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

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Energy Efficiency: Budget, Oil Conservation, and Electricity Conservation 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 in 2001 and the Iraq war have led to heightened concern for energy security and raised further concerns about the vulnerability of energy infrastructure and the need for alternative fuels. Further, the 2001 power shortages in California, the 2003 northeast-midwest power blackout, and continuing high natural gas and oil prices have brought a renewed emphasis on energy efficiency and energy conservation to dampen electricity, oil, and natural gas demand.

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

The Bush Administration's FY2006 budget request for the Department of Energy's (DOE's) Energy Efficiency Program seeks \$846.8 million, \$21.4 million less than FY2005. This includes \$575.8 million for R&D and \$271.0 million for grants.

The House passed H.R. 2419, the Energy and Water (E&W) appropriations bill for FY2006, which funds DOE's Energy Efficiency (Conservation) and Renewable Energy programs. A new account structure does not provide a total figure for energy efficiency programs.

The House has passed H.R. 6, the Energy Policy Act of 2005, with many non-tax energy efficiency provisions similar to H.R. 6 of the

108th Congress. It reauthorizes many programs, sets a new goal for reducing federal facilities energy use, extends federal Energy Saving Performance Contracts (ESPCs), establishes several standards for products and equipment, and could terminate cogeneration purchase requirements. Further, it has about \$0.4 billion in tax incentives for energy efficiency.

The Senate version of H.R. 6 (incorporates S. 10) is on the Senate floor. Thus far, the main differences from the House bill are stronger standards for products and equipment (§135 and §136) and a major oil savings provision (§151). Also, the tax package in the Senate Finance Committee has about \$5.4 billion in tax incentives for energy efficiency, including \$3.7 billion for equipment and \$1.7 billion for vehicles.

In the 108th Congress, the conference version of the omnibus energy bill (H.R. 6) had significant tax and regulatory measures for energy efficiency. It would have allowed DOE to set an efficiency standard for "standby mode" energy use in battery chargers and external power supplies; set equipment efficiency standards by statute and rule; and set a higher goal for efficiency in federal facilities. The bill did not pass, in part due to concerns about cost and the controversial MTBE "safe harbor" provision.

P.L. 108-357 provided tax-exempt bonds for green buildings and reduced the tax deduction for SUVs. P.L. 108-311 extended a tax credit for electric vehicles and a tax deduction for clean fuel vehicles. Neither law contained any of the key energy efficiency tax provisions in H.R. 6, S. 2095, or S. 1637.

MOST RECENT DEVELOPMENTS

A June 16 draft Senate amendment to H.R. 6, entitled “Climate and Economy Insurance Act,” would create (§1526) a Climate Change Trust Fund with incentives for energy efficiency and conservation. Also on June 16, the Senate adopted S.Amdt. 775, incorporating S. 10 into its version of H.R. 6, which is on the Senate floor. Further, the Senate Finance Committee chairman’s mark for tax provisions to be incorporated into the Senate bill has \$5.4 billion (29%) for efficiency, with \$3.7 billion for equipment and \$1.7 billion for vehicles. On May 26, 2005, the Senate Energy and Natural Resources Committee reported S. 10 with several non-tax energy efficiency provisions. The House-passed version of H.R. 6, the Energy Policy Act of 2005, contains many non-tax energy efficiency provisions similar to those of H.R. 6 in the 108th Congress. It has about \$0.4 billion in tax incentives for efficiency and conservation. (Key issues of H.R. 6 are described in CRS Issue Brief IB10143, *Energy Policy: Comprehensive Energy Legislation (H.R. 6) in the 109th Congress*; the renewable energy provisions in H.R. 6 and other bills of the 109th Congress are discussed in “Energy Efficiency in the 109th Congress,” below; and the provisions in H.R. 6 and S. 2095 from the 108th Congress are described in “Energy Efficiency in 108th Congress Omnibus Energy Bills,” below.)

