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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 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 renewed emphasis on energy efficiency and energy conservation to dampen oil, electricity, 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 FY2007 budget request for the Department of Energy's (DOE's) Energy Efficiency Program seeks \$484.7 million for energy efficiency R&D programs, which is \$20.9 million, or 4.5%, more than the FY2006 appropriation. In support of the President's proposals for the American Competitiveness Initiative and Advanced Energy Initiative, the request includes major funding increases for hydrogen and fuel cell technology under the Hydrogen Fuel Initiative. For the DOE Energy Efficiency Program, the main increases are for Hydrogen (\$40.2 million) and Hybrid/Electric Propulsion (\$6.9 million). Some key cuts are for Industries of the Future ("Specific," -\$7.2

million), Building Codes Program (-\$4.5 million), Clean Cities (-\$3.5 million), and Rebuild America (-\$1.3 million). Further, the Weatherization Program would receive a major cut of \$78.4 million. Also, the request would eliminate all congressional earmarks under the DOE energy efficiency programs.

P.L. 109-102 (H.R. 3057) provides \$100 million for clean (renewable) energy and energy efficiency programs in developing countries. P.L. 109-97 (H.R. 2744) provides \$23 million for farm-based energy efficiency (and renewable energy) grants and loans. H.R. 2862 has telecommuting provisions for federal agencies, and P.L. 109-54 (H.R. 2361) provides \$109.4 million for the Environmental Protection Agency's (EPA's) Climate Protection Programs.

P.L. 109-58 (H.R. 6) authorizes or reauthorizes several energy efficiency and conservation programs. It also establishes several new commercial and consumer product efficiency standards, sets new goals for energy efficiency in federal facilities and fleets, broadens the Energy Star products program, expands programs for hydrogen fuel cell buses, and extends daylight savings. However, it does not include Senate-proposed provisions for oil conservation or a broader range of legislated standards for equipment efficiency.

P.L. 109-59 (H.R. 3) contains several provisions for energy conservation and fuel savings, including sections 1121, 1307, 1807, 1808, 1952, 1954, 3005, 3016, 3045, 4149, 5301, 5502, 6001, and 9002.

MOST RECENT DEVELOPMENTS

On March 23, 2006, Andrew Karsner, formerly with Enercorp (a renewable energy development firm), was sworn in as DOE Assistant Secretary for Energy Efficiency and Renewable Energy. On March 9, 2006, the House Committee on Science held a hearing focused on a National Academy of Sciences proposal that Congress consider establishing an Advanced Research Projects Agency for Energy (ARPA-E) at DOE. Some bills (H.R. 4435, H.R. 4906, S. 2196, S. 2197, S. 2398) propose creating such an agency in various forms. However, the Administration has already requested FY2007 funding for an Advanced Energy Initiative (AEI), as part of its American Competitiveness Initiative (ACI), that includes accelerated funding for the “Hydrogen Fuel” initiative under DOE’s Energy Efficiency and Renewable Energy Program.

On February 6, 2006, President Bush issued the Administration’s budget request for FY2007. The Department of Energy (DOE) request seeks \$484.7 million for energy efficiency R&D, which is \$20.9 million, or 4.5%, more than the FY2006 appropriation (excluding inflation). The request calls for elimination (or reprogramming) of all congressional earmarks, which amount to \$71.6 million for FY2006 Energy Efficiency programs, including Hydrogen (\$42.5 million) and Vehicle Technologies (\$20.3 million). (For more details, see “FY2006 DOE Budget” and **Table 3**. CRS Report RL33294, *DOE Budget Earmarks: A Selective Look at Energy Efficiency and Renewable Energy R&D Programs*, by Fred Sissine, provides more details about earmarks for DOE’s energy efficiency programs. Also, the DOE budget document is online at [<http://www.cfo.doe.gov/budget/index.htm>].)

For FY2007, the Environmental Protection Agency’s (EPA’s) request for Climate Protection (energy efficiency) Programs is \$104.3 million, which is \$5.1 million lower than the FY2006 level. (For more details, see “EPA Budget, FY2007” and **Table 2**, below.) Appropriation bills for the Department of Agriculture and the Department of State also include funding for energy efficiency programs. (For more details, see the “Legislation” section below.)

