goals

In 2002, the Office of Energy Efficiency and Renewable Energy (EERE) completed a major re-organization. The number of deputy assistant secretaries was reduced from five to two; the number of offices shrank from 19 to 14 (11 program and 3 business) and included new offices for FreedomCAR & Vehicle Technologies and for Hydrogen, Fuel Cells and Infrastructure; and the number of programs was reduced from 31 to 11. The new management strategy is put forth by Assistant Secretary David Garman in *Focused on Results: A New Government Business Model*, available at [http://www.eren.doe.gov/eere/pdfs/eere_reorg.pdf]. More information about EERE is available on the DOE web site [http://www.eren.doe.gov/eere/organization.html].

A National Research Council report, *Energy Research at DOE: Was it Worth It?*, found that from 1978 to 2000 an investment of about $8 billion in DOE's Energy Efficiency Programs produced an economic return of at least $30 billion. Areas found short of expected benefits lacked incentives needed for private sector adoption.

The President's Management Agenda set out the Bush Administration's framework for performance management based on human capital, competitive sourcing, financial performance, electronic government, and integration of budget with performance. The Government Performance and Results Act (GPRA, P.L. 103-62) requires each federal agency to produce and update a strategic plan linked to annual performance plans.

In DOE's *Strategic Plan of September 2000*, energy efficiency objectives and strategies appear under strategic goal #1, "Energy Resources." In the *DOE Annual Performance Plan (APP) for FY2004*, energy efficiency is addressed under the revised strategic goal #2, "Energy Conservation and the Environment," which states "Energy use and greenhouse gas emissions versus the gross domestic product (GDP) are reduced by 40% by 2025 compared to 2000 and the growth versus the U.S. population stops by 2025." In support of Goal 2, the APP lists five strategic performance goals. ER1-1 says that relative to the 1985 baseline, FEMP will support federal agency efforts to reduce energy intensity by 30% in 2005 and

35% by 2010. ER 1-2 says that from 1991 to 2010, the Industries Program will reduce energy intensity by 20-25%. ER 1-3 says the FreedomCAR and Vehicle Technologies Program will achieve several specific vehicle technical and cost goals through 2010. ER 1-4 says that the Buildings Program will achieve several specific goals to improve building efficiency through 2009. ER 3-1 puts forth specific output goals through 2010 for weatherization grants, state grants, Rebuild America, Energy Star, Clean Cities, and for other programs.

Energy Efficiency in Omnibus Energy Bills, 108th Congress

In the 108th Congress, most legislative action on energy efficiency has focused on the omnibus energy policy bills, H.R. 6, S. 14, and the Senate energy tax bill (S. 597), which is expected to be incorporated into S. 14. Key energy efficiency and energy conservation provisions include efficiency standards for consumer and commercial products, efficiency goals for federal buildings, and several tax incentives. Other provisions cover public housing, funding authorizations, and certain other energy efficiency and energy conservation programs. (For information on H.R. 4, the omnibus energy bill in the 107th Congress, see CRS Report RL31427.)

Efficiency Standards for Consumer and Commercial Products

DOE currently sets minimum energy efficiency standards for several consumer and commercial products, including household appliances such as clothes washers and refrigerators. The omnibus energy bills would expand standards to other equipment. H.R. 6 (§11045) and S. 14 (§621) have identical provisions that direct DOE to set efficiency standards within three years for "standby mode" energy use by battery chargers and external power supplies. The two bills also have identical provisions that call for standards to be developed for suspended ceiling fans, vending machines, unit heaters, commercial refrigerators, freezers, refrigerator-freezers, illuminated exit signs, torchieres, distribution transformers, and traffic signal modules. S. 14 differs by including medium base compact flourescent lamps (CFLs) and commercial clothes washers. Many of the above items were approved by the conference committee on H.R. 4 in the 107th Congress. In March 2003 testimony on a draft version of H.R. 6, the American Council for an Energy-Efficient Economy estimated that these new standards would save more energy than any other provisions in the bill. Most of the other provisions in the House and Senate titles on consumer product efficiency programs are similar. The table below indicates which standards would be set by law and which would be set by DOE rulemaking.