On June 16, the Senate Appropriations Committee reported the FY2006 Energy and Water Appropriations bill (H.R. 2419), which provides funding for DOE’s Energy Efficiency (Conservation) and Renewable Energy programs. Compared with the House-passed bill, the Senate version of H.R. 2419 has increases of \$32 million for Vehicle Technologies and \$5 million for Weatherization, and it has decreases of \$15 million for Program Direction, and \$2.4 million for Industrial Technologies. (For more details, see “DOE Budget, FY2006,” and **Table 3**.) The FY2006 request for EPA’s Climate Protection (Energy Efficiency) Programs is \$113.3 million, which is \$3.8 million higher than the FY2005 request. (For more details, see “EPA Budget, FY2006,” and **Table 2**.)

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 “curtailment,” which decreases 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, the downward pressure on energy prices created by energy efficiency comes from demand reductions instead of increased supply. As a result, energy efficiency can reduce resource use and environmental impacts. (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 *FY2006 Congressional Budget Request*, DOE/ME-0052, vol. 7, February 2005, available at [<http://www.cfo.doe.gov/budget/06budget/Start.htm>].)

From FY1973 through FY2002, DOE spent about \$11.7 billion in 2003 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 2003 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 FY2003, \$612 million was appropriated, which was \$56 million, or 9%, above the FY1994 mark in 2003 constant dollars. Also, in 2003 constant dollars, since FY1973, DOE has spent about \$7.7 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 2003 constant dollars, the federal government spent about \$24.3 billion for nuclear (fission and fusion) R&D and about \$5.5 billion for fossil energy R&D. From FY1973 through FY2003, the federal government spent \$49.1 billion for nuclear (fission and fusion), \$24.8 billion for fossil, \$14.6 billion for renewables, and \$11.7 billion for energy efficiency. Total energy R&D spending from FY1948 to FY1998, in 2003

constant dollars, reached \$131.2 billion, including \$74.0 billion, or 56%, for nuclear, \$30.9 billion, or 24%, for fossil, \$14.6 billion, or 11%, for renewables, and \$11.7 billion, or 9%, for energy efficiency.

DOE's FY2004 energy efficiency R&D funding totaled \$559.7 million, or about 24% of DOE's energy R&D appropriation. Renewable energy R&D received \$439.4 million (19%), fossil energy received \$672.8 million (29%), and fission and fusion were appropriated \$667.4 million (29%).

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* found 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.

DOE's Strategic and Performance Goals

In 2004, a National Academy of Public Administration (NAPA) study found dramatic improvement in the Office of Energy Efficiency and Renewable Energy (EERE) after a major reorganization that included new offices for FreedomCAR and Vehicle Technologies and for Hydrogen, Fuel Cells, and Infrastructure. Information about the new management structure and other aspects of EERE are available on the DOE website at [http://www.eere.energy.gov/office_eere/]. The study is available on the NAPA website at [<http://www.napawash.org/Pubs/EERE%20NAPA%20Rpt%20Sept%2004.htm>].

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.

A 2004 Resources for the Future (RFF) report, *The Effectiveness and Cost of Energy Efficiency Programs*, reviews a broad range of studies about DOE and EPA programs. The report estimates that a selected range of non-transportation programs saves four Q of energy per year and estimates carbon and air pollution emission savings. The full report is available on the RFF website at [<http://www.rff.org/Documents/RFF-DP-04-19REV.pdf>].

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, DOE's Federal Energy Management Program (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 the 109th Congress

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. H.R. 6 (§133) would authorize the DOE Secretary to expand efficiency standards within three years to cover "standby mode" energy use by battery chargers and external power supplies. It would also legislate efficiency standards for exit signs, torchieres, traffic signals, and distribution transformers and it calls for DOE to set standards by rule for suspended ceiling fans, vending machines, unit heaters, and commercial refrigerators and freezers. H.R. 6 in the 108th Congress had identical provisions for these standards. In testimony (March 2003) on H.R. 6 in the 108th Congress, the American Council for an Energy-Efficient Economy estimated that these new standards would save more energy than any other efficiency provisions in the bill. The table below indicates which standards would be set by law and which would be set by DOE rulemaking.