(Note: The energy efficiency provisions in the Energy Policy Act of 2005 [P.L. 109-58, H.R. 6] and other bills of the 109th Congress are discussed in “Energy Efficiency in the 109th Congress” and “Legislation,” below.)

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 FY1978 through FY2005, DOE spent about \$12.0 billion in 2004 constant dollars for energy efficiency R&D, which amounts to about 15% of the total DOE spending for energy R&D during that period. In 2004 constant (real) dollars, energy efficiency R&D funding declined from \$692 million in FY1980 to \$223 million in FY1988 and then climbed to \$652 million in FY2001. For FY2005, \$584 million was appropriated, which was \$12.8 million, or 2%, less than the FY2004 mark in 2004 constant dollars. Also, in 2004 constant dollars, since FY1978, DOE has spent about \$8.2 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 FY1977, in 2004 constant dollars, the federal government spent about \$41.2 billion for nuclear (fission and fusion) R&D and about \$13.7 billion for fossil energy R&D. From FY1978 through FY2005, the federal government spent \$32.8 billion for nuclear (fission and fusion), \$20.4 billion for fossil, \$13.0 billion for renewables, and \$12.0 billion for energy efficiency. Total energy R&D spending from FY1948 to FY2005, in 2004 constant dollars, reached \$135.4 billion, including \$74.0 billion, or 55%, for nuclear, \$34.1 billion, or 25%, for fossil, \$13.0 billion, or 10%, for renewables, and \$12.0 billion, or 9%, for energy efficiency.

Under the FY2005 budget structure (in current 2005 dollars) for EERE, DOE's energy efficiency R&D funding totaled \$595.9 million, or about 25% of DOE's energy R&D appropriation. Renewable energy R&D received \$380.3 million (16%), fossil energy received \$539.6 million (22%), and fission and fusion were appropriated \$784.1 million (32%).

Since 1985, national energy use has climbed about 20 Q (quads — quadrillion Btus, British thermal units), reaching a record high of 99.7 Q in 2004. 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 the *DOE Budget Request for FY2006*, energy efficiency is addressed under the strategic goal “to protect national and economic security” and within General Goal 4, which seeks to “[i]mprove energy security” through a variety of energy supply measures and by “improving energy efficiency.” In support of DOE General Goals, the request lists 10 Program Goals (PGs) under Energy Conservation, from which selected PGs follow. PG 4.01 says the Hydrogen/Fuel Cell Technologies Program will achieve certain cost and performance goals. PG 4.02 aims to increase the efficiency of cars and trucks to “reduce energy use and greenhouse gas emissions.” PG 4.04 says that the Buildings Program will become “capable of generating as much energy as they consume.” PG 4.06 says that the Industrial Technologies Program will reduce energy intensity and improve economic competitiveness. PG 4.13 says that relative to the 1985 baseline, DOE’s Federal Energy Management Program (FEMP) will support federal agency efforts to reduce energy intensity by 35% by 2010. Further, DOE notes that from 2001 through 2004, EERE was awarded 33 R&D 100 awards. DOE projects that the EERE programs will curb energy demand growth by 12 Q per year in 2025 and by 30 Q in 2050, which would represent more than half of the otherwise expected growth by 2050.

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. P.L. 109-58 (§135 and §136) sets a variety of energy efficiency standards for consumer appliances and commercial equipment. As the table below shows, most of the standards are set by law, but some are at the discretion of a DOE rulemaking. The American Council for an Energy-Efficient Economy (ACEEE) estimates that these new standards will save more energy than any other efficiency provisions in the bill. Further, §141 requires that DOE report regularly to Congress when efficiency standard rulemakings are behind schedule, including steps being taken to get back on schedule. The table below indicates which standards would be set by law and which would be set by DOE rulemaking.