Standard set:	H.R. 6	S. 14
By law	exit signs, traffic signals, torchieres, distribution transformers	all items in H.R. 6 plus unit heaters and compact flourescent light bulbs
By rule	ceiling fans, vending machines, commercial refrigerators and freezers, unit heaters	all items in H.R. 6 except unit heaters

Efficiency Goals for Federal Buildings

The purpose of federal efficiency goals is to lead by example in saving energy, reducing costs, and helping transform markets for new equipment. The past goal had called for a 20% reduction in federal buildings' energy use, measured in energy use per square foot (sf), over the period from 1985 to 2000. This goal was exceeded, slightly. H.R. 6 (§11002) and S. 14 (§601) set goals for further energy efficiency in federal buildings. The baseline years differ slightly: the House bill specifies FY2001 while the Senate bill specifies FY2000. Otherwise the provisions are nearly identical, with both setting progressive annual reductions that end with a 20% reduction from baseline by FY2014. However, the Senate bill (§601[c]) also calls for DOE to review results by the end of 2011 and recommend further goals for building energy savings for the period 2014 through 2022. Most of the other provisions in the House and Senate titles on federal programs are administrative measures that would help agencies achieve the above-described goals.

The historical record shows that congressional buildings have had less focus on energy efficiency goals than those in the executive branch. To address this, H.R. 6 (§11001) and S. 14 (§606) have identical provisions that call for a study of the potential for energy efficiency and renewables to increase reliability during a power outage and for the implementation of a plan for congressional buildings to meet the energy efficiency goals for federal agencies noted above.

Tax Incentives for Efficiency and Conservation

Since the late 1970s, there have been some tax incentives to promote fuel switching and alternative fuels as a way to conserve gasoline and reduce oil import dependence. In contrast, tax incentives for energy efficiency and for electricity conservation have been rare, and generally short-lived. The omnibus energy bills propose some modest new tax incentives for energy efficiency.

The Senate energy tax bill (S. 597) has four tax provisions that are not in H.R. 6. One (§302) creates a tax credit for manufacturers of certain appliances (clothes washers and refrigerators) with energy efficiencies that exceed federal standards. The credit per appliance ranges from $50 to $150, with a $60 million maximum for the total program through 2006. A second provision (§305) creates a tax deduction for efficient commercial buildings. A maximum of $2.25 per square foot (sf) is allowed through 2009 for new construction or reconstruction where the total energy use is at least 50% below Standard 90.1-1999 of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). Two other provisions create a $30/unit tax deduction (§306) to utilities for investment in energy management devices installed in residences or businesses and set a 3-year recovery period (§307) for depreciation purposes. The table below shows the differences between the House and Senate maximum tax incentives for efficiency in new and existing homes.

	New Homes		Existing Homes	
	H.R. 6 (§41005)	S. 14 (§301)	H.R. 6 (§41004)	S. 14 (§309)
Energy Reduction	30%	50%	IECC*	30%
Credit Cap	$2,000	$2,000	$2,000	$300
Period (years)	5	5	3	4

Note: IECC represents year 2000 standards in the International Energy Conservation Code.

Similar tax provisions for fuel cell power plants and combined heat and power (CHP) appear in both bills. Also, both bills have tax incentives for alternative fuel vehicles and equipment.

Energy Efficiency Tax Revenue Effect. Table1 compares the estimated 10-year revenue effect of renewable energy and alternative fuel tax provisions in H.R. 6 (H.R. 1531) and S. 14 (S. 597). It also shows the share of the total in each bill.

Table 1: Omnibus Energy Bills, Tax Revenue Effect
($ billions)

	H.R. 6	S. 14
Energy Efficiency and Conservation Measures (Excludes diesel fuels, alternative fuels, and solar credit)	$ 1.33	$ 2.43
Total, All Tax Provisions	$18.67	$15.47
Energy Efficiency and Conservation Share of Total	7.1%	15.7%

Source: Joint Tax Committee. Estimated Revenue Effects of H.R. 1531 and S. 597, April 2, 2003.

Housing, Funding Authorizations, and Other Provisions

H.R. 6 (Division G, §70001-§70009) and S. 14 (§631-§639)) have identical provisions for energy efficiency in public housing. They also have nearly identical provisions that authorize funding for energy assistance (e.g., Low-Income Home Energy Assistance Program, LIHEAP) and grant programs (e.g., DOE Weatherization Program).