Standard set:	H.R. 6 (House-passed)
By law	exit signs, traffic signals, torchieres, distribution transformers, unit heaters, medium base compact fluorescent lamps
By rule	ceiling fans, vending machines, commercial refrigerators and freezers and refrigerator-freezers, residential furnace fans

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), from 1985 to 2000. This goal was exceeded, slightly. H.R. 6 (§102) would set a goal for further energy efficiency in federal facilities. Compared to the baseline year energy use in 2003, the goal is a 20% energy reduction over a 10-year period from 2006 to 2015. Also, DOE is required to review results by the end of the 10-year period and recommend further goals for an additional decade. Most of the other provisions for federal programs are administrative measures that would help agencies achieve the above-described goal.

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 (§101) calls for the implementation of a plan for congressional buildings to meet the energy efficiency goal

for federal agencies noted above. It also calls for a study of the potential for energy efficiency and renewables to increase reliability during a power outage and authorizes up to \$2 million annually, over five years.

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. H.R. 6 proposes two modest new tax credits for energy efficiency. Section 1312 encourages business use of fuel cells and Section 1317 aims to improve efficiency in existing homes.

Energy Efficiency Tax Revenue Effect. Table 1, below, compares the estimated 10-year revenue effect of energy efficiency and conservation tax provisions in the House-passed version of H.R. 6, and the Senate Finance Committee chairman's mark.

Table 1. H.R. 6, Tax Revenue Effect
(\$ billions)

	House	Sen. Finance Cmte.
Energy Efficiency and Conservation Measures (§1312 and §1317 in House bill, excluding diesel fuels, alternative fuels, and solar credit)	\$0.397	\$3.733
Hybrid and Fuel Cell Vehicles	—	\$1.686
Total, Energy Efficiency and Conservation	\$0.397	\$5.419
Gross Total, All Tax Provisions	\$8.090	\$18.421
Energy Efficiency and Conservation Share of Total	4.9%	29.4%

Source: Joint Committee on Taxation (JCT), *Estimated Revenue Effects of the Chairman's Amendment in the Nature of a Substitute to H.R. 1541, Scheduled for Markup by the Committee on Ways and Means, April 13, 2005* (JCX-17-05); *Estimated Revenue Effects of the Chairman's Amendment in the Nature of a Substitute to the "Energy Policy Tax Incentives Act of 2005," Scheduled for Markup by the Committee on Finance, June 16, 2005* (JCX-47-05).

Housing, Funding Authorizations, and Other Provisions

H.R. 6 has several provisions (§ 141-149) for energy efficiency in public housing. Also, Section 121 authorizes funding for energy assistance (e.g., Low-Income Home Energy Assistance Program, LIHEAP), and Sections 122 and 123 authorizes grant programs (e.g., DOE Weatherization Program and State Energy Program). Several other energy efficiency programs are authorized in Title I and Title IX.

Energy Efficiency in 108th Congress Omnibus Energy Bills

In the 108th Congress, most legislative action on energy efficiency focused on omnibus energy policy bills, S. 1637, S. 2095, H.R. 6, and S. 14/S. 1149. Late in 2003, a cloture motion to stop a Senate filibuster on the conference report (H.Rept. 108-375) for H.R. 6 failed (57-40). Key objections cited in Senate debate included budget concerns and the Title

XV “safe harbor” from product liability lawsuits for producers of MTBE (methyl tertiary-butyl ether), ethanol, and other renewable fuels.

Several significant energy efficiency provisions were included in S. 1637, S. 2095, and H.R. 6. Key provisions included proposals that would have required a DOE rulemaking to set an efficiency standard for “standby mode” energy use in battery chargers and external power supplies; legislated standards for certain equipment and directed DOE to set a standard by rule for other types of equipment; and set goals for efficiency in federal buildings. Other provisions would have created incentives for energy efficiency measures in home construction, home renovation, appliances, residential equipment, commercial buildings, fuel cells, and combined heat and power equipment, and for alternative fuels. (For a detailed summary of provisions in the conference version of H.R. 6, see CRS Report RL32204, and see CRS Report RL32078, which compares House and Senate versions of H.R. 6 with S. 14. For side-by-side comparisons of provisions in H.R. 6, see CRS Report RL32033 (non-tax provisions), CRS Report RL32042 (tax provisions), and CRS Report RL32041 (electricity provisions).