Standard set:	H.R. 6 (Conference)
By law (16 products)	exit signs, traffic signals, building transformers, torchiere lighting fixtures, compact fluorescent lamps, commercial unit heaters, residential dehumidifiers, commercial refrigerators and freezers, large commercial air conditioners, commercial ice makers, commercial clothes washers, pedestrian crossing signals, mercury vapor lamp ballasts, fluorescent lamp ballasts, pre-rinse spray valves (used in restaurants), and residential ceiling fan light kits.
By rule (3 products)	external power supplies, battery chargers, refrigerated beverage vending machines

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. P.L. 109-58 (§102) sets 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, P.L. 109-58 (§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.

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. P.L. 109-58 includes new tax credits for energy efficiency. In commercial property, new home construction, existing home improvements, appliances, residential fuel cells, and business fuel cells.

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, Senate, and Conference versions of H.R. 6.

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

	House	Senate	Conference (P.L. 109-58)
Energy Efficiency and Conservation Measures (§1312 and §1317 in House bill, excluding diesel fuels, alternative fuels, and solar credit)	\$0.397	\$3.733	\$1.260
Hybrid and Fuel Cell Vehicles	—	\$1.686	—
Total, Energy Efficiency and Conservation	\$0.397	\$5.419	\$1.260
Gross Total, All Tax Provisions	\$8.090	\$18.421	\$14.553
Energy Efficiency and Conservation Share of Total	4.9%	29.4%	8.7%

Source: Joint Committee on Taxation (JCT), *Estimated Budget Effects of the Conference Agreement for Title XIII of H.R. 6, July 27, 2005 (JCX-59-05)*; *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

P.L. 109-58 has several provisions (§ 151-154) 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 authorize grant programs (e.g., DOE Weatherization Program and State Energy Program). Several other energy efficiency programs are authorized in Title I and Title IX.

DOE Budget, FY2007

The main requested increases are for Hydrogen (\$40.2 million), Hybrid/Electric Vehicle Propulsion (\$6.9 million), Residential Buildings (\$4.5 million), and a total of \$2.3 million for new Industrial programs in Combustion, Robotics, and Sensors/Automation. The main program cuts are for Industries of the Future (“Specific,” -\$7.2 million), Industrial Technical Assistance (-\$1.5 million), Vehicle Materials (-\$5.5 million), and the Federal Energy Management Program (-\$2.3 million). In addition, the request seeks a \$13.8 million increase for State Energy Program grants and a \$78.4 million, or 32.3%, cut for Weatherization Program grants. Further, the Gateway Deployment program area would be eliminated, which includes terminations of the Building Codes Program (-\$4.5 million) and the Inventions Program (-\$3.0 million), as well as cuts in Clean Cities (-\$3.5 million), Rebuild America (-\$1.3 million), and Energy Star (-\$0.2 million) programs, which would be transferred to other program areas.

In his State of the Union address, President Bush announced the launch of the American Competitiveness Initiative (ACI) to stimulate long-term economic growth, in large part by increased promotion of R&D and technological innovation. A key component of the ACI is the Advanced Energy Initiative, which DOE says also “aims to reduce America’s dependence on imported energy sources.” The Hydrogen Fuel Initiative is one theme under the Advanced Energy Initiative that is funded under energy efficiency programs in DOE’s Office of Energy Efficiency and Renewable Energy (EERE). The goal of the Hydrogen Fuel Initiative is to “bring hydrogen and fuel cell technology from the laboratory to the showroom.” Specifically, the program aims to “facilitate a decision by industry to commercialize a hydrogen infrastructure and fuel cell vehicles by 2015.” To support this initiative, the DOE request for energy efficiency programs proposes major funding increases for hydrogen and fuel cell technology programs. The ACI and the FY2007 federal budget reflect strong concern about the rapidly growing amount of legislative earmarks for R&D programs, including the Hydrogen program.

In FY2006, Congress adopted a new appropriations structure that merged EERE funding for renewable energy from the Energy and Water Development bill with funding for energy efficiency from the Department of Interior and Related Agencies bill. The unified account structure (now under the Energy and Water Development bill) no longer reports completely separate funding amounts for energy efficiency and renewable energy programs.