DOE Budget, FY2004

The Budget Appendix to the U.S. Government's FY2004 Budget (p. 378) notes that "[t]he Administration's energy efficiency programs have the potential to produce substantial benefits for the Nation ... in terms of economic growth, increased energy security and a cleaner environment." Specifically, it says that "[t]he 2004 budget proposes a major new initiative to accelerate the worldwide availability and affordability of hydrogen-powered fuel cell vehicles." Also, it says the proposed National Climate Change Technology Initiative "... has as its primary goal the reduction of greenhouse gas emissions ... " According to the Budget Highlights of the DOE request (p. 100), the "request presents a new budget structure that mirrors the new organizational structure. In addition, the budget shifts reflect application of the R&D Investment Criteria and the Program Assessment Rating Tool developed as part of the *President's Management Agenda*."

For further information on the *Energy Conservation Budget*, see the web site at [http://www.cfo.doe.gov/budget/04budget/index.htm/]. For further information on *Energy Conservation Programs*, see the Web site at [http://www.eere.energy.gov/].

DOE Budget, FY2003

On February 20, 2003, the Consolidated Appropriations Resolution (H.J.Res. 2) was signed into law as P.L. 108-7 (H.Rept. 108-10). For DOE's Energy Efficiency Program, it appropriates $897.6 million (excluding the possible application of a 0.65% across-the-board reduction), which is $15.2 million less than the FY2002 appropriation. This includes $5.0 million less for Grants and $18.2 million less for R&D.

Under the Foreign Operation, Export Financing, and Related Programs Appropriations Bill (H.Rept. 108-10, Sec. 555, p. 192), P.L. 108-7 also contains $175 million for new "Energy Conservation, Energy Efficiency, and Clean Energy Programs" to reduce greenhouse gas emissions and other environmental problems in developing countries.

EPA Budget, FY2004

The FY2004 request for EPA's CPP Programs is $116.6 million, which would be a $1.4 million increase over the FY2003 appropriation. For specific programs, the request includes $1.5 million less for Buildings and $0.5 million less for International Capacity Building. It also includes $1.4 million more for Transportation and $0.8 million more for Industry.

Table 2. EPA Funding for Climate Protection Energy Efficiency Programs (CPP)

($ millions current)

	FY2001 Enacted	FY2002 Enacted	FY2003 Request	FY2003 Conf.	FY2004 Request	FY2004 -FY2003
CPP Buildings	52.5	48.6	49.8	49.8	48.3	-1.5
CPP Transportation	29.4	30.8	21.6	21.6	22.9	1.4
CPP Industry	31.9	25.4	25.7	25.7	26.4	0.8
CPP Carbon Removal	1.0	1.5	1.6	1.6	1.7	0.2

CPP State & Local	2.5	2.2	2.3	2.3	2.6	0.3
CPP Int'l Capacity	5.5	7.0	7.1	7.1	6.6	-0.5
CPP Int'l Partnerships	----	----	----	----	----	----
CPP Int'l Tech. Coop'n	0.8	----	----	----	----	----
CPP Other	-----	8.4	7.2	7.2	8.0	0.7
CPP, SUBTOTAL	123.6	123.9	108.1	115.2	116.6	1.4
Climate Change Rsch	22.6	21.4	21.7	21.7	21.5	-0.2
TOTAL	146.2	145.3	129.8	137.0	138.1	1.2

Source: EPA FY2004 Congressional Justification, p. VI-28; H.Rept. 108-10 (Cong. Rec. Feb. 12, 2003, p. H1087.

EPA conducts its CPP programs under the Office of Environmental Programs and Management (EPM) and the Office of Science and Technology (S&T). EPA's CPP programs are focused primarily on deploying energy-efficient technologies. These programs include Green Lights, Energy Star Buildings, Energy Star Products, Climate Wise, and Transportation Partners. They involve public-private partnerships that promote energy-efficient lighting, buildings, and office equipment. Efforts also include information dissemination and other activities to overcome market barriers.

Energy Security

Since September 11, 2001, terrorist attacks have focused national attention on developing a strategy to address the vulnerabilities of energy systems and other essential services. The Department of Homeland Security (DHS, P.L. 107-296) includes offices and programs (Infrastructure Protection, Energy Security and Assurance) responsible for measures to protect energy infrastructure, including power plants, transmission lines, oil refineries, oil storage tanks, oil and natural gas pipelines, and other energy infrastructure. By reducing the demand for fuels and electricity, energy efficiency measures may contribute to energy security by slowing growth in the number of energy facilities and amount of other energy infrastructure. It can also reduce the risk of oil shortages, energy price shocks, and attendant impacts on the national economy. Some of the possible ways that energy efficiency can improve energy security are described in *U.S. Energy Security Facts* (available at [http://www.rmi.org/images/other/S-USEnergySecurityFacts.pdf].)