DOE Budget, FY2006

The Department of Energy (DOE) request seeks \$846.8 million for energy efficiency, which is \$21.4 million, or 2%, less than the FY2005 appropriation (excluding inflation). The main increases are for Biofuels/Biorefinery (\$14.5 million) and Fuel Cells (\$8.7 million). The main cuts are for Industrial programs (-\$18.3 million), Advanced Combustion Vehicles (-\$8.7 million), Buildings (-\$7.5 million), Clean Cities (-\$4.1 million), and State Energy Program (-\$3.2 million).

The FY2006 budget request (Appendix, p. 402) notes that the “Administration’s energy efficiency programs have the potential to produce substantial benefits for the nation — both now and in the future — in terms of economic growth, increased energy security and a cleaner environment.” In particular, the request aims to “accelerate” the development of hydrogen-powered fuel cell vehicles. The Hydrogen program aims to facilitate industry commercialization of infrastructure for those vehicles by 2015. Goals for other energy end-use and production technologies generally seek to improve energy efficiency and performance while reducing costs. The request also proposes funding tax credits, including an investment tax credit for combined heat and power (CHP) through the end of 2009, an extension of the hybrid vehicle tax credit through the end of 2008, and a tax credit for fuel cell vehicles purchased through the end of 2012.

For further information on the *Energy Conservation Budget*, see [<http://www.cfo.doe.gov/budget/06budget/Start.htm>]. For further information on *Energy Conservation Programs*, see [<http://www.eere.energy.gov/>].

EPA Budget, FY2006

The FY2006 request for EPA’s Climate Protection Programs (CPPs) is \$113.3 million, which is \$3.8 million more than FY2005 request. This includes \$3.6 million more under the Office of Environmental Programs and Management (EPM) and \$0.3 million more under the Office of Science and Technology (S&T).

EPA conducts its CPP programs under the Office of Atmospheric Programs, with funding from appropriation accounts for EPM and S&T. EPM programs cover the areas of buildings, industry, state and local government, international, and sequestration. S&T programs mainly cover transportation. CPP programs focus mainly on voluntary energy efficiency activities. 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 labeling, information dissemination, and other activities to overcome market barriers.

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

(\$ millions current)

	FY2004 Enacted	FY2005 Request	FY2006 Request	FY2006 -FY2005	Percent Diff.
Environ. Programs & Management	88.5	92.0	95.5	3.6	4%
Science & Technology	21.8	17.5	17.7	0.3	2%
TOTAL	110.3	109.4	113.3	3.8	3%

Source: EPA FY2006 Congressional Justification of Appropriation Estimates (EPA-205/R-05-001), Feb. 2005, [<http://www.epa.gov/ocfo>], pp. S&T-6, EPM-29, Appendix-75.

Energy Security

The September 11, 2001, terrorist attacks 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 DOE's report *Homeland Security: Safeguarding America's Future with Energy Efficiency and Renewable Energy Technologies* and in *U.S. Energy Security Facts* (available at [http://www.rmi.org/images/other/EnergySecurity/S03-04_USESFtext.pdf]).

Electricity Demand-Side Management (DSM) and Distributed Power

The August 2003 electric power blackout that affected several states and Canadian provinces rekindled interest in energy efficiency, energy conservation/demand response measures, and distributed power generation. 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 called 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 has provisions (§126, §932) for distributed energy. (For more on distributed energy, see the DOE website at [http://www.eere.energy.gov/EE/power_distributed_generation.html] and at [<http://www.eere.energy.gov/distributedpower/>].)

Energy Conservation to Curb Natural Gas Demand

The Secretary of Energy requested that the National Petroleum Council (NPC) report on policy options to address the problem of high natural gas prices. The report, *Balancing Natural Gas Policy*, says gas prices could average from \$5 to \$7 per thousand cubic feet for years to come, and it concludes, among other options, that energy conservation and greater energy efficiency have the biggest immediate potential to hold down prices. The report recommends updating building codes and equipment standards, promoting Energy Star equipment, using the most efficient power plants, deploying distributed energy, installing smart controls, and employing best practices for low-income weatherization. The Alliance to Save Energy and the American Council for an Energy-Efficient Economy (ACEEE) applaud the NPC recommendations but stress that many other measures — including tax incentives, utility performance standards, federal buildings improvements, and regulations to make energy conservation profitable for utilities — were not in the report and should be considered. Also, a 2005 report by ACEEE, *Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets: Updated and Expanded Analysis*, says that in one year, a massive energy efficiency effort could be put in place that would reduce gas use by 1% and cut prices by 37%. (The NPC report is at [<http://www.npc.org/>] and the ACEEE report is at [<http://www.aceee.org/press/0504eerespond.htm>].)