For additional information on Energy Conservation Programs, see [<http://www.eere.energy.gov/>].

EPA Budget, FY2007

The FY2007 appropriation for EPA's Climate Protection Programs (CPPs) is \$104.3 million, which is \$5.1 million less than FY2006 appropriation. This includes \$1.0 million more under the Office of Environmental Programs and Management (EPM) and \$6.1 million less under the Office of Science and Technology (S&T) for transportation activities.

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 Energy Star Buildings, Methane to Markets, 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 Enacted	FY2006 Appn.	FY2007 Request	FY2007- FY2006	Percent Diff.
Environ. Programs & Management	88.5	92.5	90.8	91.8	1.0	1.1%
Science & Technology	21.8	20.4	18.6	12.5	-6.1	-32.8%
TOTAL	110.3	112.9	109.4	104.3	-5.1	-4.7%

Source: EPA FY2007 Annual Performance Plan and Congressional Justification, Feb. 2006, [<http://www.epa.gov/ocfopage/budget/2007/2007cj.htm>].

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 Conservation, Demand-Side Management (DSM), and Distributed Power

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 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.

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 by nearly half, to about \$1.4 billion. In response, some states, such as California, included 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 that provides about \$300 million per year for "cost effective" energy efficiency and conservation programs directed by the California Energy Commission.

The August 2003 electric power blackout that affected several states and Canadian provinces rekindled interest in energy efficiency, demand response, 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 Office of Electricity (OE) program may help reduce the security risk by decentralizing energy facilities and establishing some facilities off-grid. Also, the need in emergency situations to ensure rapid restoration of transportation systems and energy production, transmission, and distribution can be readily addressed by small, highly mobile distributed energy equipment. P.L. 109-58 has provisions (§126, §921-925, §931) 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/de/>].)

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 22.4 mpg in 2004. Light trucks have experienced greater variability, with a recent peak in 2001 at 17.6 and a decline to 16.2 mpg in 2004. Section 774 of P.L. 109-58 requires EPA to revise its adjustment factors to increase the accuracy of fuel economy labels. In action on H.R. 6 (P.L. 109-58), the Senate version included a provision to save 1 million barrels of oil per day by 2010, but the provision did not survive conference. (For more on CAFE standards, see CRS Issue Brief IB90122, *Automobile and Light Truck Fuel Economy: The CAFE Standards*, by Robert Bamberger.)

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 Department of State, Foreign Operations, and Related Programs Appropriations Bill, 2006 (P.L. 109-102, H.R. 3057; Section 585[a]) provides \$100 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. In February 2005, the Kyoto Protocol went into effect, without a U.S. commitment to an emissions reduction goal.

At COP-11 in December 2005, the parties focused on the post-2012 period and sat as the first "Meeting of the Parties to the Kyoto Protocol (MOP-1)." COP-11/MOP-1 adopted detailed rules for the operation of the Kyoto Protocol, including emissions trading, joint implementation, clean development mechanism, crediting of domestic sink activities, a compliance regime, and a system for reporting and reviewing national emissions. Shortly before COP-11/MOP-1 convened, both leaders of the Senate Foreign Relations Committee introduced Res. 312, which calls for U.S. participation in "negotiations under the UNFCCC" and in agreements that "establish mitigation commitments by all countries that are major emitters of greenhouse gases." This resolution may reflect an increasing interest from Congress for stronger U.S. engagement in the multilateral climate effort.

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 2006* projects 2010 emissions will be 1,731 MMTC, 27% 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 2005, the California Air Resources Board approved final rules that would require car manufacturers to cut automobile carbon dioxide and other GHG emissions 22% by 2012. This could force automakers to increase fuel efficiency sharply. Although the rules take effect in 2006, new cars will not have to meet new standards until model year 2009. An industry court challenge is possible. Seven northeastern states have adopted other auto emission regulations that parallel those in 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.