Electricity Demand-Side Management (DSM) and Distributed Power

The use of energy-efficient appliances and other end-use equipment can reduce electricity demand, which drives the need for new power plants. Further, the development of small, modular "distributed energy" systems (also referred to as distributed generation and distributed power) under DOE's program may help reduce the security risk by decentralizing energy facilities and establishing some facilities off-grid. Also, the "response and recovery" element in the President's DHS proposal calls for it to "... ensure rapid restoration of transportation systems, energy production, transmission, and distribution systems. ..." The deployment of smaller, highly mobile distributed energy equipment may help address this

aspect of energy security. H.R. 6 and S. 14 have provisions for distributed energy. (For more on distributed energy see the DOE web site at [http://www.eren.doe.gov/EE/power_distributed_generation.html] and at [http://www.eren.doe.gov/distributedpower/].)

Vehicle Fuel Efficiency and Oil Conservation

Energy efficiency measures to curb oil demand, and other oil conservation measures, may help address energy security, economic issues such as high gasoline prices and oil import dependence, and environmental issues such as air pollution, climate change, and the proposal to develop oil in the Arctic National Wildlife Refuge (ANWR).

For the ANWR issue, technology-driven improvements to the fuel economy of cars and light trucks – without any change to the Corporate Average Fuel Economy (CAFE) standard – might save more fuel than would likely be produced by oil drilling in ANWR, although the two options are not mutually exclusive. The Energy Information Administration (EIA) says that a technology-driven projection for cars and light trucks could increase fuel economy by 3.6 mpg by 2020. Through the first 20 years, this increase would generate oil savings equivalent to four times the low case and three-fourths of the high case projected for ANWR oil production. Extended through 50 years, the fuel economy savings would range from 10 times the low case to more than double the high case for ANWR. (For more information on this issue, see CRS Report RL31033, *Energy Efficiency and Renewable Energy Fuel Equivalents to Potential Oil Production from the Arctic National Wildlife Refuge*).

CAFE is a key federal regulatory policy that had instituted a gradual ramp-up of fuel efficiency for newly manufactured cars and light trucks. The present CAFE standard for new cars is 27.5 mpg. The national fleet fuel economy for cars peaked at 21.1 mpg in 1991, declined slightly, and then climbed to 22.1 mpg in 2001. Similarly, light trucks peaked at 16.9 mpg in 1991, declined slightly, and then reached 17.6 in 2001. A floor amendment to S. 14 on fuel economy is expected. (For more on CAFE standards, see CRS Issue Brief IB90122, *Automobile and Light Truck Fuel Economy: Is CAFE up to Standards?*)

In the January 2003 State of the Union Speech, President Bush announced $720 million in new funding for a hydrogen fuel initiative to accelerate the use of fuel cells for transportation and power generation. Fuel cells can reduce gasoline (hence oil) use due to the ability to employ hydrogen-rich fuels, such as natural gas and alcohol fuels. The initiative builds on the Freedom Cooperative Automobile Research (FreedomCAR) Program launched in early 2002 by the Bush Administration to replace the Clinton Administration's Partnership for a New Generation of Vehicles. FreedomCAR creates a partnership with the auto industry to develop a fuel-cell-powered vehicle that would attain commercial use during 2010 to 2020. This program is funded primarily by DOE's Fuel Cell Technologies Program (see Table 2), but includes some funding from other agencies. (For more details on FreedomCAR see CRS Report RS21442, *Hydrogen and Fuel Cell Vehicle R&D: FreedomCAR and the President's Hydrogen Fuel Initiative*.)

Oil use for gasoline, home heating, and other applications makes it important to the transportation and production sectors of the nation's economy. Thus, fluctuating oil prices and dependence on imported sources can create economic vulnerabilities. Also, oil use has important environmental impacts. Its extraction and transport can lead to spills that pollute

land and water. Further, oil-based fuels, such as gasoline, generate sulphur dioxide and other air pollutants as well as large amounts of carbon dioxide that contribute to climate change.

U.S. oil use accounts for about 24% (2001) of the world's oil consumption and about 40% (2002) of total U.S. energy use. The nation uses (2000) about 19.7 million barrels of oil per day (mb/d), of which about 13.8 mb/d is used for transportation, including 4.7 mb/d for cars and 3.4 mb/d for light trucks (includes pickups, minivans, and sport utility vehicles).