On January 24, 2005, the Senate Energy and Natural Resources Committee held a natural gas conference. Some participants described the potential for energy efficiency to reduce gas demand and prices. See [<http://energy.senate.gov/conference/conference.cfm>]. Some statements refer to a recent DOE study, *Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency*, available at [<http://eetd.lbl.gov/ea/ems/reports/56756.pdf>].

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 22.3 mpg in 2003. Similarly, light trucks peaked at 17.4 mpg in 1993, declined slightly, and then reached 17.7 in 2003. A floor amendment (H.Amdt. 73) to H.R. 6 to raise fuel economy standards failed to pass. H.Amdt. 75 was passed, requiring EPA to revise its adjustment factors to increase the accuracy of fuel economy labels. (For more on CAFE standards, see CRS Issue Brief IB90122, *Automobile and Light Truck Fuel Economy: Is CAFE up to Standards?*)

A report by the Congressional Budget Office (CBO), *The Economic Costs of Fuel Economy Standards Versus a Gasoline Tax*, found that a 46-cent-per-gallon gasoline tax increase would achieve a 10% reduction in fuel use at a cost that is 3% less than the cost of creating a higher CAFE standard with or without credit trading.

The Bush Administration's hydrogen fuel initiative seeks 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 Administration's Freedom Cooperative Automobile Research (FreedomCAR) Program. 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 3**) 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 25% (2003) of the world's oil consumption and about 40% (2003) of total U.S. energy use. The nation uses (2003) about 20.1 million barrels of oil per day (mb/d), of which about 13.2 mb/d is used for transportation, including about 5.0 mb/d for cars and 3.7 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

The FY2004 Foreign Operations, Export Financing, and Related Programs Appropriations Act (P.L. 108-199, Division D, Section 555) provided \$180 million for “energy conservation, energy efficiency, and clean energy” to reduce greenhouse gas emissions in developing countries.

DOE’s November 2003 report *U.S. Climate Change Technology Program — Technology Options for the Near and Long Term* compiles information from multiple federal agencies on more than 80 technologies. For these end-use and supply technologies, the report describes President Bush’s initiatives and R&D goals for advancing technology development, but it does not estimate emissions saving potentials, as some previous DOE reports on the topic had presented.

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), 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-10 in 2004, the parties focused mainly on technical issues, including “next steps” for developing nations. In February 2005, the Kyoto Protocol went into effect, without a U.S. commitment to an emissions reduction goal.

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*.)

In September 2004, the California Air Resources Board approved a plan that would require automobile manufacturers to cut carbon dioxide and other GHG emissions 22% by 2012. This could force automakers to increase fuel efficiency sharply. An industry court challenge is possible. Seven northeastern states have adopted other auto emission regulations by California. In April 2005, the Canadian government signed a "voluntary" agreement with automakers to reduce GHG by 5.3 million tons, or 17%, by 2010.

Electric Industry Restructuring and Conservation

The debate over the federal role in restructuring includes questions about energy efficiency. The 2001 electricity problems in California 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 megawatts (MW) and save \$12 billion over the next 10 years.

Many states and electric utilities 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 "public goods" 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 Report RL32728, *Electric Utility Regulatory Reform: Issues for the 109th Congress*.)