LEGISLATION

Public Laws

P.L. 109-54 (H.R. 2361)

Department of the Interior, Environment, and Related Agencies Appropriations Bill, 2006. The conference bill includes \$112.5 million for EPA’s Climate Protection Program (energy efficiency) — \$93.5 million under the Office of Environmental Programs and Management (EPM) and \$19.0 million under the Office of Science and Technology (S&T). Conference reported (H.Rept. 109-188) July 26, 2005. Signed into law August 2.

P.L. 109-58 (H.R. 6)

Energy Policy Act of 2005 (EPACT 2005). The enacted version (H.Rept. 109-190) authorizes or reauthorizes several energy efficiency and conservation programs. It also establishes several new commercial and consumer product efficiency standards, sets new goals for energy efficiency in federal facilities and fleets, broadens the Energy Star products program, expands programs for hydrogen fuel cell buses, and extends daylight savings. However, it does not include Senate-proposed provisions for oil conservation and a broader range of legislated equipment efficiency standards. Conference reported (H.Rept. 109-190) July 27, 2005. Signed into law August 8.

P.L. 109-59 (H.R. 3)

Transportation Equity Act. Sections related to energy efficiency and conservation include 1121, high occupancy vehicle (HOV) facilities; 1307, magnetic levitation transportation; 1807, nonmotorized transportation pilot program; 1808, additions to congestion mitigation and air quality (CMAQ); 1952, congestion relief; 1954, bicycle transportation and pedestrian walkways; 3005, metropolitan transportation planning; 3016 national research and technology programs; 3045, national fuel cell bus technology development program; 4149, office of intermodalism; 5301, intelligent transportation systems; 5502, congestion relief research initiative; 6001, transportation planning; and 9002, study of high speed rail. House bill introduced February 9, 2005; referred to Committee on Transportation and Infrastructure. Conference reported (H.Rept. 109-203) July 28, 2005. Signed into law August 10.

Note: Four other public laws make appropriations for energy efficiency programs. P.L. 109-97 (H.R. 2744) makes appropriations for grant and loan (§9006) programs at the

Department of Agriculture; P.L. 109-102 (H.R. 3057, §585[a]) makes appropriations for the Department of State's climate change programs in developing countries, including \$100 million that "should be made available to directly promote and deploy energy conservation, energy efficiency, and renewable and clean energy technologies"; P.L. 109-103 (H.R. 2419) makes appropriations for the DOE energy efficiency (energy conservation R&D and grant) programs; and P.L. 109-108 (H.R. 2862, §618 and §619) directs several federal agencies to certify that telecommuting opportunities have increased over the previous year and several other agencies to certify that telecommuting opportunities are available to 100% of the eligible workforce. Failure to certify would cause agencies to risk forfeiting \$5 million. More details about these laws and other bills are described in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*, by Fred Sissine.)

P.L. 109-171 (S. 1932)

Deficit Reduction Act of 2005. Section 1301 amends section 9006(f) of the Farm Security Act of 2002 to set a limit of \$3 million in FY2007 funding for the USDA Commodity Credit Corporation to carry out renewable energy and energy efficiency projects. Section 1402 terminates FY2007 funding authorization for the USDA Value-Added Producer Program (created by section 6401 of the Farm Security Act of 2002) to provide grants to renewable energy and energy efficiency projects. Conference reported (H.Rept. 109-362) December 19, 2005. Signed into law February 8, 2006.

Legislation

(A more extensive list of more than 160 bills appears in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*, by Fred Sissine.)

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

(An extensive list appears in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*, by Fred Sissine. Testimony by officials of DOE's Office of Energy Efficiency and Renewable Energy (EERE) at many hearings of the 109th Congress are listed on EERE's 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 Online: *Guide to Cars and Trucks, Model Year 2006*. Highlights at [<http://www.greencars.com/bestof.html>].

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 Manufacturers (NAM). *Efficiency and Innovation in U.S. Manufacturing Energy Use*. 2005. 37 p. [http://www.fypower.org/pdf/Mfg_NAM_ASE.pdf]
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- 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) 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) 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>].
- . *Investing in Our Future: Energy Star and Other Voluntary Programs 2004 Annual Report*. September 2005. 54 p. [http://www.energystar.gov/ia/news/downloads/annual_report2004.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 RL33294. *DOE Budget Earmarks: A Selected Look at Energy Efficiency and Renewable Energy R&D Programs*, by Fred Sissine.