Oil use in transportation can also be reduced through short-term conservation measures such as increased use of public transit, carpooling and ridesharing, and telecommuting; and through curtailment (e.g., driving less) and substitution of alternative fuels. Other measures can help reduce non-transportation oil uses. For example, home improvement measures such as insulation, energy-efficient windows, and weatherization measures can reduce the use of home heating oil.

Climate Change: Energy Efficiency's Role

Under the FY2003 Foreign Operations, Export Financing, and Related Programs Appropriations Bill in the 107th Congress, the Senate Appropriations Committee recommended (S.Rept. 107-219) $175 million under Development Assistance in a new fund for "energy conservation, energy efficiency, and clean energy" in developing countries. In contrast, the House Appropriations Committee recommended (H.Rept. 107-663) $3 million for this clean energy fund.

Energy efficiency is seen as a key means to reduce fossil fuel-induced carbon dioxide (CO2) emissions that may contribute to global climate change. Thus, recent debates over the U.S. role in the Kyoto Protocol and related international negotiations to curb global emissions of greenhouse gases tend to be reflected in deliberations over federal funding and incentives for energy efficiency.

In fulfilling requirements under the United Nations Framework Convention on Climate Change (UNFCCC), in June 2002, EPA issued the third U.S. climate report to the United Nations entitled *Climate Action Report 2002*. In it, the Bush Administration commits to reducing greenhouse gas intensity (emissions per unit of GDP) by 18% (4% more than under existing policies) over 10 years through a combination of voluntary, incentive-based, and existing mandatory measures focused on energy efficiency and other measures. This is projected to attain a 4.5% reduction from forecast emissions in 2012. The Administration has proposed this policy in place of the Kyoto Protocol, which it opposes due to concerns that it could raise energy prices and slow economic growth. Further, the Administration has stated its intent to support funding for energy efficiency and renewable energy programs at DOE and at the Global Environment Facility.

The 2001 *White House Initial Review on Climate Change* cites an existing array of energy efficiency and other programs that support goals of the UNFCCC and refers to the National Energy Policy (NEP) report's provisions for CHP, CAFE, Energy Star, and other energy efficiency policies as part of the foundation for its strategy to curb greenhouse gas (GHG) emissions.

The Kyoto Protocol had called for the United States to cut GHG emissions to 7% below the 1990 level during the period from 2008 to 2012. At the Seventh Conference of Parties (COP-7) in 2001, the United States was accused of avoiding real efforts to reduce emissions, through energy efficiency and other means, in order to address the Kyoto Protocol. At COP-8 in 2002, the parties resolved to continue efforts to ratify the Protocol and meet its goals.

DOE's 2000 report *Scenarios for a Clean Energy Future* shows the potential for advanced energy efficiency and other measures to cut two-thirds of the projected U.S. carbon emissions growth by 2010 and to cut emissions to the 1990 level by 2020. Assuming no major future policy actions, the reference case scenario in the EIA's January 2003 *Annual Energy Outlook 2003* projects 2010 emissions will be 1,800 MMTC, 32% more than that for 1990. DOE's 1995 report *Energy Conservation Trends* shows that energy efficiency has reduced long-term rates of fossil energy use and thereby curbed emissions of CO2 significantly. (For details about the potential for energy efficiency to reduce CO2 emissions, see CRS Report RL30414, *Global Climate Change: The Role for Energy Efficiency*.)

Electric Industry Restructuring and Conservation

There is a debate over the federal role in restructuring generally and in creating incentives to ensure a continuing role for energy efficiency specifically. The recent electricity problems in California, combined with the prospect of similar problems in other western states and the Northeast, raised the issue of whether a federal role is needed to encourage demand-side energy efficiency and load management measures. A June 2002 report (#49733) by the Lawrence Berkeley National Laboratory, *California Consumers Kept Lights on During Electricity Crisis by Conserving and Investing in Efficient Equipment*, found that conservation and efficiency measures reduced summer 2001 peak demand by 10%, increased system reliability, avoided some wholesale power purchases, and avoided $2 billion to $20 billion in potential losses from rolling blackouts. *Energy Efficiency Leadership in California*, an April 2003 report by the Natural Resources Defense Council and Silicon Valley Manufacturing Group, uses California Energy Commission data to project that additional efficiency measures could reduce electric demand by 5,900 MW and save $12 billion over the next 10 years. Some provisions in H.R. 6 and S. 14 would increase the energy efficiency of buildings, appliances, or other equipment that would reduce electric power demand or otherwise conserve electricity.