LEGISLATION

109th Congress

H.R. 6 (Barton). Energy Policy Act of 2005. Section 102 sets a goal for 20% energy reduction in federal facilities by 2015. Section 104 requires federal agency purchases of EPA Energy Star and FEMP-designated products. Section 105 permanently extends ESPCs and sets \$500 million cap. Section 124 authorizes funding to states for rebates to support the cost premium for residential purchases of Energy Star products. Section 133 establishes energy efficiency standards for a variety of consumer products and commercial equipment. Title I also sets out several energy efficiency provisions for public housing. Title VII has provisions for hybrid, fuel cell, and electric vehicles; and revises and extends some aspects of fuel economy standards. Title IX reauthorizes DOE energy efficiency R&D programs. Section 1253 would, under certain conditions, terminate PURPA cogeneration requirements. Sections 1312 and 1317 would create \$397 million in tax credits for energy efficiency. Committee on Energy and Commerce ordered committee print reported, as amended, April 13. Incorporated Domestic Energy Security Act and H.R. 1541 (as Title XIII). Referred to Committees on Energy and Commerce, Resources, Ways and Means, Science, and others April 18. Passed House, amended, April 21.

H.R. 1541 (Thomas). Section 202 provides a 15% business investment tax credit to support installation of fuel cell equipment. The Joint Committee on Taxation scores this provision at \$6 million over 10 years. Section 207 provides a 20% investment tax credit (\$2,000 maximum) to home owners for energy efficiency improvements. The Joint Committee on Taxation scores this provision at \$391 million over 10 years. Committee on Ways and Means ordered bill reported, April 13. Incorporated into H.R. 6.

H.R. 2419 (Hobson). Energy and Water Development Appropriations Act, 2006. Provides funding for DOE energy efficiency (conservation) programs, formerly funded under Interior Appropriations, in a new account structure that merges program funding for DOE renewable energy programs. Reported (H.Rept. 109-86) May 18, 2005. Passed House, amended, May 24.

S. 726 (Alexander). Natural Gas Price Reduction Act of 2005. Section 101 authorizes funding for an energy conservation public education initiative. Section 102 sets efficiency standards, test procedures, and labeling requirements for several types of residential and commercial equipment. Section 103 authorizes funding for distributed generation. Section 104 authorizes funding to accelerate hydrogen and fuel cell development. Section 105 would, under certain conditions, repeal PURPA Section 210 requirements for cogeneration and small power facilities. Section 106 calls for a study of cogeneration and small power. Introduced April 6, 2005; referred to Committee on Energy and Natural Resources.

S. 727 (Alexander). Tax Incentives for the Natural Gas Price Reduction Act of 2005. Section 2 makes a 10% investment tax credit available over four years to combined heat and power (CHP or cogeneration) systems smaller than 50 megawatts (MW) that satisfy certain efficiency standards. Section 4 has an investment tax credit (20%) for residential fuel cell equipment. It also creates a 20% investment tax credit (\$2,000 maximum) to homeowners for retrofits to existing residential housing with energy efficient envelope components

(insulation, windows, roofs, heating equipment); and an equipment tax credit (maximum \$2,000) to home builders for envelope components that reduce home energy use by 30%. Section 4 also provides a tax credit to manufacturers (\$60 million maximum) for energy-efficient clothes washers (\$100 each) and refrigerators (\$150 each). Further, Section 4 creates a tax deduction (\$1.50 per square foot maximum) for energy efficient equipment in commercial buildings that reduces energy use by 50%. Introduced April 6, 2005; referred to Committee on Finance.

(A more extensive list of more than 80 bills appears in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress.*)

108th Congress

P.L. 108-311 (H.R. 1308). Working Families Tax Relief Act of 2004. Section 318 extends a credit for electric vehicles and Section 319 extends a deduction for clean fuel vehicles. House and Senate approved the conference report (H.Rept. 108-696) September 23, 2004. Signed into law October 4, 2004.

P.L. 108-357 (H.R. 4520). American Jobs Creation Act. Section 701 creates a \$2 billion tax exempt bond program for green building demonstrations at brownfields. Section 910 reduces the tax deduction for Sport Utility Vehicles (SUVs). Introduced in House June 4, 2004. Reported (H.Rept. 108-548, Part 1) June 16. Passed House June 17. In Senate, S. 1637 reported (S.Rept. 108-192) November 3, 2003. S.Amdt. 3562 incorporated S. 1637 into H.R. 4520 and passed Senate July 15, 2004. Conference report (H.Rept. 108-755) approved in House October 7 and in Senate October 11. President signed October 22, 2004.