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

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

CRS Report RL32251. *Tax Incentives for Alternative Fuel and Advanced Technology Vehicles*, by Brent Yacobucci.

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

Websites

Alliance to Save Energy. Many resources on energy efficiency.
[<http://www.ase.org/>]

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/>]

Tax Incentives Assistance Project. Resources for energy efficiency incentives in P.L. 109-58 (H.R. 6). [<http://www.energytaxincentives.org/>]

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

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[<http://www.eere.energy.gov/>]

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[http://www.cfo.doe.gov/budget/07budget/Content/Volumes/vol_3_ES.pdf]

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

Table 3. DOE Energy Efficiency Budget for FY2005-FY2007
(selected programs, \$ millions)

	FY2005 Appn.	FY2006 Appn.	FY2006 Request	FY2007 - FY2006	Percent Change
HYDROGEN TECH.	166.8	155.6	195.8	40.2	25.8%
Fuel Cell Tech.	81.9	67.8	96.6	28.8	42.4%
VEHICLE TECH.	161.3	182.1	166.0	-16.1	-8.8%
Hybrid and Electric	44.1	44.0	50.8	6.9	15.6%
Advanced Combustion	48.5	45.6	46.7	1.1	2.5%
Materials Technology	36.0	35.3	29.8	-5.5	-15.5%
Fuels Technology	12.4	13.7	13.8	0.1	1.0%
Technology Introduction	4.9	6.3	11.0	4.8	76.5%
Clean Cities	10.6	7.9	4.4	-3.5	-44.3%
BUILDING TECH.	65.2	69.3	77.3	8.1	11.6%
Res. & Commercial Bldgs	21.9	18.3	24.4	6.1	33.3%
Emerging Technologies	31.1	33.1	32.8	-0.3	-0.9%
Tech. Valid. & Mkt. Intro.	0.0	0.0	8.2	—	—
Rebuild America	8.6	3.8	2.5	-1.3	-34.2%
Energy Star	3.7	5.9	5.8	-0.1	-1.7%
INDUSTRIAL TECH.	73.4	56.9	45.6	-11.3	-19.9%
Ind. of the Future, Specific	37.4	24.2	17.0	-7.2	-29.9%
Ind. of the Future, Cross.	32.3	28.9	28.6	-0.3	-1.0%
Comb., Robotics, Sesors	4.5	3.1	5.4	2.3	76.7%
Industrial Tech. Assist.	15.1	14.4	12.9	-1.5	-10.4%
DISTRIB. ENERGY RES. ^a	59.1	0.0	0.0	—	—
FED. ENERGY MGMT	19.9	19.2	16.9	-2.3	-11.8%
WEATHER'N & INTERG.	325.5	316.9	225.0	-91.8	-29.0%
Weatherization Program	228.2	242.6	164.2	-78.4	-32.3%
State Energy Grants	44.2	35.6	49.5	13.8	38.8%
State Energy Activities	2.3	0.5	0.0	-0.5	-100.0%
Gateway Deployment ^b	33.9	25.4	0.0	—	—
Inventions	3.9	3.0	0.0	-3.0	-100.0%
PROGRAM MGMT	115.1	111.9	102.0	-9.9	-8.8%
Prior Year Balances	-5.3	—	—	—	—
EERE, TOTAL ^a	1,234.3	1,173.8	1,176.4	2.6	0.2%
EFFICIENCY R&D, SUB. ^c	466.6	463.9	484.7	20.9	4.5%
GRANTS, SUBTOTAL	272.3	278.2	213.7	-64.5	-23.2%
EE EARMARKS, SUB.	34.0	85.7	0.0	-85.7	-100.0%

Source: DOE FY2007 Budget Request, v. 3, Feb. 2006.

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

b. The request would terminate Gateway Deployment and move some subprograms to other Programs.

c. Efficiency R&D Subtotal includes Hydrogen, Fuel Cells, Vehicles, Buildings, and Industrial Technologies.