In the 1980s, many states and electric utility companies created demand-side management (DSM) programs to promote energy efficiency and other activities as a less costly alternative to new supply. DSM became a significant part of the nation's energy efficiency effort. Utility DSM spending peaked in 1994 at $2.7 billion and DSM energy savings peaked in 1996 at 61 billion kilowatt-hours (which is equivalent to the output from 12 one-gigawatt powerplants).

After California issued its 1994 proposal for electric industry restructuring, many states and utilities reduced DSM efforts. By 1998, utility DSM spending had fallen to about $1.4 billion. In response, some states, such as California, include provisions for energy efficiency and conservation in their restructuring legislation. For example, California's law (A.B. 1890, Article 7) placed a charge on all electricity bills from 1998 through 2001 that provided $872

million for "cost effective" energy efficiency and conservation programs. Other states, such as Pennsylvania, have few if any provisions for energy efficiency.

(For a discussion of broader electricity restructuring issues, see CRS Electronic Briefing Book on *Electricity Restructuring* at [http://www.congress.gov/brbk/html/ebele1.html] and CRS Issue Brief IB10006, *Electricity: The Road Toward Restructuring*.)

LEGISLATION

P.L. 108-7, Division E (H.J. Res. 2)

Consolidated Appropriations Resolution for FY2003. Foreign Operations, Export Financing, and Related Programs Appropriations, 2003, appears as Division E of the Resolution. Appropriates funding for renewable energy and energy efficiency under programs of the Global Environment Facility (GEF), U.S. Agency for International Development (AID), Overseas Private Investment Corporation (OPIC), and other bilateral and multilateral programs. Under Development Assistance, Section 555 appropriates $175 million in a new account to create a fund for "energy conservation, energy efficiency, and clean energy" in developing countries. House passed as a continuing resolution, January 8, 2003. Senate inserted its amendment (S.Amdt 1) and issued an unnumbered committee print (*Congressional Record*, p. S492) January 15, 2003. Passed Senate, amended, January 23, 2003. Conference reported (H.Rept. 108-10) February 13. Passed House and Senate February 13. Signed into law February 20, 2003.

P.L. 108-7, Division F (H.J. Res. 2)

Consolidated Appropriations Resolution for FY2003. Interior and Related Agencies Appropriations, 2003, appears as Division F of the Resolution and makes appropriations for DOE's Energy Efficiency program. Signed into law February 20, 2003.

P.L. 108-7, Division F (H.J. Res. 2)

Consolidated Appropriations Resolution for FY2003. Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations, 2003, appears as Division F of the Resolution. It includes appropriations for EPA's Climate Protection Energy Efficiency Programs. Signed into law February 20, 2003.

H.R. 6 (Tauzin)

Omnibus Energy Bill. In Division A, Title I has provisions for energy efficiency and energy conservation, Titles V and VII treat alternative fuels, Title VI has a PURPA cogeneration provision, and Title VIII addresses automobile efficiency. In Division B, Title I contains R&D authorizations. In Division D, Title I has tax incentives for efficiency and conservation. The bill incorporates provisions of H.R. 39, H.R. 238, and H.R. 1531. Introduced April 7, 2003; referred to Committee on Energy and Commerce and several other committees. Passed House, amended, April 10.

S. 14 (Domenici)

Omnibus Energy Bill. Energy efficiency appears as Title VI. Also, Title VII A covers alternative fuels, Title VIII covers hydrogen, Title IX covers R&D authorizations, and Title

XI on Electricity includes a provisions on PURPA and cogeneration. Energy efficiency markup held April 8. S. 597 (energy tax bill) is expected to be incorporated into S. 14. Introduced April 30, 2003. Floor action began May 6.

S. 139 (Lieberman)

Climate Stewardship Act of 2003. Accelerates the reduction of greenhouse gas emissions in the United States by establishing a market-driven system of greenhouse gas tradeable allowances that could be used interchangeably with passenger vehicle fuel economy standard credits, to limit greenhouse gas emissions in the United States and reduce dependence upon foreign oil. Introduced January 9, 2003; referred to Committee on Environment and Public Works.

S. 189 (Wyden)

21st Century Nanotechnology Research and Development Act. Authorizes FY2004 DOE appropriation of $160 million for nanotechnology R,D&D that addresses a variety of goals, including improved energy conservation. Introduced January 15, 2003; referred to Committee on Energy and Natural Resources.