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

U.S. Congress. House. Committee on Science. *Improving the Nation's Energy Security: Can Cars and Trucks Be Made More Fuel Efficient?* Hearing held February 9, 2005. [<http://www.house.gov/science/hearings/full05/feb9/February92005.htm>]

(A more extensive list appears in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress.*)

(Many hearings on Energy Efficiency and Renewable Energy held in the 108th Congress are listed on the DOE Office of Energy Efficiency and Renewable Energy website 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 2004 Summer Study on Energy Efficiency in Buildings.* Washington, 2004. (10 v.)

—ACEEE's *Green Book: The Environmental Guide to Cars and Trucks: Model Year 2005.* 2005. 120 p. Summary at [<http://aceee.org/press/0502greencar.htm>].

- Cato Institute. *The High Costs of Federal Energy Efficiency Standards for Residential Appliances*. (Policy Analysis No. 504) 2003. 15 p.
- Government Accountability Office (GAO). *Research and Development: Lessons Learned from Research Could Benefit FreedomCAR Initiative*. (GAO -02-8101) 2002. 50 p.
- National Association of Regulatory Utility Commissioners (NARUC). *AGA and NRDC Release Energy Efficiency (Conservation Tariff) Joint Statement*. August 2004. 4 p. [<http://www.naruc.org/displayindustryarticle.cfm?articlenbr=21073&startrec=1>]
- 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.
- Rocky Mountain Institute. *Winning the Oil Endgame: Innovation for Profits, Jobs, and Security*. 2004. 306 p. [<https://www.rmi.org/store/p12details4772.php>]
- U.S. Department of Energy. Energy Information Administration. *Impacts of Modeled Recommendations of the National Commission on Energy Policy*. [Report on CAFE fuel economy] (SR/OIAF/2005-02) April 2005. 79 p. [<http://www.eia.doe.gov/oiaf/servicerpt/bingaman/>]
- Interlaboratory Working Group. *Scenarios for a Clean Energy Future*. (ORNL/CON-476) November 2000. 350 p. [<http://www.ornl.gov/sci/eere/cef/>]
- State Energy Advisory Board. *Homeland Security: Safeguarding America's Future with Energy Efficiency and Renewable Energy*. (DOE/EE-0272) August 2000. 26 p. [<http://www.steab.org/>]
- U.S. Environmental Protection Agency. *U.S. Climate Action Report 2002*. 2002. 260 p. [<http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsUSClimateActionReport.html>].
- *Protecting the Environment — Together: Energy Star and Other Voluntary Programs 2003 Annual Report*. (EPA 430-R-04-011) September 2004. 47 p. [http://www.energystar.gov/ia/news/downloads/annual_report_2003.pdf]
- U.S. Government Accountability Office (GAO). *Electricity Markets: Consumers Could Benefit from Demand Programs, But Challenges Remain* (GAO-04-844) August 2004. 68 p. [<http://www.gao.gov/new.items/d04844.pdf>]

CRS Reports

CRS Report RL32860. *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*, by Fred Sissine.

CRS Report RL32543. *Energy Saving Performance Contracts: Reauthorization Issues*, by Anthony Andrews.

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.

Websites

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

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

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

U.S. Department of Energy. Energy Efficiency and Renewable Energy Network.
[<http://www.eere.energy.gov/>]

U.S. Department of Energy. FY2005 Congressional Budget Request.
[<http://www.mbe.doe.gov/budget/05budget/>]

U.S. Department of Energy and U.S. Environmental Protection Agency. Fuel Economy.
[<http://www.fueleconomy.gov/>]

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

U.S. Environmental Protection Agency. FY2005 Budget Justification (Goal 1, Clean Air and Global Climate Change, p. I-111 to I-133 and Special Analysis, p. SA-42).
[<http://www.epa.gov/ocfo/budget/2005/2005cj.htm>]

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

Table 3. DOE Energy Efficiency Budget for FY2004-FY2006
(selected programs, \$ millions)