S. 194 (Corzine)

National Greenhouse Gas Emissions Inventory and Registry Act of 2003. Establishes an inventory, registry, and information system of United States greenhouse gas emissions to inform the public and private sector concerning, and encourage voluntary reductions in, greenhouse gas emissions. Includes emissions reductions from energy efficiency activities. Introduced January 15, 2003; referred to Committee on Environment and Public Works

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

U.S. Congress. House. Committee on Science. President's Hydrogen Initiative. Hearing held March 5, 2003.

U.S. Congress. House. Committee on Energy and Commerce. Subcommittee on Energy and Air Quality. Comprehensive National Energy Policy: Hearing held March 5, 2003.

(An extensive list of hearings on energy efficiency in the 107th Congress appears on a DOE web site at [http://www.eere.energy.gov/office_eere/congressional_test.html].)

FOR ADDITIONAL READING

American Council for an Energy-Efficient Economy. *Proceedings from the ACEEE 2002 Summer Study on Energy Efficiency in Buildings.* Washington, 2002. (10 v.)

—— *ACEEE's Green Book: The Environmental Guide to Cars and Trucks: Model Year 2003.* 2003. 120 p.
[http://www.greenercars.com/indexplus.html]

—— *Proceedings from the ACEEE 2001 Summer Study on Energy Efficiency in Industry.* 2001. (2 v.) 1127 p.

Electric Power Research Institute (EPRI). *Selling Customers on Energy Efficiency*. EPRI Journal, v. 23, November/December 1998. p. 8-17.

General Accounting Office (GAO). *Research and Development: Lessons Learned from Research Could Benefit FreedomCAR Initiative*. (GAO -02-8101) 2002. 50 p.

National Research Council. *Energy Research at DOE: Was It Worth It? [Energy Efficiency and Fossil Energy Research 1978 to 2000]*. 2001. 224 p.
[http://www.nap.edu/books/0309074487/html/]

—— *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards.* 2001. 184 p.

U.S. Department of Energy. Interlaboratory Working Group. *Scenarios for a Clean Energy Future*. (ORNL/CON-476) November 2000. 350 p.
[http://www.ornl.gov/ORNL/Energy_Eff/CEF.htm]

—— Energy Information Administration. *Measuring Energy Efficiency in the United States' Economy: A Beginning*. (DOE/EIA-0555[95]/2) October 1995. 91 p.
[http://www.eia.doe.gov/emeu/efficiency/contents.html]

—— *U.S. Electric Utility Demand-side Management.* In *Electric Power Annual 2000, Volume II.* (DOE/EIA-0348[2000]/2) November 2002. p. 77-84.
[http://www.eia.doe.gov/cneaf/electricity/epav2/epav2.pdf]

U.S. Environmental Protection Agency. *U.S. Climate Action Report 2002*. 2002. 260 p.
[http://www.epa.gov/globalwarming/publications/car/index.html]
—— *Partnerships Changing the World: Energy Star and Other Voluntary Programs 2001 Annual Report.* (430-R-02-010) August 2002. 52 p.
[http://www.epa.gov/appdstar/pdf/cpdann01.pdf]

U.S. Executive Office of the President. President's Committee of Advisors on Science and Technology. *Powerful Partnerships: The Federal Role in International Cooperation on Energy Innovation.* June 1999.

Vine, Edward et al. *Public Policy Analysis of Energy Efficiency and Load Management in Changing Electricity Businesses.* Energy Policy, v. 31, 2003. p. 405-430.

CRS Reports

CRS Report RL31427. *Omnibus Energy Legislation: H.R. 4 Side-by-side Comparison*, by Mark Holt and Carol Glover.

CRS Report RL30452. *Climate Change: Federal Research, Technology, and Related Programs*, by Michael M. Simpson.

CRS Report RL30414. *Global Climate Change: The Role for Energy Efficiency*, by Fred Sissine.

CRS Report RS20298. *Sport Utility Vehicles, Mini-Vans, and Light Trucks: An Overview of Fuel Economy and Emissions Standards*, by Brent Yacobucci.

CRS Report RL31188, *Energy Efficiency and the Rebound Effect*, by Frank Gottron.