	FY2005 Appn.	FY2006 Request	FY2006 House	FY2006 Senate Cmte	Senate Cmte - House	Senate Cmte - FY2005
HYDROGEN TECH.	94.6	99.1	99.1	99.1	0.0	4.5
FUEL CELL TECH.	74.9	83.6	83.6	83.6	0.0	8.7
Fuel Processor	9.7	9.9	—	—	—	—
Stack Component	32.5	34.0	—	—	—	—
BIOFUELS / BIOREF ^Y	89.1	72.2	86.2	92.2	6.0	3.1
VEHICLE TECH.	166.9	165.9	167.9	199.9	32.0	33.0
Hybrid and Electric	—	—	—	—	—	—
Advanced Combustion	—	—	—	—	—	—
Materials Technology	—	—	—	—	—	—
Fuels Technology	—	—	—	—	—	—
Technology Introduction	—	—	—	—	—	—
BUILDING TECH.	67.1	58.0	65.0	67.0	2.0	-0.1
Res. & Commercial Bldgs	21.9	22.9	—	—	—	—
Emerging Technologies	31.4	25.4	—	—	—	—
INDUSTRIAL TECH.	75.3	56.6	56.6	56.5	— 2.4	-18.9
Ind. of the Future, Specific	38.2	22.1	—	—	—	—
Ind. of the Future, Cross.	32.9	30.6	—	—	—	—
DISTRIB. ENERGY RES.*	60.6	56.6	56.6	—	—	—
FED. ENERGY MGMT	20.1	19.2	19.2	19.2	0.0	-0.9
WEATHER'N & INTERG.	309.6	298.2	307.2	325.1	4.0	-1.4
Weatherization Program	224.7	225.4	235.4	240.4	5.0	15.7
State Energy Grants	44.2	41.0	41.0	41.0	0.0	-3.2
State Energy Activities	2.3	0.5	0.5	0.5	0.0	-1.8
Gateway Deployment	35.0	26.7	25.7	26.7	-1.0	-8.3
Rebuild America	—	—	—	6.6	—	—
Clean Cities	—	—	—	6.5	—	—
Energy Star	—	—	—	5.8	—	—
Inventions	—	—	—	2.4	—	—
PROGRAM MGMT	123.8	117.5	118.0	153.0	0.5	36.5
EFFICIENCY R&D SUBTOTAL	595.8	575.8	—	—	—	—
GRANTS SUBTOTAL	268.9	266.4	276.4	281.4	10.0	12.5
Prior Year Balances	-5.3	—	—	—	—	—
EERE, TOTAL	1,248.9	1,200.4	1,235.8	1,253.8	17.0	4.9

Sources: DOE FY2006 Budget Request, v. 7, Feb. 2005, p 208-214. H.Rept. 109-86 (p. 96-104); S.Rept. 109-84.

*Funding for Distributed Energy was moved to the Office of Electricity Delivery and Energy Reliability.

Energy conservation: 10 ways to save energy. Last updated 12/23/2020. There are many different ways to reduce your household's energy use, ranging from simple behavioral adjustments to extensive home improvements. Traditional incandescent light bulbs consume an excessive amount of electricity and must be replaced more often than their energy efficient alternatives. Halogen incandescent bulbs, compact fluorescent lights (CFLs), and light-emitting diode bulbs (LEDs) use anywhere from 25-80 percent less electricity and last 3 to 25 times longer than traditional bulbs. Although energy efficient bulbs are more expensive off the shelf, their efficient energy use and longer lifetimes mean that they cost less in the long run.

3. Use smart power strips. Conservation of energy is just a way to balance the energy from one form to the other form. Just like balancing budget and expenditure in accounting. Since you know that Energy can not be created or destroyed, we use conservation of energy to balance our energy "check books". It's important to do so in order to calculate how much we need to generate.

Emerging Trends in Energy Conservation. A Review on Energy Efficiency Improvement methods for Oil and Gas Industries. A Review on Energy Efficiency Improvement methods for Oil and Gas Industries. Mostafa Mahinroosta. Saving energy through improved efficiency and conservation has a central role to play in reconciling the goals of economic development, energy security and environmental protection [11]. primary source like fossil fuels or an energy carrier such as electricity or hydrogen-and the output of an energy service, such as light, heat or mobility. Improving energy efficiency, by.