Web Sites

American Council for an Energy-Efficient Economy (ACEEE). Extensive listing of web sites on energy efficiency.
[http://www.aceee.org/]

CRS electronic briefing book on Electricity Restructuring.
[http://www.congress.gov/brbk/html/ebele1.html]

CRS electronic briefing book on Global Climate Change.
[http://www.congress.gov/brbk/html/ebgcc1.html]

National Association of State Energy Offices.
[http://www.naseo.org/]

U.S. Council for Automotive Research (USCAR). FreedomCAR.
[http://www.uscar.org/pngv/index.htm]

U.S. Department of Energy. Energy Efficiency and Renewable Energy Network.
[http://www.eren.doe.gov/]

U.S. Department of Energy. FY2004 Congressional Budget Request.
[http://www.cfo.doe.gov/budget/04budget/index.htm/]

U.S. Lawrence Berkeley Laboratory. Center for Building Science.
[http://eetd.lbl.gov/]

U.S. Environmental Protection Agency. FY2004 Budget Justification (Goal 6, Climate Change, p. VI-28).
[http://www.epa.gov/ocfo/budget/2004/2004cj.htm]

U.S. Environmental Protection Agency. Energy Star Programs.
[http://www.energystar.gov/]

Table 3. DOE Energy Efficiency Budget for FY2001-FY2004

(selected programs, $ millions)

	FY2002 Appn.	FY2003 Appn.	FY2004 Request	FY2004 - FY2003	Pct. Diff.
VEHICLE TECH.	181.4	177.3	157.6	-19.7	-11%
Hybrid and Electric	47.1	42.7	49.6	6.9	16%
Advanced Combustion	47.2	56.3	37.1	-19.2	-34%
Materials Technology	39.2	36.8	39.6	2.9	8%
Fuels Technology	24.7	19.6	6.8	-12.8	-65%
Technology Introduction	3.5	4.6	5.9	1.3	29%
FUEL CELL TECH.	46.7	55.1	77.5	22.4	41%
Transportation Systems	7.5	6.2	7.6	1.4	23%
Distributed Energy Systems	5.5	7.5	7.5	0.0	1%
INTERGOVERNMENTAL	324.2	314.4	357.0	42.5	14%
Weatherization Program	230.0	223.5	288.0	64.7	29%
State Energy Program	45.0	44.7	38.8	-5.9	-13%
Other State Energy	8.2	5.3	2.4	-3.0	-56%
Gateway Deployment	41.0	40.9	27.6	-13.3	-32%
Rebuild America	11.9	11.0	8.6	-2.4	-22%
Clean Cities	11.0	11.0	6.6	-4.4	-40%
Energy Star	3.0	4.2	3.7	-0.5	-11%
Ind. Competitiveness	2.7	2.7	0.0	-2.7	-100%
Inventions	4.3	3.8	2.4	-1.5	-38%
International Market Dev.	0.7	0.6	0.0	-0.6	-100%
DISTRIB. ENERGY RES.	55.1	61.1	51.8	-9.4	-15%
BUILDING TECH.	63.1	59.4	52.6	-6.8	-11%
Res. & Commercial Bldgs	16.6	16.8	20.2	3.4	20%
Emerging Technologies	35.0	31.3	21.8	-9.5	-30%
INDUSTRIAL TECH.	100.9	98.6	64.4	-34.1	-35%
Ind. of the Future, Specific	61.8	60.4	24.0	-36.4	-60%
Ind. of the Future, Cross.	33.6	34.2	34.4	0.2	1%
BIOMASS/ BIOREFINERY	24.8	24.6	8.8	-15.8	-64%
Advanced Biomass Tech.	7.1	9.2	8.4	-0.8	-9%
Systems Integ. & Production	17.1	14.6	0.0	-14.6	100%
FED. ENERGY MGMT	18.9	19.3	20.0	0.7	3%
PROGRAM MGMT	81.4	77.0	76.7	-0.3	0%
Energy Eff. Science Init.	-----	5.0	0.0	-5.0	-----
National Climate Initiative	-----	0.0	9.5	9.5	-----
R&D SUBTOTAL	621.5	623.5	548.8	-74.7	-12%
GRANTS SUBTOTAL	275.0	268.2	327.0	58.8	22%
TOTAL	896.5	891.8	875.8	-16.0	-2%

Sources: EERE Pocket Card, Apr. 30, 2003: DOE FY2004 Cong. Bud. Request, v. 7, February 2003; H.Rept. 108-10 (Cong. Rec. Feb. 12, 2003, p. H1087-88).